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AN EMPIRICAL STUDY OF CROWD DYNAMICS AND MANAGING SAFETY AT EVENTS

Finn, Kristin

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University of Plymouth

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**UNIVERSITY OF
PLYMOUTH**

**AN EMPIRICAL STUDY OF CROWD DYNAMICS AND MANAGING SAFETY
AT EVENTS**

by

KRISTIN FINN

A thesis submitted to the University of Plymouth in
partial fulfilment for the degree of

DOCTOR OF PHILOSOPHY

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Author's Declaration

At no time during the registration for the degree of *Doctor of Philosophy* has the author been registered for any other University award without prior agreement of the Doctoral College Quality Sub-Committee.

Work submitted for this research degree at the University of Plymouth has not formed part of any other degree either at the University of Plymouth or at another establishment.

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An Empirical Study into Crowd Dynamics and Managing Crowd Safety at Events

Kristin Finn

Abstract

The UK live events market has long been considered to be a growth sector. Given the range of challenges linked to event crowd safety felt by the industry in recent years, and despite recent setbacks associated with new safety measures and public uncertainty following the arrival of the COVID-19 pandemic in 2020, event organisers remain optimistic about the future. Many authors have studied crowd dynamics and safety planning in recent years, but often the emphasis has been one of objective observation and expert opinion. The outcomes of this thesis are timely as it aimed to investigate attitudinal differences among event audiences relating to safety, and the nature of crowd incidents, alongside observed and perceived efficacy of crowd management strategies, with the ultimate intention to better understand the audiences that attend events and provide recommendations for tailored crowd management strategies and successful, safe event delivery for the long term.

A two-phase methodology was employed using mixed methods and underpinned by a pragmatic philosophical approach. Phase one involved the development of a global crowd incident database with data collated on a range of key factors for analysis that addressed the interrelated complexities of delivering safe and successful events. Phase two then explored audience perceptions related to the efficacy of crowd management strategies and perceived event safety, from 512 UK event attendees in total, across a wide range of events. Practically, the data generated from this joined up approach provide a robust overview of crowd dynamics and its relationship to strategic event safety management to aid in the activity of profiling crowds in attendance at events, alongside the likely dynamic intervening variables of influence that must be determined in order to develop targeted and effective crowd management strategies.

The new knowledge developed from the thesis research outcomes represents an original interdisciplinary contribution to the existing body of literature concerned with crowd dynamics and managing event safety, and also provides a practical contribution to the field of crowd safety management in several ways. First, the matrix of crowd dynamics and effective safety strategies provides detailed insights in relation to likely crowd profiles attending different events as well as unique recommendations for their safe and effective management. Second, a new theoretical representation of crowd dynamics and strategic event safety management was developed that reviews the strategic crowd management process in its entirety to provide an overview of the process, its influences and potential strategic fail points that can impact on an event's safety outcome and its ultimate success or failure. Its application could arguably aid practitioner understanding, to instil a strategic 'overview' of the fundamental elements involved in the crowd safety strategic process when safety is not their primary role. This enhanced understanding would arguably be beneficial to the event safety management process as a whole.

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An Empirical Study of Crowd Dynamics and Managing Safety at Events

1. Introduction

In its most simple form, events are gatherings of people (Bladen, Kennell, Abson and Wilde 2012) yet a crowd at a special event is not the number of attendees but rather a set of multiple personalities (Berlonghi 1995), and therefore planners must aim to foresee the nature of the crowd that is in attendance in order to effectively manage it. Whilst most events historically have proceeded without complication, they can present a broad range of risks to staff and audience alike. According to Wakefield (2013) crowds can be dangerous places and issues can be triggered by the weather, factions in the crowd or event managers. In recent years, incidents such as the Hillsborough crowd surge disaster (BBC News Online 2013a), the Fresh Island Festival Fire Evacuation (Sky News Online 2019) and the Brazilian nightclub fire (BBC News Online 2013b), the drugs deaths at Mutiny Festival (Busby 2018), the human error involved in the Indiana State Fair stage collapse (Tuohy & Ritchie 2012) and Love Parade crowd crush disaster (Helbing and Mukerji 2012) as well as the terror attacks including the Manchester Arena Bombing (The Kerslake Report 2019) and the Las Vegas Shooting (Hernandez, McCarthy, and McGowan 2019), have highlighted the range of influencing crowd and human factors, natural disasters, and safety failings that can affect planned events.

The emergence of the COVID-19 pandemic halted live event production and mass gatherings in the first quarter of 2020 (Stewart 2020), bringing about change for the industry, with new lasting safety guidelines regarding crowded spaces and an estimated recovery time of over two years for the UK events sector and night-time economy specifically (BVEP 2021a; Public Policy Exchange 2022). The year 2021 saw the partial return to live events from the mid-year point onwards, with the phased removal of restrictions that occurred in England and other parts of the UK, whereby most legal restrictions on social contact were lifted and the final closed sectors (i.e., nightclubs and live indoors entertainment) were opened up in England in July 2021 (Institute for Government 2021). This lifting of restrictions marked the return of full capacity crowds at major sports events such as the premier league from August 2021 and some late-summer UK festivals including Reading and Leeds Festival, albeit with new protocols to be followed including mask wearing in enclosed spaces, avoiding close contact and following one-way systems as well as the need for evidence of full vaccination at the point of entry (BBC Berkshire Online 2021; Rodwell 2021). This 'opening up' of crowds at events, for England at least, continued in 2022 with the UK summer festival programme seeing the return of all major UK festivals including Glastonbury.

However, more stringent measures and higher levels of caution remained elsewhere. Notable, was the prohibition of spectators at more than half of the venues hosting the Tokyo Summer Olympics in July 2021 and with only domestic spectators permitted at venues open to spectators, in light of a state of emergency called in Japan due to the surge in covid cases linked to the new Delta variant (Ingle and McCurry 2021). A similar strategy was employed for the Beijing Winter Olympics in February 2022 to manage the spread of the new Omicron variant,

whereby a closed-loop of invite-only domestic spectators in restricted numbers were able to attend associated venues (IOC 2022; Ni 2022).

To coincide with the lifting of most social contact restrictions in England in August 2021, and the reopening of live events, the UK Government announced a support package for the events industry help cover costs incurred due to Covid-based cancellation (HM Treasury and DCMS 2021); the scheme, which was open until September 2022 and enabled organisers to purchase cancellation cover for when Covid-related circumstances legally prohibited the event from taking place, has contributed to the post-covid recovery of the UK live events industry. Moreover a global survey of 4500 event organisers by Eventbrite (2022) found that event organisers in 2022 were feeling optimistic about the future since being able to return to live event production and agreed that whilst some uncertainty remains and certain safety measures such as social distancing, mask wearing and proof of vaccination persist at least for the short term, the industry as a whole has become much more resilient to external influences, with events becoming more innovative and creative as a whole.

It therefore stands that organisers cannot be excused from the significant responsibility of providing the public with the highest standard of safety and security that is both possible and feasible (Berlonghi 1995:239). Furthermore, it is this need to address the potential that events possess for personal harm and associated legal and other costs (Abbot & Geddie 2001) that emphasises the need for research into crowd dynamics and effective safety management; arguably now more than ever.

With these observations in mind, this thesis investigates the interrelated concepts of crowd dynamics and managing audience safety at events, exploring existing conceptual knowledge around crowd behaviour and event safety management, as well as previous crowd incident cases to address the complexities of delivering safe and successful events. The study aims were threefold: First, to investigate crowd culture and behaviour at events to analyse the potential for behavioural and attitudinal differences that exist among event audiences. Second, to undertake a detailed analysis of crowd safety incidents at events and the efficacy of crowd management strategies employed in relation to different event scales and types, to better inform planning for effective crowd management strategies and creation of safe audience experiences. The third and final aim sought to develop a matrix of crowd dynamics and safety management strategies by event and crowd profile type to validate an interdisciplinary contribution to the event management theory. To satisfy these aims, seven research objectives were established, designed to explore all aspects of the aforementioned aims in depth; the specific details of the study's research objectives can be found in Chapter 5 (p72).

Whilst the future of the events industry may be somewhat altered as the world recovers from the impact of the COVID-19 pandemic (BVEP 2021a; Stewart 2020), it is intended that the conceptual findings and research outcomes from this thesis could offer new insight that may help to better understand the audiences that attend events and the most appropriate ways to organise and manage their safety. The interdisciplinary nature of the research, which explores the research question from the perspectives of crowd psychology, event safety management and event design and experience, arguably offers a synthesised contribution to the event management literature alongside practical contributions to enhance industry resilience linked to a range of operational scenarios that may exist for the UK events industry going forwards.

The Introduction chapter (Chapter 1) has outlined the study context by exploring issues linked to crowd dynamics whilst also identifying and outlining the contemporary challenges being faced by the industry in terms of managing event safety. This thesis therefore extensively explored the existing literature linked to crowd behaviour and management of crowd safety at events through the Literature Review that spans Chapter 2 (Crowd Behaviour), Chapter 3 (Managing Crowd Safety) and Chapter 4 (Conceptual Framework).

The study followed a pragmatic methodological approach, being guided by inductive principles whilst adopting a mixed method qualitative and quantitative approach to data collection. The study Aims and Objectives were set out in Chapter 5 informed by the review of the existing literature and conceptual framework, and the Methodology (Chapter 6) followed on from these to discuss the research considerations required to complete a data collection exercise that satisfied all three aims and all seven objectives.

Specifically, Aims 1 and 2 and Objectives 1,2,4,5,6, and 7 related to the data analysis outcomes presented and discussed in Chapter 7 linked to the qualitative historical crowd incident database analysis findings. This chapter explored concepts and outcomes linked to global crowd incidents in terms of detailed analysis of the nature of the incidents themselves and associated influencing factors linked to event type, scale, crowd behavioural profile and crowd management failings and strategies. Following on from this, Aims 1 and 2, and Objectives 2 to 7 related to the findings presented in Chapter 8 linked to the quantitative audience perceptions investigation conducted. Outcomes captured the attendee profile and explored crowd sentiment around the event environment, site planning, and crowd management strategies experienced and perceived safety of events attended. Given the timing of the audience-based research exercise (Spring 2020) and the noted potential impact of the Pandemic on safety perceptions, consideration was given through the audience survey of potential pandemic-based attitudinal change through a series of targeted questions. It should be noted, however, that this was not the intended emphasis of the thesis' aims and its research outcomes. Rather, its recognition and inclusion reflected acknowledgement that the COVID-19 pandemic had some level of influence on audience perceptions of safety and crowd safety strategies at events than may have otherwise been recorded.

Aim 3 and Objective 7 of the study set out to identify levels of risk in terms of crowd safety and events to create a matrix of crowd behaviour and safety management at events. The discussion of study findings outlined in Chapters 7 and 8 against the existing literature has been presented within Chapter 9, culminating in the creation of this new risk matrix of crowd dynamics and effective targeted safety strategies, the theoretical model informing it and its original interdisciplinary contribution to new knowledge in the context of the existing literature. Finally, conclusions regarding the thesis research outcomes and its subsequent academic, research and industrial impacts have been addressed in the final chapter (Chapter 10).

2. Crowd psychology and audience behaviour at events

Due to the very nature of event experiences, understanding the audience in attendance and ways to manage their behaviour is imperative to the safe planning of events (Berlonghi 1995). As Le Bon (2009:5) observed, 'crowds, doubtless, are always unconscious, but this very unconsciousness is perhaps one of the secrets of their strength'. In its simplest form, a crowd is defined as a gathering of individuals in a densely populated area (Borch 2006; Le Bon 2003). However, it is also suggested that crowds are situations where a lot of people seem to overreact in similar ways and the collective result of this pattern of behaviour is often not known beforehand (Russ 2007). The concepts of crowds and audience behaviour will be explored in detail throughout the course of this chapter.

2.1 Crowd behaviour theory: Sociology and psychology of crowds

Within the existing literature, two key perspectives are believed to underpin the way in which crowds behave and are managed; psychological influencing factors (these factors have often been linked to the more negative classical view of crowd theory) and physical proximity and social relations to others (seen as a more rational, contemporary view). Linked to this, Templeton (2021: 217) defines *physical* crowds as those that consist of people in the same physical space who are not socially connected other than in small pre-existing groups (i.e., commuters in transport hubs or shoppers in a city centre), whilst *psychological* crowds are characterised by social connections wherein crowd members feel part of the same social group (i.e., music festival attendees or football fans celebrating together). Evidence suggests that whilst there is consensus that crowds cannot simply be viewed or managed as a negative entity, the aspects of these different theoretical viewpoints inform modern crowd management techniques (Gorringe, Stott and Rosie 2012; Hoggett and Stott 2010; Stott and Reicher 1998). Therefore, it is important to understand the unique characteristics associated with these perspectives in further detail.

2.1.1 Classical view of crowd theory

Several key figures are widely credited to have developed the foundation upon which crowd psychology theory today has been built. These figures included Gustave Le Bon, Gabriel Tarde, Sigmund Freud and Scipio Sighele and formed what is today viewed as the early semantics of crowds (Blackman 2008; Borch 2006; Borch 2009). Towards the end of the 19th Century, studies of crowds were often presented in a negative or pessimistic light. The re-published work of Le Bon (2003), for example, emphasised that 'under certain given circumstances, and only under those circumstances, an agglomeration of individuals presents new characteristics very different from those of the individuals composing it'. He went on to state that a collective mind is formed when conscious and individual personality vanishes and as such, crowds therefore become irrational with the possibility of both positive and negative outcomes, deemed as intellectually inferior to the isolated individual (Le Bon 2003). Moreover, Tarde (1968:325) cited by Borch (2006:86) viewed crowds as 'hypnotic states' and 'one of two distinct germs of society, the other being family'. The classic view of crowds was thus three-fold according to Borch (2006:87); first,

the crowd is a distinct entity that through contagious and collective suggestion brings about mainly destructive acts that would be unlikely to be committed by individual crowd members alone. Second, the crowd is less intelligent and rational than the individuals composing it and third, the crowd may pose a threat to established social order.

Linked into the classical nineteenth century viewpoint of crowds are the concepts of Deindividuation and Social Unity Theory. Drawing on the notion of one collective mind-set (Borch 2006), is the theory of Deindividuation, whereby in crowd situations people tend to lose their normal inhibitions and restraints and in doing so, also lose their sense of individuality and self-awareness that typically moderate irrational behaviour (Berlonghi 1995). This longstanding concept has given rise to many social psychology experiments, such as Derren Brown's *The Gameshow* (Channel 4 2011), which depicted how by granting anonymity and the opportunity to become 'faceless' in a crowd when presented with questionable actions to undertake, the general social norms (e.g., what is acceptable behaviour in society generally) within that group were compromised, resulting in a mob-like or pack mentality and deviant behavioural outcomes. The concept of deviant behaviour will be addressed further on, in the context of event visitor motivation however, as Berlonghi (1995: 245) observed, it could be argued that 'some even seek to join crowds for the reason to offend'. Whilst the outcomes of such social experiments may be true and indeed, despite the fact that the classical work on crowd theory had seemingly become institutionalised within police training until recently (Hoggett and Stott 2010), there is a counter argument against deindividuation and the 'irrationalism' of classical crowd psychology including the transgression of general social norms that suggests crowds actually *conform* to situation-specific norms rather than to *disregard* general social norms; this concept is known as Social Identity Theory (Postmes and Spears 1998; Stott and Radburn 2020) and is a more modern contribution of crowd theory to be discussed in section 2.1.2.

To refer again to the classical view of crowd psychology, Blackman (2008) notes in discussing suggestibility among crowds, that key figures such as Le Bon and Tarde began to distinguish leaders from followers and in doing so, developed Social Unity Theory (not to be confused with Social Identity Theory) whereby in social groups, there were those subjects who were seen to have the capacity to lead and influence, and those who were more likely to copy. She goes on to state that under Social Unity Theory, those who were found to be self-reliant, strong in their convictions and individual were perceived to have leadership qualities whilst women, the working class, colonies and the youth were perceived to be followers (2008:34). In the modern era, this notion has applicability in relation to events when considering the common younger demographic of attendees, particularly at music festivals (Walters and Raj 2004). A study by Verkooijen, de Vries and Nielsen (2007) into youth crowds and substance use found that perceived norms played a pivotal role; results showed that those individuals who considered themselves a part of the pop, skate/hip-hop, techno and hippie 'scene' sub-groups were associated with higher risks of substance use. This therefore has clear implications for management of youth crowds at events likely to attract this demographic and also to explore more generally the impact of age, gender and subculture on audience behaviour and event management. Moreover, as can be seen above, that many authors reference these classic crowd theory concepts when discussing and analysing crowd behaviour today and current event control mechanisms (Hoggett and Stott 2010), highlights the importance of their consideration in the understanding of audience behaviour at events.

2.1.2 Contemporary view of crowd theory

During the late 1960s and early 1970s, the classical and somewhat negative view of crowds was debated and developed towards a 'rational' view of collective behaviour whereby crowds began to be seen as more than pathological entities, suggesting they may be formed to achieve specific goals that were not perceived simply to amount to the destruction of society (Borch 2009:276). Around this time, it appears that crowds began to be analysed in a physical as well as a psychological sense and a viewpoint emerged that unified behaviour begins to occur when physical proximity to others limits the individual to be able to move independently from neighbours. Canetti was one of the key figures to develop this concept in his seminal work *Crowds and Power* (Borch 2009). In summary, Canetti's (1973) theory centred on the everyday fear of being touched or in close proximity to unknown people and thus, typically suggested that individuals will avoid situations where this arises. He suggested that when in crowds and personal space diminishes, people on the whole tend to rationalise that close proximity to unknown people is unavoidable and therefore the everyday fear diminishes, producing specific patterns of behaviour. Technological advances have led to the study of this crowd movement and behaviour via simulation models (Kemp, Hill, Upton & Hamilton 2007; Wakefield 2013). Moreover, Wakefield (2013) notes that crowds can be dangerous places and simulation models can aid learning for event managers by providing accurate and real-time data on crowd numbers, densities, distributions and flows (to be discussed further in Chapter 3).

To refer back to Canetti's (1973) anthropological view of crowds, escapism, crowd equality and liberation of daily norms are discussed as central notions to his theory; this includes the removal of social norms and boundaries and moreover, in situations when boundaries are removed, that violent or deviant tendencies can arise. The links emerge between this and the concept of 'Social Identity Theory' (SIT), and the Elaborated Social Identity Model (ESIM), which is a much-debated modern view on how crowds react and offers a theoretical basis for understanding crowd psychology from the perspective of intergroup dynamics (Drury 2020; Gorringer et al 2012; Reicher, Stott, Cronin and Adang 2004; Stott and Reicher 1998). This is less about conforming to general norms though and instead, gaining a social identity by conforming to situation-specific norms (e.g., support of a specific team, demonstrating for a cause, joining with other fans at conventions and other events). This collective behaviour can lead to cooperation in times of crisis or emergency, for instance, with the collective social identity either 'reflecting existing relations or an emergent sense of groupness arising from the experience of common fate' (Drury 2020: 13). According to Postmes and Spears (1998) as discussed earlier, Social Identity Theory provides a counter argument to the more classical concept of Deindividuation whereby the latter states that as the crowd grows in mass, people lose the ability to think as individuals and begin to act as one. Social Identity Theory suggests that individuals in a crowd still know right from wrong, yet sometimes choose to become involved in atypical behaviour due to being able to 'get lost in the crowd'. Either way, the ability to get lost in the crowd is demonstrated in an experiment conducted by Derren Brown in an episode called 'The Gameshow' for his Channel 4 series called 'The Experiments' (Channel 4 2011). During the experiment, a studio audience was provided with masks to conceal their identities and asked to vote on a series of incidents that were to happen to an 'unsuspecting member of the public' being secretly filmed (although unbeknownst to the audience, in on the experiment) as a direct result of their majority vote. For every vote, the audience was given one positive and one negative scenario to choose from and with increasing ability to impact on the individual in question's life. The majority of audience

members in each case opted and cheered for the negative scenario including damage to personal items, redundancy and being arrested, demonstrating the detrimental effects of anonymity on collective crowd behaviour.

In his work around group pressures and conformity, Asch (1956) found that whether or not individuals remained independent in their perceptions or yielded to the majority view was likely based on three key factors. First, the character of the stimulus situation was found to have an influence, whereby with diminishing clarity of the stimulus conditions, the majority effect increased. The second factor to influence conformity was linked to the character of the group forces, where great importance was placed on unanimity and the majority effect was heightened by the size of group opposition. Third and finally, the character of the individual was a key factor whereby character differences pertaining to a person's social relations could impact greatly on the majority effect. In reviewing the Asch experiment, McLeod (2008) further simplifies these factors to be twofold; either because the individual wants to fit in with the group (normative influence) or because they believe the group to be better informed (informational influence).

In terms of events, the contemporary view of crowd dynamics could arguably suggest that physical proximity to others in the audience can alter behaviour either positively or negatively. Moreover, it could be argued that connections exist between conforming to collective crowd behaviours and the impact of the event environment stimulus and external catalysts on audiences. Linked to this, the desire to belong to a group and motivations of opposition in engaging in group behaviour tie in closely to the classical concept of deindividuation (Berlonghi 1995; Borch 2006) as well as contemporary intrinsic sub cultural motivations. Pertinently, much of the modern theory around crowds points towards explaining potential indicators for situations in crowds where atypical, potentially harmful or deviant behaviour occurs. Therefore, considering the nature of events and their purpose to deliver positive experiences for their audiences (Bladen et al 2012), then understanding the audiences' social and psychological influence as a component of managing crowds to limit the occurrence of harmful behaviour (intended or unintended and physical or to the audiences' positive experience) is crucial to an event's success.

2.2 Crowd characteristics and catalysts

To this point, the theory of crowds has been discussed predominantly from a more general viewpoint of them acting as one whole entity. However, Borch (2013) discusses the need to study crowd identities in the plural sense. He states that emotions are often heightened when in groups of like-minded and opposing individuals and these 'aroused emotions' can impact either positively or negatively on behaviour; in essence, one crowd can evoke a range of different behaviour patterns at different points within an event due to the unique characteristics of the individuals involved and event-specific catalysts. Supporting this theory, Berlonghi (1995: 241) observed that crowds are regarded in the modern-day event setting to have multiple personalities and as such, this range of characteristics must be explored.

Knowledge of crowd typologies is important for the understanding of audience behaviour at events. Rutherford-Silvers (2008) identified five types of crowds (casual, cohesive, expressive,

aggressive and explosive) ranging in the level of impact they can have on an event and its audience. Similarly, Canetti (1973) identified six crowd types (invisible, bating, fleeing, prohibition, reversal and feast) and also used visual imagery to identify three main crowd symbols whereby he likened crowd movement to; the sea (dense and ever moving), fire (volatile with the ability to spread, destroy and behave expectedly), and the river (behavioural origins are taken more seriously than the goals). Building on this, Berlonghi (1995) identified a series of eleven crowd types, again ranging in behavioural characteristics and the level of risk or impact they can have on an audience. What is interesting is that core themes emerge across these typologies which demonstrate a set of key behaviour profiles for audiences attending events. These common themes can arguably be summarised to highlight crowds as being casual, expressive and joyous, thrill-seeking, political, cautious and / or deviant. What is also clear from the literature is the fact that crowd behaviour can be impacted by both internal and external catalysts, which can progress crowds from one category to another; in some circumstances these behavioural changes can be positive, arguably adding to the event atmosphere, but it is also evidence that some catalysts can provoke negative behavioural responses within a crowd. Thus, it could be argued that the range of crowd typologies and characteristics within these must be understood by event managers to fully grasp the distinct profiles of common crowd types, how they are influenced and their level of risk to the safety of an event in order to understand effective ways to manage event crowds. According to Raineri (2013) 'crowd type' and 'crowd mood' are measurable indicators of the behaviour of a crowd and in attempting to develop a predictive model of behavioural assessment, it is necessary to identify those factors which act on and transform individual behaviour into the more dangerous and high-risk behaviour observed at the heart of behaviour-specific event incidents.

2.2.1 Crowd catalysts, the external influencing factors on audience behaviour

As alluded to, crowd behaviours can arguably be influenced by audience profiles and collective characteristics in a positive or negative way. It may also be said that threat to safety can be impacted by a broad range of catalysts. For example, expressive or revellous crowds (Berlonghi 1995) are often formed due to catalysts such as event activities, performers' actions and spectator and social factors, which influence the audiences' experience in a typically positive way. The contributions of the experience economy and service design to successful audience experiences is well documented in event management literature (Berridge 2007; Hoffman et al 2009; Mudie & Pirrie 2006; Pine and Gilmore 1999, 2011; Rutherford-Silvers 2008) and an expressive crowd is arguably an outcome of this approach, whereby the event setting is designed to stimulate the senses and prompt specific behaviours with desired effect creating feelings of positivity and revelry among the audience.

It could also be argued that cohesive, spectator and participatory crowds, which are characteristics that straddle several of the common typologies developed, can also influence the audiences' experience in a positive manner. However, the catalysts that can arguably influence the formation of these types of crowds have the potential to generate positive or negative outcomes. For example, to look specifically at participatory crowds (Berlonghi 1995), those engaged in running a marathon without incident are most likely to feel a sense of goal accomplishment and camaraderie as a result of taking part (Raj et al 2009), connecting them to the expressive crowd type (Rutherford-Silvers 2008). That said, when security, social and man-

made disaster factors (Berlonghi 1995) combine in the form of terrorism threats at high profile events such as the Boston Marathon (BBC News Online 2013c), the resulting outcome on audience and participatory crowd experience is undoubtedly extremely negative, which can influence a crowd to exhibit fearful behaviours. This links to the fleeing crowd type (Canetti 1973) presenting a high risk to safety.

There are then a range of crowd types such as casual, thrill-seeker and political crowds (Berlonghi 1995; Canetti 1973; Rutherford-Silvers 2008) that can produce positive behavioural outcomes but have the potential to evoke negative behaviour if managed inappropriately, triggered by either dissatisfaction or harm to the audience. Whilst demonstrator (political) crowds can produce positive shared experiences for the audience involved, catalysts such as police and security factors, and specifically, the use of excessive or unreasonable force can result in negative demonstrator behaviour, which can escalate to a more dangerous bating crowd (Canetti 1973); this could be seen during the University of Birmingham Tuition Fee and Staff Wage Protest in January 2014, whereby a group of protestors who felt they had been contained or 'kettled' by police for four hours turned violent and were arrested on suspicion of assault and criminal damage (BBC News Online 2014). The emotions and negative behaviours that arise through heavy-handed police control strategies have also been witnessed more recently in the Hong Kong riots as conflicts escalated and the policing became increasingly more repressive (Stott and Radburn 2020). Research by Filingeri, Eason, Waterson and Haslam (2018) found that the approach taken to maintaining public order bears directly on the crowd participant experience and that crowd experience can be enhanced by police and security officials giving information and advice, or simply by being 'welcoming and friendly' (p.26). A revised communication-based approach to policing of 'policing by consent' and the assertion that 'engagement and dialogue should be used, whenever possible, to demonstrate a "no surprises" approach' (ACPO, 2010) was adopted by the UK police force following a 2009 inquiry (Gorringe et al 2012: 112). As such, the concepts of SIT and ESIM as discussed in 2.1.2, and 'dialogue policing' (Holgersson and Knutsson, 2010 in Gorringe et al 2012:112) recognise the capacity for police action to incite a crowd and emphasise the need for graded, dynamic, and reflexive pre-emptive and/or preventative public order management as opposed to reactive and indiscriminate 'riot control' and use of force to avoid the escalation of conflict when there are signs of trouble and emerging tension (Gorringe et al 2012; Reicher et al 2004).

Finally, the most negative and damaging crowd types to audience experience are deviant crowds which are potentially aggressive and hostile, rushing and looting, or violent and explosive, and also more cautious and fearful crowds which can generate crowd issues such as escaping and trampling and dense and suffocating incidents due to their need to avert risk and flee (Berlonghi 1995; Canetti 1973; Rutherford-Silvers 2008). Whilst some crowd situations can be premeditatedly deviant such as football hooliganism (Brunt and Brophy 2004), this is not always the case and some deviant crowd situations do not always start out in this manner. For example, a crowd with a thrill-seeking profile may become deviant due to group identity and conformity or perhaps external catalysts within the event setting itself such as performer provocation (Berlonghi 1995). It could be argued that there are links between the thrill seeking and deviant crowd types and Torgersen's 'Impulsives' and 'Hedonists' personality profiles (Hochwalder 2009; Vollrath and Torgersen 2002). Key common characteristics include that these individuals are often pleasure-oriented, undependable, attention-seeking, and in need of social confirmation, with little control over his or her emotional reactions, and appearing chaotic and changing.

Equally, links can be made between the cautious crowd and Torgersen's 'Insecure', 'Brooder' and 'Complicated' personality types (Hochwalder 2009; Vollrath and Torgersen 2002), where common shared traits include being self-conscious, dependent on others, overly sensitive to his or her own mental and physical experience, emotionally intense with occasional outbursts, as well as being overly careful, orderly, shy, withdrawn and with a tendency to give up easily in certain situations. It would therefore seem that inherent personality characteristics also play a part in influencing crowd behaviour.

What is frequently documented in the literature related to deviant and cautious crowd types is that the prevalence of these two very different, but equally negative crowd types often attract negative media attention for the affiliated event and typically result in fear, harm or fatalities to the event crowd in attendance. One of the most documented outcomes of crowd-related incidents is the trample disaster, which can be caused by a range of catalysts, such as poor planning for ingress and egress as happened at the 2010 Love Parade stampede (BBC News Online 2010; Helbing and Mukerji 2012), unexpected weather events including the Indiana State Fair stage collapse (Tuohy & Ritchie 2012), aroused emotions among the audience at the Pearl Jam and Roskilde Festivals (Shone and Parry 2004) and other such factors. Zhen, Mao, Zhao and Yuan (2008) researched trample disasters through the case study of an unrestricted, un-ticketed Chinese cultural celebration event that took place outdoors and where large crowds gathered on a bridge to watch celebrations, resulting in a crowd crush and bridge collapse. Their study found that in most trampling incidents, asphyxiation was the main cause of death as a result of crowd 'leaning' force (when people lean forward or push on those in front) leading to suffocation rather than 'trampling' as is often portrayed in the media. Trample disasters often occur due to external factors such as venue failings (e.g., fires, capacity issues), equipment failings, weather events and security issues (Berlonghi 1995), which in turn panic in the crowd and can be exacerbated by alcohol or drugs (Tarlow 2002); this crowd panic links clearly to emotional arousal theory (Borch 2013) and the resulting crush is the cause of most trample disaster fatalities.

As well as the more event-specific catalysts described above, links between crowd incidents and internal crowd warning signs (Tarlow 2002) and also external destination-specific contributing factors (Abbott and Geddie 2001) should be considered in the debate around crowd catalysts. According to Tarlow (2002) internally, the behaviour patterns of fan groups or followers should be considered alongside the prevalence of drugs and alcohol and a deviant, hedonistic party-fuelled atmosphere. Moreover externally, Abbot and Geddie (2001) suggest that event managers must consider the demographics of the host venue population, and the level of crime associated with the destination or venue to truly manage crowd incidents. These aspects will be addressed in detail in Chapter 3.

As Berlonghi (1995:242) stated 'disasters and the many less serious problems will continue if we only prepare for "a large number of people gathered closely together"'. Around the same time, Stott and Reicher (1998: 509) conducted research with police officers that showed that, despite a perception of crowd composition as heterogeneous, officers perceived crowd dynamics in a more classical light as involving an anti-social minority seeking to exploit the mindlessness of ordinary people in the mass; police treating crowds in disorder as a homogeneous whole was argued to play an important role in escalating (if not initiating) collective conflict and was found to be a key component of social change in crowd contexts. Despite this call for concern over

twenty years ago, there is further evidence to suggest that policing strategies still prepare for undifferentiated methods and use of force when policing crowds and events (Hoggett and Stott 2010). This could be seen more recently in the Birmingham Tuition Fee and Wage Protest kettling incident (BBC Online 2014) and the Hong Kong riots (Stott and Radburn 2020). It should be noted here, that whilst it has been established that crowds contain multiple personalities, the typologies and catalysts discussed previously are not only based on behaviour resulting from event-specific situations and scenarios but are also impacted by the intrinsic behavioural patterns unique to the individual and borne out of a range of personal factors such as subculture and perceived norms as identified in section 2.1. Linked into this topic is the question of visitor motivation and it is therefore important to also address the range of individual and intrinsic crowd characteristics in depth. As motivations are a key factor in understanding crowd behaviour (Borch 2013) in event audiences, it is therefore an important body of literature to be explored in more detail hereafter.

2.3 Audience behaviour: visitor motivations, subculture and profiles

To understand how an event crowd specifically might behave on the day, it is important to explore motivations and sub-cultural associations for attending events as well as trying to define visitor and audience profiles. Whilst some aspects of these concepts have been explored in previous sections during the discussion around crowd typologies, the detailed influencing factors that need to be understood in order to effectively profile audiences must be explored.

2.3.1 Event visit motivations and audience profiles

According to Li and Petrick (2006) motivations are found to be a function of visitor type, thus highlighting the need to address this issue in order to be able to understand an event audience or crowd. For events specifically, Crompton and McKay (1997) conducted a study which looked at visitation motives against event type and determined that six domains should be incorporated on a festival motivations instrument: cultural exploration, novelty/regression, recover equilibrium (rest and relaxation/escape), known group socialisation, external interaction / socialisation, and family togetherness (enhancing kinship relationships). Much of the event motivation literature since has centred on these categories. For instance, Bowen and Daniels (2005) and Kim, Uysal and Chen (2001) indicate that socialisation and arguably, the existence of crowds, is a key motivation for visiting events, which can be unpacked to include having fun, spending time with friends and enjoying a festive atmosphere; this highlights that for most people, the entertainment on offer is not the only motivating factor. In support of this, Berlonghi (1995) identified crowd characteristics of cohesiveness, unity of purpose and common motive for action, which all link to the broader motivation of socialisation.

More recently in relation to sports events specifically, Farrag and Althawadi (2022) have identified some of the most popular scales for measuring motives to include the Sports Fan Motivation Scale (SFMS), the Scale of Attendance Motivation (SAM), Motivation scale for sports consumption (MSSC), and the Model of Event Quality for Spectator Sport (MEQSS) among others, using a variety of constructs comparable with the festival motivations and generic event

motivations outlined above (Crompton and McKay 1997; Bowen and Daniels 2005). They argued through their observations of Kim et al's motivation study (2013) that many motivation scales can be classified into a small number of categories: hedonic motivations, psychological connections and social influences (Farrag and Althawadi 2022: 549). As Mowen, Vogelsong and Graeffe (2003) state, 'good crowding' is often a major part of the event experience and those events that do not attract enough people may be perceived in the same manner as a restaurant that does not attract enough customers. In relation to the service delivery context, people are a key part of the event product (Lovell and Wirtz 2007). What is potentially interesting is the relationship between motivations, crowd behaviour and the link to audience experience.

Crompton and McKay's (1997) categories of festival visit motivation arguably exhibit strong links to the personality trait of Sensation Seeking, which has been the focus of much tourism, sociology and psychology-related research (Zuckerman 1979; 2007). Most notably, the grouped event attendance motivations around novelty/regression, socialisation (both known and unknown groups) and some aspects associated with recovering equilibrium (particularly those linked to escapism through relieving built-up frustrations and boredom) link into the Sensation Seeking personality trait associated with the need for novelty and stimulation (Lepp and Gibson 2008). Furthermore and crucial to the explanation of crowd behaviour at events, the Sensation Seeking Scale theory adapted by Hoyle, Stephenson, Palmgreen, Larch and Donohew (2002) and also discussed by Eachus (2004:145) highlights 'disinhibition' (the tendency to ignore societal inhibitions) and 'Boredom Susceptibility' (the tendency to become restless and the need for the unpredictable) as two of four Sensation Seeking Traits which can be directly linked to the fundamental negative behavioural patterns of crowds as discussed earlier. These types of motivation can manifest into negative crowd characteristics such as group behaviour (acting without social self-consciousness) and potentially lawlessness, which have obvious crowd control implications (Berlonghi 1995). This inter-disciplinary link between crowd theory and Sensation Seeking motivation highlights the need to explore this particular personality trait in detail, to help understand the event audience, their perceptions of crowding and the ways in which to manage it.

According to Lepp and Gibson (2008) the Sensation Seeking personality trait is a key tourist motivation, and the typical profile of a sensation seeker is that they tend to be younger, most likely to be male, risk neutral, seeking novel experiences (also supported by Kim et al 2001) and are more venturesome, which ties in with Plog's (1974; 1991) *Allocentric* tourist personality type (cited by Litvin 2006:245). Much research has been done into studies of gender and attitudinal or behavioural differences with key findings indicating that males are more carefree and remain calmer when incidents occur but are also more prone to excessive alcohol consumption and intoxication compared to women, who tend to be more risk-averse (Booth and Nolan 2012; Holmila and Raitasalo 2005; Pan, Zhang, Qi, Ma, Yang and Tang 2021). Perhaps most interesting is that whilst both high and low Sensation Seekers perceive risk similarly, those who are higher Sensation Seekers are more likely to visit destinations, locations or potentially venues, rated as 'riskier'. Given the connection between event motivation, crowd behaviour and Sensation Seeking traits, this could arguably suggest a link between event audiences and their tolerance for riskier crowd behavioural actions as well as for perceived crowding issues (as to be discussed further on in relation to crowding experiences). Also pertinent is that regarding crowd behaviour and cooperation strategies during evacuation, Ibrahim, Venkat, De Wilde, Romlay and Bahamid (2022) found that the opportunity for mutual cooperation during evacuation can be best realised

when a crowd is dominated by risk-averse individuals and that risk-seekers tend toward aggressiveness. Considering this in relation to the sensation-seeking and gender-based findings above, the literature seemingly suggests that risk-averse, female crowds are arguably more compliant and easier to manage than those exhibiting strong sensation-seeking and risk-seeking tendencies, such as the younger and male audiences (Lepp and Gibson 2008).

Connected to the concept of event visitor motivation, it is important to address the potential reasons for negative crowd behaviour incidents and to consider the event visitor as a criminal offender or deviant (Brunt and Brophy 2004). As Berlonghi (1995: 245) observed, it could be argued that 'some even seek to join crowds for the reason to offend'. One of the most straightforward definitions of deviant behaviour is provided by Ryan and Kinder (1996), who explain it to be, that behaviour which differs from the norm. It can also be defined as 'crossing the divide between the legal and illegal (Ryan 1993:178) yet it does not simply mean delinquent conduct. Cohen (1971) puts forward the argument that public perceptions shape whether an act is seen to be deviant (Cohen 1971) and this is supported by Thio (1998:9), who suggests that put simply, 'an act appears deviant only because some people think it so', and it is defined as deviant according to given norms or standards of behaviour, and to the way people react to it. This would appear to suggest that in some instances and specific environments, behaviour of this nature is accepted, tolerated or at least overlooked by peers. Moreover, perceived situation-specific norms have been found to greatly influence crowd behaviour (Drury 2020; Reicher et al 2004; Stott and Reicher 1998). Given this fact, and the observation that deviance can include such 'headline social problems' as drug-taking, opportunistic theft and football hooliganism (Brunt and Brophy 2004:5) and be triggered by a range of event-specific catalysts as discussed in section 2.2.1, it could be argued that the nature of the environment and the subcultural associations provided by events is a conduit for such behaviour among its audiences. Nonetheless, it must be said that according to Harrison (1994) the deviant tourist is one who breaks the unwritten rules, in the sense that they do not represent the behaviour of most visitors, whilst perhaps deviating from their normal lifestyles.

Brunt and Brophy (2004:8) identified the factors involved in influencing tourists to deviate as a series of seven intrinsic and extrinsic factors, linked to such aspects as escapism, anonymity, tolerant attitudes and marketing. This profile of deviant behaviour traits links into Sensation Seeking personality characteristics (Lepp and Gibson 2008) including escapism by relieving frustrations and boredom, novelty, simulation, disinhibition and boredom susceptibility (triggered by restlessness). It could also arguably be connected to event attendance motivation. Whilst it cannot be said that all event visitors are likely to become involved in deviant behaviour, the links between deviance, subculture, sensation seeking, event visit motivation and crowd behaviour are arguably important considerations in the management of crowd safety.

2.3.2 Influence of subculture on audience behaviour

Linked into the audience profile discussion is the concept that events are closely linked to the celebration of subculture. By definition, subculture represents common goals, unity of purpose and intention (Green & Chalip 1998) and is primarily linked to the socialisation-based motivations discussed previously. Connected to subculture is the notion of the fan, which Henderson (n.d) posits to encapsulate the following:

“The word fan, or fanatic, conjures up a variety of images ranging from the individual sat quietly at home poring over their collection [of memorabilia] to the rampaging football fan trashing the bar when their team is in town... Their behaviour reflects the satisfaction of different needs ranging from the nostalgic elements conjured up by the word memorabilia to the pure obsession of the completist.”

Henderson (n.d.) goes on to define the fan’s situational framework as being three-fold; first, the behaviours and activities in isolation (memorabilia collection). Second, the range of behaviours they exhibit at events. Third and finally, the range of behaviours exhibited at personal meetings, ranging from fame seekers, to connecting with like-minded fans, supporters and experts, and at the extreme end of the scale, obsession and fanaticism whereby common views, shared interests and social interaction are no longer important and fans can become dangerous. Building on this, Brotherton and Himmetoglu (1997) developed a sliding scale typology of the fan at events ranging from the dabbler and enthusiast through to the expert and fanatic. Similarly, in relation to sporting events Bladen et al (2012) classified fans according to their level of involvement on a four-point sliding scale ranging from new fan, up to devoted. More specifically, Farrag and Althawadi (2022) developed a spectator typology of tennis fans, categorising them as Pragmatists, Diehard fans, Entertainers, and Socializers. This range of fan typologies linked to events helps to demonstrate the way in which, subculture and fandom can influence a visitor’s behaviour at events. Arguably, it seems logical to infer from the literature that the more committed and devoted the fan, the more likely they will be to exhibit strong levels of emotional investment in relation to the event they are attending and these aroused emotions when in groups of like-minded and opposing individuals coupled with a strong social identity (Borch 2013; Drury 2020; Reicher et al 2004; Templeton 2021) can trigger specific patterns of behaviour which can range from positive and expressive through to aggressive or hostile if rivalries with other event goers develop (Berlonghi 1995). Organisers must therefore ensure that the concept of fan behaviour is reflected within audience profiling exercises when planning crowd management strategies for events.

Furthermore, it is commonly regarded that specific subcultures bring with them their own unique identities and behavioural traits, which must also be addressed when profiling anticipated audiences for events. For instance, the hip-hop subgroup is the only subculture perceived to carry the risk of violence at music events according to European managers and the rock and heavy metal subculture are perceived to be most like to engage in moshing and missile throwing behaviour (Kemp et al 2007). Moreover, it has been widely regarded that hedonistic-styled destinations and events have tended historically to attract the youth market (Clarke 1992), with youth leisure and holiday spending patterns reflecting their home interests and activities such as music, clubs, bars, drink and fashion (Sellars 1998). It is the youth subculture that has been widely regarded in the literature historically to be most likely inclined towards ‘moral and criminal deviance’ (Kelly 1993; Menaker & Chaney 2014; Seekings 1998; Verkooijen et al 2007). Often, destinations and events of a party atmosphere nature were considered a catalyst for negative behaviour (Brunt and Brophy 2004; Tarlow 2002). Furthermore, Prideaux (1996), Sellars (1998) and Lepp and Gibson (2008) suggested that for a long time, the way in which a destination [or event] was marketed and developed played an important part in influencing the behaviour of visitors, and sometimes, served to increase levels of sensation seeking or deviant behaviour. Whilst approaches to tourism marketing have since changed (McKay 2018), Sellars (1998: 613) sarcastically noted:

“[Marketing materials] do not depict the scenic and cultural values of the resort, but show packed nightclubs with beautiful people in skimpy outfits, mouths and eyes agape with not a care in the world apart from ‘is my make up running?’”

In discussing destination marketing, Prideaux (1996:70) noted two principal types of destination: ‘Family Values’ resorts promoting family holidays for all age groups and ‘Hedonistic’ resorts which sell themselves by promoting ‘adventure, romance, escapism and sex’. According to Brunt and Brophy (2004; 2006), ‘Hedonistic’ styled resorts also tended to provide (or over provide) the familiar resources such as an abundance of bars, nightclubs and pubs; these facilities are also commonplace at events and typically have been found to relate to the factors which influence a tourist to deviate and catalysts for negative behaviour at events (Brunt and Brophy 2004; Tarlow 2002). This argument was substantiated by Smith and Foxcroft (2009) whose systematic review of studies looking at exposure to alcohol advertising, marketing and portrayal of alcohol among the youth market identified an association between the level of exposure and subsequent increased levels of alcohol drinking related behaviours.

According to Verkooijen et al (2007) identification with the pop, skate/hip hop, techno and hippie subgroups among youth crowds, each of which has strong groundings in the current music event scene, were associated with higher risks of substance use. This relates to the work of Kemp et al (2007) who identified the punk and hip-hop subcultures as being most prone to drug abuse. Moreover, Ryan, Robertson and Page (1996) also indicated that heavy alcohol consumption played a large part in student holiday behaviour and Josiam, Hobson, Dietrich and Smeaton (1998) found that party reputation was important in youth destination choice; once away, students were found to frequently indulge in binge drinking and / or drug taking behaviour, often leading to risk-taking of a sexual nature, aggression or violence towards others. The youth market could therefore be said to seek out destinations where they can indulge in deviant behaviour, and this could be pertinent to consider in the context of special events aimed at this group.

What is also important to consider in terms of managing this type of UK event visitor is the notion that excessive alcohol consumption at events and the problems it can create extends wider than solely the youth market and has been documented through more recent studies in addition to those discussed previously. Henderson (n.d) suggests the prevalence of the ‘Mine’s a pint’ culture among many event attendees, whereby visitors see drinking as a social activity before, during and after the event. Often this social drinking takes place in specific places (such as pre match pubs at sports events) and the catalysts of excessive drinking and proximity to like-minded and potentially opposing social groups can incite negative behaviour (Dun 2014). Moreover, in a study by Glassman et al (2007) ‘partying’ was found to be synonymous with excessive alcohol consumption and intoxication among event attendees, which incidentally was identified as a key factor in college game ejections and arrests in the US (Menaker and Chaney 2014). In the UK, the Home Office Consultation on delivering the UK government’s policies to cut alcohol fuelled crime and anti-social behaviour through the Alcohol Strategy (2012) brought about the introduction of an Early Morning Alcohol Restriction Order for local areas, a late night levy for serving alcohol to contribute to policing costs and recommendations to end the availability of irresponsibly priced alcohol, and devolution of power to local authorities to revoke licenses more swiftly in tackling alcohol-related harms. Linked to this, it is clear that public sentiment has shifted in recent years and the hedonistic marketing approaches discussed previously, such as those adopted by the Club 18-30 holiday brand, have fallen out of favour

with the UK public since their early 2000s heyday (McKay 2018). That said, recent research into UK University Freshers Fairs by Fuller, Fleming, Szatkowski and Bains (2018) found that in the first week of university, students are exposed to alcohol-related events, promotions and advertising, which may act as an incentive to participate in drinking. These findings suggest that the hedonistic, party-fuelled, excessive drinking behaviours that have been well-documented over the past 30 years in relation especially to the youth market cannot be underestimated and still arguably have an impact on event delivery and safety planning in the current day setting.

The conclusions of Brunt and Brophy's (2004) study indicated that the deviant behaviour that takes place in UK destinations tends to be mostly unintentional yet most literature previously had made little reference to this type of deviance compared with situational or intentional deviance; this strengthens the argument that deviance and audience behaviour are linked through the prevalence of a sensation seeking profile of visitors, event marketing that appeals to the 'hedonistic' and youth subcultures, and a subsequent conformation to situation-specific norms that are either tolerant or accepting of behaviour that in other circumstances would be socially unacceptable. Overall, the links between intrinsic motivation and audience behavioural profile coupled with the subsequent impact this has in creating either positive or negative attitudes and event experiences, is an important factor to be considered in the development of a new event risk-based typology based on crowd behaviour.

2.4 Perceptions of crowding, crowd mood and the audience perspective

Taking into account the significant messages emerging thus far from the literature around audience behaviour and overall event experience, and bearing the observations of both Borch (2013) and Berlonghi (1995) in mind, it would appear that there are both positive and negative types of crowds whereby emotional arousal, crowd characteristics, situation-specific norms (Reicher et al 2004; Stott and Reicher 1998) and audience motivations can impact on the audiences' event experience in either a positive or negative manner. Crowd mood has been established as a descriptor of emotion (Raineri 2013) and identified as a fundamental component of the study of crowd dynamics, alongside density and flow (O'Toole et al 2020). Furthermore, regarding perceptions of crowding there are distinct differences between the terms 'crowding' and 'density' at events. According to Rutherford-Silver (2008: 248), 'crowding' is perception based whilst 'density' is a physical actuality and whilst both can 'relate to personal space preferences which vary according to cultural, environmental and social environment factors, in addition, density can intensify the positive or negative magnitude of whatever is occurring (increasing either pleasure or dissatisfaction)'. This observation highlights the need to discuss perceptions of crowding and the influence of this on crowd mood in further detail.

2.4.1 Positive perceptions of crowding at events

According to Fruin (1984) crowding is a normal experience at events and it can impact on experience in both positive and negative ways. In terms of the positive aspects, Eroglu and Harrel (1986) argued that most people who attend crowded settings for leisure purposes desire, if not expect, crowds to be present, helping to form their experience and atmosphere, and often

purposefully join crowds for this reason. To refer back to Canetti's (1973) viewpoint that crowds become unified due to close proximity and the social boundaries with strangers that this breaks down, coupled with the key event visitor motivations of socialisation and related crowd characteristics of cohesiveness and social unity (explored previously), it may be argued that the event experience, by the nature of individuals that they tend to attract, is heightened by being a part of the audience or crowd. These social dimensions of event experience were explored recently by Marques, Borba, and Michael (2021) through the Event Social Interaction Scale (ESIS), which found that people who are more directly and actively engaged in the event they are attending (i.e., fans, enthusiastic and / or frequent attenders) are more likely to be open to contact with unknown others.

Many authors (Berridge 2007; Bladen et al 2012; Hoffman et al 2009; Pine and Gilmore 1999; Rutherford-Silvers 2008; Sonder 2004) discuss the need to design an event for positive crowding experiences, recognising the need to plan the event space with aesthetics, sensory influences and organisation / arrangement of the site in mind. This has direct links to the concept of the Experience Economy (Pine and Gilmore 1999; 2011) whereby positive crowding is achieved if the event design is conducive to meeting audience expectations around the experience; this may be in terms of levels of audience participation, absorption, immersion and focussed on addressing their visit motivations which could be entertainment, educational, aesthetic or escapist. However, it should be noted that crowd density, flow, architecture, coherence, safety, temperature and event timings are equally important factors in terms of positive crowding and audience experience, yet these are seemingly less well considered within the event design literature presently (see section 3.1). It could therefore be argued that there is a need for more a joined-up approach to event setting design generally, involving consistent recognition of these key factors as well as those more commonly linked to concepts such as the Experience Economy.

Connected to event design is the importance of the term functional density (Anderson, Kerstetter & Graefe 1997; Eroglu and Harrel 1986), which was developed to describe 'good crowding' or when crowding can actually augment an experience. In a study of crowding perceptions at a festival, Anderson et al (1997) found that perceptions of crowding were positive, with 92% of respondents suggesting that the sights, sounds and movements of crowds within the festival were quite enjoyable. As Mowen et al (2003) stated, 'good crowding' is often a major part of the festival experience and those events that do not attract enough people may be perceived in the same manner as a restaurant that does not attract enough customers.

Wickham and Kerstetter (2001) argued that whilst crowding has often been perceived to be one of the largest factors negatively influencing a persons' experience at an event, retail shopping and tourism research has found crowding to be viewed positively for reasons including the atmosphere and shared revelry that shared experiences within crowds can create. As noted previously, the work of Marques et al (2021) highlights that strong engagement with an event increases the desire of attendees to socialise with those outside their own group, fostering different types of social interaction beyond known-group interactions. Moreover, Sit and Johnson Morgan (2008) noted that social crowding is expected to help create enjoyment for consumers in the context of collective hedonic events, which are defined to be those events that are delivered and consumed simultaneously by a large number of people for motivations of enjoyment and pleasure. These findings suggest strong links between positive crowding and crowd moods, and the expressive and revellous crowd type identified by Berlonghi (1995). Furthermore, Eroglu, Machleit and Feldman Barr (2005) noted the concept of adaptation in

relation to spatial crowding, whereby the individual no longer pays attention to the surrounding crowd in a negative manner because it becomes so familiar due to extended exposure to it. This shares direct links with Canetti's (1973) behavioural theory of crowds acting in a rational manner due to diminished personal space and close proximity to others, as discussed in 2.1.2.

2.4.2 Negative perceptions linked to crowding at events

Despite the body of literature that exists around positive crowding, conversely, crowding is most often perceived in a negative manner by individuals at events. Sometimes this is simply due to the physical density of large volumes of individuals in confined spaces (Eroglu et al 2005) and at other times it is due to specific incidences that can have a detrimental impact on crowd mood and behaviour (see crowd catalysts, section 2.2.1). There is a common belief that crowding in a negative sense is said to occur if a certain density is seen as negative from a visitor perspective (Manning 1999). In support of this, Tarrant, Dazely and Cottom (2010) observed that crowding takes place when the behaviour of other users interferes with an individual's own goals or norms and they become considered as an 'outgroup', which inhibits empathy. This suggests that when a visitor experiences such issues such as queuing with long waits, poor visibility, cramped conditions and other such factors associated with large volumes of people at events (to be explored further in Chapter 3), the visitor will begin to perceive the crowding, and those around them, in a negative manner. According to Mehta (2013:2) there are considered to be two types of crowd density which can lead to perceptions of negative crowding: 'social density', which refers to the actual number of people in a given space, and 'spatial density', which refers to the amount of space per person.

Stewart and Cole (2001) conducted a study that researched backpackers in the Grand Canyon and perceptions of their experience, which found that respondents had viewed coming into contact with other backpackers and tourists who were not a part of their own groups' experience, as overcrowding and thus, this contact impacted negatively upon their overall mood and experience. This finding could be construed to argue in favour of the concept of Social Identity Theory (Reicher et al 2004; Stott and Reicher 1998); that those with similar situational norms feel a bond. Whilst those in the immediate backpacker group were unified, anyone encountered who was not a part of the immediate group was considered to have a negative impact on the tourists' experience. Perhaps the lack of a unified bond among distinct backpacker groups in this scenario is simply due to the relative lack of proximity to others enjoying the same activity. Or alternatively it is possible that the individual groups construct their own social identities and thus hold negative perceptions regarding 'other' groups. It could be argued that this type of territorial behaviour translates in particular to sporting events, when fans who share a common love for a sport but support opposing teams come together (Bladen et al 2012; Hoggett & Stott 2010; Stott, Livingstone & Hoggett 2008). It could therefore be said that social identity, subcultural associations and intrinsic motivations play a part in whether a visitor considers an event crowding experience to be positive or negative as perceptions depend partly on the groups present and subsequent bond shared, and partly also on their motivations for attending in the first instance. This viewpoint is demonstrated in research conducted by Alnabulsi and Drury (2014) around the effect of crowd density on safety at the Hajj, whereby though increasing levels of crowd density indeed reduced feelings of safety, this effect was moderated by identification with the crowd and perceptions that others identified as Muslim.

Specifically, those who were in high identification with the crowd actually felt safer as density increased and this was due to the perception that others in the crowd were supportive, which was higher the more that people identified with the crowd. Interestingly, further research from Drury in 2020 found that similar processes of emergent groupness and social support have been identified among children of different social groups following an earthquake, although here prominence of existing intergroup differences was also found to reduce cooperation, highlighting the importance of understanding group psychology and using communication techniques led by members of the collective group and communicated through members of the group to build shared identity with the public and affect positive behavioural changes (Drury, Rogers, Marteau, Yardley, Reicher and Stott 2021).

What is clear from the discussion about perceived crowding and crowd mood is that audiences seek a certain level of density in order to feel as though the event has a good atmosphere. It adds to the sense of enjoyment at an event and often as it is expected to an extent, means that crowds are open to and tolerant of a certain level of spatial density and crowding. That said, it would also appear that individuals perceive crowds to be negative once their actions begin to impact on the personal level of enjoyment or accessibility. For instance, if viewing is impaired or queue times are long, then the individual will most likely begin to experience negative perceptions of the crowding situation. Moreover, it has been identified that subcultural and social identity associations can impact greatly on the extent to which an individual perceives crowding to be positive or negative. It has been established that individuals are happy to be in situations of higher social and spatial density and can be more cooperative providing they affiliate with those around them; in some cases of dangerously high crowding levels with threats to safety, evidence would suggest that social identification with the crowd in such scenarios increases perceptions of safety and camaraderie (Alnabulsi and Drury 2014). Conversely, the presence of groups with opposing social identities or rivalries in crowds can have the opposite effect (Drury 2020) and has been a well-documented issue in enflaming negative perceptions of crowding, often resulting in the potential for negative and somewhat deviant behavioural actions among the crowd assembled. The literature would suggest that perceptions of crowding are subjective to an extent and share links with other inherent crowd factors such as motivation, subcultural identity and likely behavioural traits among visitor types that make up the crowd present at an event. With this in mind, it should arguably be an important consideration in audience profiling activities when planning for an event.

2.5 Perceived fear of threats to safety and its impact on audience behaviour

Whilst perceptions of risk to safety can indeed be moderated by strength of crowd identity as discussed previously, nevertheless perceived fear of threats to safety among an event audience can have a truly detrimental effect on crowd behaviour and the success of the event. It should be noted here that organiser-specific and external event catalysts have previously been addressed in 2.2 and thus this section will focus on the perceived threat to safety from other attendees specifically. With this in mind, according to Bardilli (2013) the fear of crime often acts as a deterrent to event customers and potential associated risks include harm to spectators, bad publicity and reputational damage (Brown 2014). Considering the risks to public image and

organisational reputation, it is believed that quality crowd management can minimise these repercussions for an event organisation as well as to prevent damage to the attendee experience (Kemp et al 2007). Risk perception is defined as the degree of the potential damage individuals perceive they may experience as a result of attending the event (Jeon, Robson, Colina, and Coleman 2023).

Whilst crowd management techniques for safer events will be discussed extensively in chapter 3, it is first important to understand the concept of perceived threats from the audience perspective. Ritchie and Adair (2004) noted that typically perceived threats to safety pertaining to the behaviour of other event attendees are often categorised into two groups of crimes, namely opportunistic and organised. The perceived threat of opportunistic crimes can be strongly connected to the concept of deviant behaviour and motivations whereby offences are committed in an unplanned manner, if the opportunity arises. More specifically Allen (2009), Barker, Page and Meyer (2001) and Burke (2009) have suggested that high consumption of alcohol at events can make individuals vulnerable to sexual harassment, assault, rape as well as theft by opportunistic individuals. Whilst the age of this source is recognised, Galvin and Jelinek (1989) identified a prevalence of opportunistic crimes among the recorded criminal activity at the 1987 Americas Cup. Interestingly, police noted an increase in major opportunistic offences such as sexual assault, robbery, common assault, as well as drunk and disorderly behaviour, and over the course of the event 540 visitors were admitted to hospital with crime-related injuries. Such issues remain prominent in events, more recently evident in the cancellation of the Bravella music festival in Sweden as a result of organisers being accused of not protecting their guests in light of reports of 4 counts of rape and 23 sexual assaults at the event the previous year (O'Connor 2017). Reporting of such incidents in the public domain and the sensationalist manner in which this is typically conducted (Jeon et al 2023) is likely to perpetuate public unease regarding perceptions of safety at events and the potential for victimisation.

Conversely, organised crime at events also represents a large perceived threat to audience safety and is defined by Makarenko (2004) as thoroughly planned, illegal activity, whereby the threat of organised crime at events is often linked to large scale sports events and those with high public profiles, whereby the audience members are seen as 'easy targets', and common crimes include robbery, theft and terrorism. Perceptions of safety relating to the probability of these two types of audience threats occurring has long been considered to have an impact on event enjoyment (Cohen 2002) and as peoples' views vary greatly, it is important to explore the concepts of perceived crime and event attendance in further depth.

McGinn, Evenson, Herring, Huston and Rodriguez (2008) conducted a study into perceived fear of crime as a barrier to event attendance and found that attendance levels were low if perceptions of crime were high. Moreover, the findings were found to depend on the perceived severity of crime and whether it was opportunistic or organised; this study found that organised crime was ranked as more significant in attendance decision making yet it is clear that perceived crime and potential exposure to it generally has an impact on the attendance decision making process (Dean 2004). Building on this, it could be argued that the negative impact of crime on perceived risk and event attendance illustrates links with the psychocentric visitor type as defined by Plog (1974), and noted by Tarlow (2002), who as described in sections 2.2 and 2.3, tends to be more cautious, fearful and reserved amongst other qualities in terms of their likely behavioural pattern. Moreover, Ferraro (2005) noted that fear can be defined as an emotional response to danger. Typically, perceptions of fear, attitudes to risk, and behavioural intentions

are formed based on personal experience of past incidents, communication about safety procedures, word of mouth and the media, as well as individual attitudes, perceived behavioural control and social norms (Jeon et al 2023). Thus Innes (2004) suggested that understanding risk perception enables event organisers to gain perspective on reaction to crime and event safety, and how individuals interpret threats to their own security, so that they can best communicate with the audience about the safety of their event. It also follows that reduced or alleviated negative perceptions could result in more event attendees (Ferreira and Harmse 2012) demonstrating the influence of this concept in the success of an event and highlighting the importance of designing, developing, communicating and enforcing a good crowd management strategy for an event.

In addition to personal experience and word of mouth, the media has the potential to influence fear of crime and risk perception (Jeon et al 2023) and it can be an extremely damaging factor for the events industry as it lowers attendance causing financial issues and reputational damage (Jewkes 2010). For example, the South Africa World Cup in 2010 saw large financial investment with expectations of return on investment, yet less than half the expected visitor numbers attended and the event only just broke even due to the country's poor image and potential visitors high perceived fear of crime (Ferreira and Harmse 2012; Plessisa and Maennig 2011); whilst broadcasts by organisers were designed to show the destination and event in a positive light and promote the destination to future customers (Cianfrone and Zhang 2006), the media also reported on bad news stories throughout about opportunistic and organised crime and it is these stories that shaped the perceptions of South Africa as a high risk destination and the SA World Cup as a perceived risk to personal safety. Whilst there is arguably no way to avoid the negative press, it is believed by Roche (2006) that the broadcast of positive messages which highlight key performances as well as interviews from spectators on their experiences promotes the positive event aspects, encouraging repeat attendance and new visitors in the future.

One aspect of crime at events consistently discussed in the media nowadays due to the current political climate and a key contributing factor to perceived fear (Baker and Coulter 2007) is the act of terrorism at events. According to Wilks, Pendergast and Leggat (2006) terrorism is a form of war with objectives to destroy economies through random death and panic, and Urry (2002) adds that a terrorist has no desire for peaceful resolutions. Expanding on this, Glaesser (2006: 46) defines it to be criminal, violent acts or threats aimed at persons, institutions or objects to intimidate a government or population. Moreover, it is thought that attacks at events are not only an attack on national economy but also often designed to attack a nation's icons and heritage (Mythen and Walklate 2006), demonstrating the large-scale event sector's unique vulnerability (Makerenko 2004). Quite often, certain destinations are avoided by visitors due to perception of their high risk either due to previous attacks such as the Boston Marathon (BBC News Online 2013) or political instability in destinations such as the Middle East (Altheide 2006) and as was noted previously, the influence on the decision to attend is personality dependent, most likely to affect the more psychocentric event visitor (Tarlow 2002). This perspective was researched by Sonmez and Graeffe (1998) who theorised via an adapted model of the international tourism decision-making process that a number of variables were considered to influence perceptions of terror risk and political instability of a destination and its impact on the individual's decision-making process. First, external factors such as media coverage of incidents and government travel advice were influential to the information gathering stage of the decision process. Second, internal factors such as the individual's personality type and attitude to risk

were considered to impact on the nature of the travel decision made as a result. Third, demographics such as income, age, gender, education and having children in the household were also found to be internal influencing factors on travel decisions made. With this in mind, 'safe' destination choices demonstrate risk averse behaviours, whilst 'risky' destination choices exhibit risk-seeking behaviours, linking the outcomes to the sensation-seeking and allocentric/psychocentric personality type visit motivation concepts (Eachus 2004; Hoyle et al 2002; Plog 1991) discussed previously in 2.3.1.

To combat the negative effects of criminal activity and perceived threats to safety on events, many large-scale events such as Glastonbury Festival dedicate a page on their websites to security and safety information (Glastonbury Festival 2017), which allows the consumer to see for themselves the quality of the security effort in places and learn of the ways to avoid becoming a target (Grimm and Needham 2012). In addition to audience communication ahead of the event to alleviate perceived risk, crowd management and security planning pre, during and post-event is a fundamental element of the event planning process (Abbot and Geddie 2001). Whilst the details of crowd management planning will be discussed in Chapter 3, the effect of visible, well-communicated safety and security planning is crucial to the positive experience and safety perceptions of event audiences.

It could be argued that security planning for an event should start with a risk assessment which explores a range of factors such as audience profiles, behaviour in the event of high-capacity events and panic situations, external environment scanning, identification of potential risk hot spots and weak points as well as appropriate methods identified to combat these issues. Sime (1995) suggests that effective security planning, crowd management and risk assessments should integrate both psychology and engineering principles whereby psychology theory addresses the behaviour and panic patterns of individuals whereas engineering acknowledges where and how to move crowds in the safest and most efficient manner; the *engineering* aspect here links to crowd flow planning (Fruin 1984; Still 2022) and will be explored in depth in Chapter 3. According to Tassiopoulos (2005), there should be a balance in crowd management at events in that attendees must feel safe, with the presence of sufficient levels of security but not so overwhelmed that it has the opposite effect on audience experience. In support of this, Boyle and Haggerty (2009) argued that the important role of security at events is to prevent crime without intervening in the audiences' experience. Moreover, low risk perception was found to be linked to event satisfaction (Taylor and Toohey 2007), all of which demonstrate the importance of effective crowd management planning to be discussed in the following chapter.

2.6 Chapter summary

A review of the literature linked to crowd behaviour in the context of events has uncovered a range of significant findings pertinent to the study going forwards. The two perspectives of crowds as discussed within the sociology literature were both found to inform current crowd management techniques in the modern-day era. This means that whilst management techniques have predominantly evolved nowadays, the classical view of crowds whereby they are perceived as negative entities containing psychological influencing factors, being prone to 'mindless' collective acts must be considered when profiling audiences in attendance as well as

the more contemporary views based on acceptance of physical proximity in densely crowded scenarios and influencing associations with specific social identities. What is also clear is that crowd identities must be profiled and managed in a plural sense as some crowd types generate positive behaviour and experiences whilst others can have a negative behavioural influence and outcome. The literature indicates that a broad range of crowd types and characteristics exist, which range on a scale from low to high risk to audience safety. It is also widely accepted that cautious and deviant crowd types often attract negative media attention as they are prone to resulting in fear, panic, harm or fatalities to the audience. Moreover, it has been established that event-specific or external catalysts (i.e., outside the control of the organiser) can influence and alter the behaviour profile of a crowd in either a positive or a negative manner. Catalysts commonly discussed across a broad range of literature linked to crowd incidents and disasters at events include those that are operational, performer-related, linked to security and / or social factors, and disaster-related (including man-made and natural). Moreover, a party atmosphere, prevalence of alcohol and drugs, and unique characteristics linked to the event destination were also found to be capable of triggering crowd behavioural changes.

Motivational profiles of visitors were found to have a likely impact on the behavioural profile of a crowd in attendance at an event. In total, a series of six common motivational domains were identified across the event management literature: cultural exploration, novelty/regression, recover equilibrium (rest and relaxation or escape), known group socialisation, external interaction /socialisation, and family togetherness. Importantly whilst most reflect the desire to seek positive experiences, grouped motivations of novelty/regression, socialisation and some elements of recovering equilibrium (e.g. aspects linked to escapism, boredom relief) link to the Sensation Seeking personality trait and this profile persuasion can trigger negative behavioural patterns in a crowd situation that can be linked to the concept of Deindividuation. According to the literature, Sensation Seekers are younger, most likely male, seeking novel experiences and risk neutral as well as being more allocentric and adventuresome. They are also likely to be more tolerant of crowd density crowding incidents to a point (linked to positive crowd experience). Conversely, crowds with a predominance of female, risk averse individuals were identified within the literature as being more compliant in relation to instruction and adherence to crowd control measures. Furthermore, the literature on motivation would also suggest there is a need to recognise crowd members as potential offenders or 'deviants. It would arguably appear that the nature of the event environment (event catalysts), situation-specific and group-based norms, demographic factors and social relations are thought to greatly influence crowd behaviour and therefore in certain scenarios, Sensation Seeking thrill seekers can become aggressive, non-compliant and deviant, as can political crowds.

Connected to visitor motivation, arguably one of the most commonly discussed factors to influence crowd behaviour is the concept of subculture due to its prevalence across the sociology, tourist motivation and event management bodies of literature respectively. Typologies of fan behaviour exist in relation to sports and also popular cultural events, with classifications ranging from the dabbler and enthusiast to committed experts, die hard attendees and fanatics. It would seem that specialist knowledge, social interaction and commitment among other key factors alter by category, with those at the devoted end of the scale becoming much more singular in their level of commitment with far less value placed on socialisation as a motive. As well as typologies related to the individual fan, specific subcultures are known in the literature for unique crowd problems. A review of the literature linked to

subcultural impacts on visitor and event management indicated that the hip hop culture is arguably perceived as the only subgroup to carry the risk of violence, the rock and heavy metal subgroup are connected strongly to mosh-pit activities at music events, the youth market most likely to engage in deviant behaviour such as hedonistic partying, excessive alcohol or drug consumption and the other issues that come with these personality traits, and the pop, skate/hip-hop, techno and hippie subgroups among youth crowds most likely to engage in substance abuse. These findings would suggest that motivation and subcultural identity are likely to greatly influence crowd behaviour and therefore must be considered in the development of typologies relating to anticipating crowd (audience) behaviour at events.

Also, important to consider in the debate of crowd behaviour at events are factors related to audience perception, namely perceptions of crowding and also perceptions of the fear of threat to safety. The literature has identified differences between the concepts of social density (actual number of people in a given space, linked to capacity) and spatial density (amount of space per person) and between 'crowding' (perception) and 'density' (actual/physical). Furthermore, perceptions of crowds can be unpacked as either positive or negative. Positive crowding links to traits found in expressive and thrill-seeking crowds as well as political crowds to an extent, whereby audience numbers (and sufficient crowd volume or density) create atmosphere as does the opportunity for socialisation and shared experience, and perceptions of positive crowding exist if the audiences' expectations are met by the design and delivery of the event. Conversely, negative perceptions of crowding relate to physical density in confined spaces, impact on personal experience, or specific incidents (catalysts) that occur and can alter crowd behaviour. Ultimately, it could be argued that when behaviour of other visitors or issues within the event design (long waits, poor visibility, cramped conditions) interfere with an individual's own goals or norms, or there is a reluctance to share close proximity with those outside of a shared social subgroup, then crowding is perceived to be negative. Interestingly though, in physically dense crowd scenarios, social identity was found to alleviate feelings of risk to safety whereby in times of crisis, high crowd association can bring with it a perceived level of camaraderie and support.

In terms of the perception of fear in relation to threat to safety, as discussed above, this can be moderated by the strength of crowd identity, although generally it can still be an extremely detrimental factor for event success. Fear of crime and threat to personal safety can act as a deterrent to event attendees and perceived threats of crime are often categorised in the literature into two groups: opportunistic and organised. Opportunistic perceived threats to safety are closely linked to deviance whereby crimes against individuals are not premeditated but can occur perhaps as a result of anonymity, escapism, excessive alcohol or drug consumption, and common crimes to fall into this category include of perceived threat include sexual harassment, assault, theft, drunk and disorderly behaviour and rape. In contrast to this, organised crime is often linked to large scale sporting events and other mega events or those held in destinations with a high international public profile, where audiences are seen as 'easy targets' and common crimes and threats documented within this category include robbery, theft and terrorism. In the modern era, terrorism is a key standalone factor in perceived risk and its impact on attendance and the literature suggests that often, a destination considered as high risk due to political instability or previous incidents will be avoided, arguably by visitors of the psychocentric visitor type (Plog 1974; 1991).

Perceived fear of risk to safety was found to act as a barrier to attendance particularly in instances where previous victimisation, awareness of crime at past events via word of mouth

(WOM) and Media, and / or negative destination profiles exists. In fact, the media was found to play a pivotal role in perceived fear in relation to events, whereby broadcasts and interviews with attendees are often designed to show events associated with perceived higher risk in a positive light, yet simultaneously the media also pick up on and report on negative incidents associated with the event, which are highlighted in the literature as being more impactful in shaping perceptions. To combat effects of criminal acts and perceived threats to safety at events, organisers put into place a series of measures including dedicated website pages for event safety and security information, frequent audience communication, as well as visible crowd and security planning that must be balanced (i.e. visible enough to prevent crime and negative behavioural actions whilst ensuring the audience feels safe, but not too intrusive that it intervenes with the audience experience and their perceptions of the event). These same communication-based and crowd management approaches could be valuable in alleviating perceived fear for safety that may arguably reside linked to returning to live events and mass gatherings following the bans and heavy restrictions that have been placed on the sector since the COVID-19 pandemic took hold (Stewart 2020) as the UK moves past the pandemic.

Ultimately, it would appear that low risk perception is linked to overall event satisfaction (Taylor and Toohey 2007) and thus what has been uncovered within this chapter is that effective crowd and security planning must involve and be underpinned by a thorough risk assessment exercise that details audience profiles (including likely behavioural patterns, catalysts, motivations, subcultural associations and crowding perceptions), environmental scanning, identification of event hot spots and weak points and ways to address these issues. The planning of effective crowd management strategies is therefore addressed in detail in the following chapter (Chapter 3) hereafter.

3. Site design considerations and effective crowd management strategies

According to Rutherford-Silvers (2008), the setting in which the event occurs must meet the needs of its occupants [audience] as well as to facilitate the event's purpose, and thus in addition to understanding audience behaviour as discussed in Chapter 2, crowd management strategies, site planning, furnishings and way-finding systems should enhance the attractiveness and functionality of the event environment. Moreover, to echo the broader concept linked to service marketing of the 'service setting' or 'Servicescape' in designing, differentiating and facilitating the service delivery process (Hoffman et al 2009: 10) the event organiser must be mindful of the effects of environmental stimuli on the behaviour of the audience and seek balance between the physical, perceptual and social service setting aspects (Gifford 2007). For event organisers, consideration of the event audience likely to be in attendance is imperative to the planning and operational design of the event space as well as the crowd management plan.

3.1 Designing the event environment

According to Berridge (2007) design is a creator of experiences, which can be envisioned from start to finish. Building on this, Bladen et al (2012: 69) propose that event organisers clearly articulate a 'blueprint of intended attendee experiences throughout an event, reviewing the programme, staging and timing elements as well as intended outcomes (memory formations, engagement, etc)'. Blueprinting, which is also known as service mapping, is a useful starting point for organisers in terms of determining the 'moments of truth' and potential fail points that could be associated with event delivery and its impact on experience (Mudie and Pirrie 2006), including identification of all audience interaction points (Hoffman et al 2009). However, in addition to the importance of aesthetics in relation to event design and audience experience (Pine and Gilmore 1999; 2011), the event design principles as set out by Malouf (1999) and Munroe (2006) are deemed to be of equal importance in design of the event environment (Berridge 2007: 97), in that design must have a focus, consider the use of space, and reflect the flow of movement.

Design of the event setting (known as blueprinting) should arguably be informed by an understanding of consumer behaviour; for example to affect a cognitive response, fixtures and fittings could be used to give the audience clues of the service to be expected, or to affect a specific emotional response perhaps colour, lighting or sound could be used to create a certain 'feeling', and if a behavioural response is needed then perhaps the event space could be designed to take the audience speedily through a specific area or alternatively to linger or stay in a specific part of the venue (Hoffman et al 2009). This argument is supported by Rutherford-Silvers (2008: 247) who stated that physical configuration and decoration of the event setting should be based upon the audience in attendance and the activities to be conducted, designed to both enhance performance and encourage desired behaviour. Moreover, blueprinting of the intended service experience facilitates avoiding the potential bottlenecks in terms of staffing and service as well as physical capacity (Hoffman et al 2009) in different areas as well as different points of the event.

A review of the literature related to factors that influence the efficacy of an event environment (Berridge 2007; Bladen et al 2012; Hoffman et al 2009; Pine & Gilmore 1999; Rutherford-Silvers 2008; Sonder 2004) has shown that the careful design of the event space is imperative for successful events and positive audience experiences, the literature reviewed concurred most frequently on those influences linked primarily to careful organisation and arrangement of the site in relation to the activity, and also around the aesthetics and sensory influences. It also more specifically illustrates that influences such as crowd density, flow, architecture, coherence, safety and timings (among others) are less frequently discussed within the event experience design literature. Given the apparent relevance of many of these less-commonly discussed aspects to the management of crowd and audience behaviour, it could be argued that there is a need for more consistent recognition of crowd dynamics (as discussed in Ch 2) and its associated influences as a key factor in shaping perceptions of the event environment. Thus, a more joined-up approach to the design of the event setting is needed, with recognition that crowd dynamics also inform the event experience, from event inception.

Helbing and Mukerji (2012) noted that crowd disasters happen globally each year, and event crime and misdemeanours are often commonplace (Tarlow 2002), leading many to question whether such incidents are caused by crowd behaviour and panic or a consequence of a breakdown of event coordination. Either way, Berlonghi (1995:239) argued that organisers cannot be excused from the significant responsibility of providing the public with the highest standard of safety and security that is both possible and feasible. Moreover, it is this need to address the potential that events possess for personal harm and associated legal and other costs, including loss of goodwill, (Abbott & Geddie 2001:260) that emphasises the requirement for the event industry to plan to manage crowds safely. To refer back to the design of the event environment, Rutherford-Silvers (2008:246) identified a range of typical hazards associated with event settings which can threaten audience safety or experience, ranging from confusing layouts and obscured sightlines, signage and exits, through to temporary structures, expansive or multiple locations and overcrowding among other things. These hazards illustrate the importance of effective event planning for the safety, success, and ultimate reputation of the event and its organisers. Moreover, Tarlow (2002: 171) noted that concerns increase for the staging of outdoor events due to aspects such as electrical usage, the weather, crowd control and communication as well as the consumption of alcohol and/or drugs and the relationship to law enforcement. All of these aspects will be discussed in detail from section 3.2 onwards.

Finally in relation to the design of the event environment from a safety perspective, the HSE (2000) produced *Managing Crowds Safely* as an extension of the Event Safety Guide. The document dictates that organisers are responsible for the safety of the audience and all those involved in delivery of the event, in additions to general duties under the Health and Safety at Work Act (1974) for all staff, sub-contractors and volunteers. Planning for the safe management of crowds is split into two main areas: crowd management (CM) and crowd control (CC) and ensuring audience safety at events and thus, positive event experiences, means that CM and CC must be considered in the planning, operations, services and communication at an event, as well as informing the way in which the crowd, major incidents and other communications are dealt with (HSE 2000). Yet in relation to this, Getz (2005:107) asked “*Why do some events lead to unruly behaviour and how can it be prevented?*” With this in mind, CM and CC planning for events will be discussed hereafter with a view to deciphering the important factors in managing safety for events.

3.2 Site planning

Crucial to the success of an event is the selection of its site. Once the event is committed to a site it becomes a constraint to all other planning and intended activities, with the ultimate ability to impact on experience, safety and success (O'Toole 2011). Many recurring events therefore consider site moves or alternative venues based on the learning obtained from past outings (Tum, Norton and Nevan-Wright 2006). Careful determination of the feasibility of an event site for its intended purposes is required before the detailed planning of the event environment can take place. With this in mind, site options should be visited and compared in terms of their capacity, cost, safety and site-related constraints, availability of emergency services, accessibility, configuration, conditions and capabilities, proximity to town and accommodation facilities, and atmosphere, as well as to be considered in the context of previous event experience and learning from other event incidents discussed in the public domain (O'Toole 2011; Rutherford-Silvers 2008).

Once a site or venue has been selected, then the event environment must be planned, including the development of site maps and on-site operational manuals (O'Toole 2011). It is then on-site logistics which must take priority and should be explained as the on-the-ground activities in meeting event and customer expectations (Raj et al 2009). Linked to this, Tum et al (2006) suggested that the three fundamental on-site issues to be addressed through layout planning are to optimise movement, reduce congestion and maximise the use of space in an event site. Underpinning this concept is the importance of site planning in ensuring crowd safety and positive customer experiences at events. Rutherford-Silvers (2008:247) therefore argues that design of the event setting must strive to encourage desired behaviour in a range of ways linked to the functional environment of the event by considering seven elements of influence:

- **Access:** roads and parking, disability accessibility, entrances, passageways
- **Atmosphere:** heating, cooling, ventilation, weather, noise, lighting
- **Escape:** emergency exits, emergency response, communications
- **Services:** information, welfare, food and beverage, sanitary facilities
- **Signage:** information, instructions, navigation, orientation, restrictions, safety, identification, branding
- **Staging:** decor, seating, risers, barricades, dance floors, partitions, production equipment, steps/ramps
- **Structures:** tents, canopies, grandstands, stages, AV stands/towers, viewing platforms, archways, attractions

Building on this, Getz (2005) identified a series of Site Planning Principles which are commonly discussed in events management literature in various forms as important on-site logistical functions to be considered when designing an event; Tum et al (2006), for example, discuss the features of layout planning in the context of location management. Moreover, he goes on to state that beyond the safety aspect, the event setting is as important to an event as programming, playing a crucial role in creating the 'right atmosphere' and determining and shaping crowd behaviour. These site design notions will be discussed hereafter in the context of existing literature and case study examples.

3.2.1 Legibility

The first site planning principle to be discussed for event organisers to address is site legibility and Getz (2005:106) identifies this to mean that event customers should find a site to be 'legible' and clear in its organisation and meaning. An illustration of this concept is the way in which the London Underground was rebranded and transformed by Frank Pick in the 1930s (London Transport Museum 2022; The Channel 5 Network 2019) to simplify the messages provided to customers in terms of navigating the London underground network and enhance the use of space to improve pedestrian movement and flow. The result of this change was heightened legibility and clarity, as well as better use of space and congestion reduction, ultimately making it safer and more user friendly for those using it. With its links to spatial planning, movement and interpretation, legibility arguably underpins and influences several of the site design principles to be explored further on in section 3.2.

Building on this, Getz (2005: 106) based a number of principles for maximising legibility on the work of Lynch (1960), and specifically argued that landmarks are needed to improve orientation at key points around an event, with pathways marked out using signage or some other types of visual indicators. Furthermore, he stated that site edges and no-go areas must be marked out so that the audience is aware of the site limits and event 'districts' should also be mapped out for the audience so that the different spaces (such as the food quarter or main areas) are easily identifiable.

Perhaps most pertinently in terms of crowd safety however, it could be argued that identification of 'nodes', defined by Getz (2005) as the key activity points at events which traffic must flow through, is a key area of site planning which can sometimes either be neglected during the planning phase or which can fail for a number of reasons and catalysts linked to crowd behaviour as discussed in section 2.2.1, during event delivery. The prevalence of these issues linked to the site planning of event nodes is exemplified by Helbing and Mukerji (2012), who conducted a qualitative analysis of existing online materials linked to the 2010 Love Parade Disaster and concluded that the singular ingress and egress point for the event, combined with the denser than expected flow of attendees through the entrance/exit node following a delayed opening of the event contributed to the crowd crush that ensued and the resulting fatalities. Furthermore, it could be argued that sites without sufficient exit points to cope with expected visitor capacity open themselves up to the risk of crowd injury and questions of liability.

As stated previously, linked closely to the broader concept of legibility is the importance of including event signage (Rutherford-Silvers 2008). Abbot and Geddie (2001) noted that signage can be used to warn, to inform and to direct a crowd. In addition to sponsorship and general 'thanks for coming' signs, Tum et al (2006) and O'Toole (2011) argued that external to the venue and internal directional signs (e.g., parking areas and 'you are here' boards), statutory and safety related signs (e.g., fire exits and hazards), and room and space identification signs (e.g., bar and toilet signs) are integral to the planning for safer event sites. Moreover, Berlonghi (1994) stated that the clarity of signage used is also important, with consideration required for the type of information to be provided, size and dimension, type of material used, wording and language specifications and location of signage, in that it must be both visible and strategically positioned. The links between signage, CM and communication are further discussed in section 3.3.1.

3.2.2 Capacity

In terms of capacity planning, organisers must plan for a positive audience experience and design capacity enables this to happen (Yeoman et al 2004). As 'positive crowding' and 'social density' are perceived by audiences to help form an event's atmosphere (Anderson et al 1997; Eroglu and Harrel 1986; Fruin 1984; 1993; Mehta 2013; Sit and Johnson-Morgan 2008; Templeton 2021), with a sparse crowd perceived in the same manner as a restaurant without enough customers (Mowen et al 2003) it could be argued that event organisers must pay due attention to the design capacity of an event. In this case, venue selection is crucial in terms of the expected crowd to attend, and the size of the site needed for a positive and safe audience experience (Tum et al 2006). On-site flow at peak vs non-peak times must be calculated with limits placed on attendee numbers to reduce the chances of congestion (Yeoman et al 2004). In several recent crowd disasters, numbers in attendance have either been underestimated by organisers and / or poorly managed by on-site crowd control measures, resulting in congestion as a contributing factor to audience injury and fatalities (Helbing and Mukerji 2012; Still 2022; Zhen et al 2008). Site capacity is typically calculated based on the available area, the suitability of that area and the rate of egress in an emergency as well as the physical and safety considerations for the site (Still 2013). Moreover, Still goes on to state that assessment of ingress (entry) rates is also an important safety factor in reducing site capacity if not sufficient to meet the arrival profile of the crowds (2013: 82).

In terms of congestion, Yeoman et al (2004) argued that this is often more of a problem for outdoor events with less rigid or harder to control capacities in comparison to indoor events with fixed capacities; they suggested crowd management strategies such as introducing favourable seating or pricing options in times of average visitor attendance flow to balance audience ingress flow across the event, as well as ticketing for the most popular activities and ensuring that all nodes (key activity points such as entry / exit / seating / food areas) are effectively spaced with sufficient room between each to allow for crowd flow and avoid bottlenecks. Moreover, as Tum et al (2006: 141) state, it follows that where possible more space per person should be allocated to customer areas and less space to backstage facilities and supporting functions. Specifically, Still (2013; 2022) discusses the impact of crowd density on crowd flow rates and determines that as dynamic (moving) crowd density rises above three people per square metre, then the flow rate of people past a specific point per minute, drops; this was found to result in congestion, with four people per square metre resulting in maximum safe density yet very restricted movement, five people per square metre likely to result in crowd slips, trips and falls, and above six or seven people per square metre likely resulting in physical contact and experiencing crowd pressure. On the contrary, Still argued that for a static (stationary) crowd, an upper limit of five people per square metre (without backpacks and of average size) would represent a maximum for comfort, thus highlighting that all facets of site capacity (event space, static and dynamic crowds), plus estimation of likely crowd numbers to be in attendance is critical to ensure safe event planning (2013).

3.2.3 Queuing

Linked to 3.2.2, queuing and queue management is considered to be a key component of capacity management at events (Getz 2005). If managed correctly queuing can build anticipation among an audience and according to Rutherford-Silvers (2008), the strategy is often used by event organisers to manage the flow and number of visitors to an event or specific activity within it to prevent overcrowding and enable security checks upon entry as well as to reduce crowds rushing at once for good spots (Yeoman et al 2004).

Despite its benefits, all too frequently, queuing if managed ineffectively can also be a trigger for negative crowd experiences (Filingeri, Eason, Waterson and Haslam 2018) or crowd incidents, as the audience becomes impatient with the lack of progress and attempts to push forward to the detriment of their safety and the safety of others around them (Helbing and Mukerji 2012). In fact, in the case of the Duisberg Love Parade disaster in 2010, a range of contributing factors such as a lack of audience information, site legibility, event stewards and security presence from the audience perspective during an intense ingress and egress bottleneck situation forced a queue situation which prompted audience impatience and the behaviour to surge forward; this action ultimately resulted in the crush and crowd quake phenomenon that resulted in the death of 21 individuals and the injuries of 500 more event attendees (BBC News Online 2010: Helbing and Mukerji 2012).

Considering the fact that audience impatience can act as a trigger for surging and pushing behaviours to the detriment of crowd safety, queue strategies are therefore an important element of crowd management strategies. If human nature is to become frustrated with long waits, then it is the responsibility of the event planner to make audience wait times more comfortable (Tum et al 2006). Moreover, Getz (2005) suggested that for long and sustained queues, 'batch' processing through more than one entrance / exit wherever possible, the use of barriers, rope and gates at points of entry/exit and around popular areas, and staff surveillance of waiting visitors (for example, face to face or via CCTV) are useful strategies to adopt. For example, in an experiment to determine crowd behaviour conducted by the programme 'Bang Goes The Theory' (BBC Two 2012), research showed that placing an obstruction such as a pillar a short way in front of a door or exit, whilst sounding counterintuitive, will actually improve visitor flow through the space as the crowd subconsciously split and organise themselves into two lines to move around the object. That said, Selley (2004) argues that the use of barriers, gates, and other physical crowd-calming measures is two-fold, as their use must first be identified at the pre-event site planning stage and installed during the site build at all perimeters, no-go areas and potential hazard spots around the event site as well as to help direct and calm crowd flow and pinch points. Second, crowd safety managers must walk the site and monitor all event areas for barrier efficacy, new safety hotspots, hazards and pinch-points that might require further support during the event. In dense crowds, reactive installation of barriers is often not possible, so different escalated CM and CC measures are therefore required to manage crowds once they are onsite beyond the efficacy of physical barriers installed.

Returning to the discussion of managing the expectations of those in lengthy queues, several authors (Helbing and Mukerji 2012; Tum et al 2006) suggest that those in lengthy queues would benefit from the availability of facilities such as toilets, food and beverage stands as well as entertainment to soften the wait time. Building on this, Filingeri et al (2018) found queuing to be a fundamental factor in crowd experience, whereby poor decisions regarding the amount

and layout of the crowd space, along with provision of insufficient welfare facilities and food and beverage outlets, for example, will all impact negatively on crowd participant experience. In addition to each of these strategies, organisers must understand the psychology of queuing to its audience and ensure that wait times are communicated clearly and frequently to their audience (Yeoman et al 2004). In support of this, Maister (1985) proposed that there are eight ways in which people react to queues: first, occupied time feels shorter than unoccupied time. Second, people want to 'get started'. Third, anxiety and uncertainty make a wait seem longer. Fourth, uncertain waits are longer than known, finite waits. Fifth, unexplained waits are longer than explained waits. Sixth, unfair waits are deemed longer than equitable waits. Seventh, the more valuable the service, the longer the visitor will wait. Eight and finally, solo waits feel longer than group waits. Findings from the research by Filingeri et al (2018) with event organisers, called for better understanding of queuing theory in service operations for the advantage of customers, employees and management alike. Therefore, it could be argued that queuing strategies should take all of the aforementioned aspects into consideration to be truly effective in managing crowds in areas of high density.

3.2.4 Traffic and flow

Another important site planning principle according to Getz (2005) is the recognition of how visitors will get to the event site as well as how they will move around once onsite. In terms of transporting visitors to site, he suggests that signage is imperative as well as the introduction of shuttle buses, parking provision and / or communication of public transport alternatives to the event logistics plan. Moreover, planning for emergency and service vehicles as well as vendors and suppliers and identification of security routes is also key at this stage (Getz 2005; Helbing and Mukerji 2012; Still 2013). A common method utilised by organisers to enhance traffic and flow on-site is scheduling and task sequencing of event activities (both behind the scenes and audience-related) in order to avoid over-occupation of any one space at any one time (Rutherford-Silvers 2008).

Crucially, Berridge (2007) and Hoffman et al (2009) determined pedestrian flow to be a crucial element of event design and Fruin (1984) stated that this particular element of site planning plays a significant part in audience injury and fatalities if planned ineffectively. Specifically related to the measurement of the movement of crowds around a site, pedestrian flow modelling allows organisers involved in the design and planning stages of crowd situations to assess the effects of the environment and layout on crowd movement, which can allow changes to be made that eliminate congestion points altogether or to implement crowd management strategies to alleviate the effects (Filingeri et al 2018). As mentioned previously in relation to capacity (3.2.2), Still (2013; 2022) observes that as dynamic (moving) crowd density rises above three people per square metre, then the flow rate of people past a specific point per minute drops, resulting in congestion, with four people per square metre resulting in maximum safe density yet very restricted movement, five people per square metre likely to result in crowd slips, trips and falls, and above six or seven people per square metre, where the crowd will likely experience physical contact and pressure; He also found that the maximum upper limit for a safe static (stationary) crowd was five people per square metre (without backpacks and of average size), emphasising the need to consider the nature of the crowd (i.e. static or moving) as well as the site area when planning for safe crowd flow at events. Often, the notion linked to

determining the nature of crowds is referred to within the literature as the study of *crowd dynamics*, as defined by O'Toole, Luke, Semmens, Brown and Tatraj (2020) and Still (2022) to involve a combination of three influencing factors on crowd outcomes, namely, crowd density, crowd speed / flow and crowd mood. The most commonly recognised patterns of collective behaviour that result from crowd dynamics have been found to be lane formation, cluster formation, oscillations at bottlenecks, the faster-is-slower effect, and clogging at exits (Helbing and Mukerji 2012; Still, Papalexli, Fan and Bamford 2020; Templeton et al 2018; Zhang, Ma, Si, Ran, Wu, Wang, and Lin 2017). With this in mind, Filingeri et al (2018) observed that most events monitor capacity, density and flow using pictorial schema or crowd images to chart flow and movement but noted the lack of confirmed reliability of this method, arguing alongside Martella, Conrado and Vermeeren (2017) that there is a role in larger scale events for greater use of more sophisticated monitoring technologies for greater accuracy. Pedestrian flow modelling has been the subject of many research studies in recent years (Elzie, Frydenlund, Collins, and Robinson 2016; Harihara Subramanian and Verma 2022; Liu et al 2016; Templeton et al 2018; Wang et al 2013), many of which advocate the use of monitoring software to aid in flow and crowd dynamics predictions.

From a planning perspective, Getz (2005) argues that in terms of managing pedestrian flow and safety, police control where pedestrians and vehicles arrive and / or leave at the same time is important and it is good practice to introduce a circular pedestrian route to an event site wherever possible to maximise flow. Moreover, Rutherford-Silvers (2008: 290) argues that sufficient space, time and staff resource must be devoted to ingress (entrance) and egress (exit) areas and procedures as well as planning the site to encourage pedestrian circulation within and during the event itself. Underpinning this notion of enhancing pedestrian flow for safe event management, Fruin (1984; 1993) argued that Force, Information, Space and Time (FIST) are the key factors influencing the occurrence of crowd disasters and that perceived poor safety alone could result in a crowd disaster if improperly managed. Therefore, Fruin's work emphasised the importance of investigating the four FIST factors in relation to crowds in attendance to identify the perceptions of factors that make them feel unsafe in a built or crowded environment (Alkhadim, Gigado & Painting 2018). Moreover, O'Toole et al in 2020 (p83) adapted Fruin's FIST model to consider its relationship to Professor James Reason's Swiss Cheese Model SCM (2020) which draws comparisons between the holes in slices of Swiss cheese and the representative layers in a crowd management strategy, including the identification of all potential holes in its defence which could be linked to decision making and failure causation. The SCM was presented as a simplified, refined and reconsidered version of his Organisational Accident Model (OAM) and identifies two types of failure-related 'holes' in relation to crowd safety hazard planning and that when the holes in different layers of a CM strategy line up, they contribute to the likelihood of a hazard becoming an incident. The first of the two types of 'holes' are known as active failures (caused by human interaction such as poor site management, communication, briefings, security, crowd control and decision making). The second type are known as systematic failures in design such as knowledge sharing (information legibility), control of crowd types, training, event site design, structures and procedures. With this in mind, O'Toole et al (2020: 83) argued that the active (human error) and systematic holes in the layers of a CM strategy for crowds at events could be linked to representation of the failures in decision making associated with Fruin's FIST factors of pedestrian movement and behaviour (1984; 1993), thus proposing that poor safety monitoring and management of these factors could allow a crowd incident to occur on site.

Building on this, Still (2013: 83) argued that if the arrival flow rate (number of people moving towards the entry system) exceeds the entry system capacity (number of people moving through the entry system), this will result in a gradual build-up of crowd density as those arriving at the back of the queue are beginning to arrive more quickly than those at the front can be processed, causing potential critical density issues that can expose the crowd to the risk of crushing injuries or fatalities depending on the volume of build-up and impact this has on the crowd density per square metre. Moreover, recent research has begun to make connections between the concept of collective behaviour (as discussed in Chapter 2) and its influence on pedestrian flow and movement. Namely, that affiliation behaviour occurs in known-groups within crowds (i.e., friends or family members) whereby known groups often try to maintain a formation in crowd settings and this reduces their overall travel time as known-groups try to stay together whilst moving around a site and also in times of egress and evacuation (Templeton et al 2018). Such behaviour can be detrimental to crowd safety, leading to outcomes including bottlenecks, congestion and potentially irrational behaviour, thus requiring careful and controlled monitoring and management.

Helbing and Mukerji (2012) noted that in places where bottlenecks can be expected such as entrance and exit points, then separating the direction of traffic can be helpful in aiding pedestrian flow; this is something that failed to happen at the Duisberg 2010 Love Parade causing immense pressure points at the centre of the crowd, resulting in asphyxiation injuries and fatalities, as the crowd (in their impatience at the hold-up) most likely pushed from either end. Getz (2005) suggested that parades are particularly troublesome for this reason, due to the large crowd volumes and road-side setting. In fact, it could be argued that any event working with anticipated high volumes of visitors could be at risk of issues with pedestrian flow, congestion and density, which must be addressed effectively for the purpose of audience safety.

3.2.5 Special need and accessibility

The quality of experience for all audience members is an important consideration and therefore another consideration in terms of site planning is to plan the experience of those with special needs or accessibility issues. Getz (2005) notes that during the site planning phase, organisers must ensure that all audience members can view and enjoy the performance, as well as removing physical barriers for those in wheelchairs (accessible toilets, viewing and dining areas) or those with sight, sensory and hearing problems (Braille, ear defenders and hearing loops), and providing disabled parking spots with easy access. As can be seen at the majority of UK events (examples include Eden Sessions Concerts 2014; Reading Festival 2014; Wembley Stadium 2014) these details are often planned into the site and event design due to the fact that equal access to events and facilities is legislated (Getz 2005). Furthermore, carers are often allowed free entry to facilitate the experience of those with disability issues; this is something that alongside accessibility site planning has been greatly improved upon since it was identified by Darcy and Harris (2003) as one of the key legal issues that can arise in relation to planning for those with disabilities. That said, to refer back to the specific focus of this study the relevance of accessibility planning is the resulting impact it can have on audience experience and event company liability if managed incorrectly.

3.2.6 Staging and structures

The HSE (2015a) provides dedicated information for the safe management of temporary demountable structures (TDS), which details guidelines on organiser duties as well as (among other support aids) a checklist of good vs poor practice that includes using approved contractors, clear provision of site information as well as spec details for the structure and clear risk assessment of any potential hazards associated with the TDS. Legislation was introduced in 2015 in the UK to ensure health and safety of this nature; The Construction, Design and Management (CDM) regulations (2015) apply to all construction projects, including those undertaken within the entertainment industry, to include live events and conferences and exhibitions (HSE 2022). Under Section 8 of the CDM 2015 Regulations pertaining to general duties (CDM 2015), the following seven statutory obligations are defined:

1. A designer or contractor appointed to work on a project must have the skills, knowledge and experience, and, if they are an organisation, the organisational capability, necessary to fulfil the role that they are appointed to undertake, in a manner that secures the health and safety of any person affected by the project.
2. A designer or contractor must not accept an appointment to a project unless they fulfil the conditions in paragraph (1).
3. A person who is responsible for appointing a designer or contractor to carry out work on a project must take reasonable steps to satisfy themselves that the designer or contractor fulfils the conditions in paragraph (1).
4. A person with a duty or function under these Regulations must cooperate with any other person working on or in relation to a project, at the same or an adjoining construction site, to the extent necessary to enable any person with a duty or function to fulfil that duty or function.
5. A person working on a project under the control of another must report to that person anything they are aware of in relation to the project which is likely to endanger their own health or safety or that of others.
6. Any person who is required by these Regulations to provide information or instruction must ensure the information or instruction is comprehensible and provided as soon as is practicable.
7. To the extent that they are applicable to a domestic client, the duties in paragraphs (3), (4) and (6) must be carried out by the person specified in regulation 7(1).

Applied specifically to the events sector, these legal duties for organisers, contractors and employees set the guidelines that must be adhered to in order to ensure the health and safety of all involved, including those working on the construction build and those on site to either work at or enjoy the event as it occurs. However, there are examples in the public domain of safety incidents that have occurred as a direct consequence of failure to properly manage the construction phase of a TDS, such as the Indiana State Fair Stage Collapse in 2011 (Moss 2014; Nacheman, Jackson, Nelson, Pinto, Valderruten & Bhagath 2012; Witt Associates 2012) in which 7 attendees died and 58 were injured. Investigations into the structural failure that caused the

incident found that there were issues with the TDS design and construction (i.e., failure in safe securing of temporary structure and loading of additional rigging for the Sugarland entertainment act) for which the subcontractor James Thomas Engineering was held liable. There were also issues with the inspection of the TDS post-build and prior to the event occurring (i.e., certain construction requirements of temporary structures were waived, one of which failed in winds, and organisers had insufficient knowledge of / information about the structure to appropriately evaluate its safety before / during event) for which the State of Indiana and the State Fair Commission (the event organisers) were found liable. Moreover, Witt Associates (2012) found in their review of the incident that also fundamental to its occurrence was the lack of preparedness, communication and response, as well as inadequate emergency planning and communication, through failure to implement a show stop procedure and evacuate crowds due to the weather warnings of the storm received in advance. Emergency planning will be discussed in greater depth in section 3.4, but as a direct result of these failings and investigations, successful lawsuits were filed against several defendants including the State of Indiana (\$11m payout) and others including Live Nation (promoter) and Sugarland (the act) who had to pay out \$39m in damages after being found liable (Moss 2014). The outcome of this incident emphasises the need for careful TDS health and safety planning in event delivery.

Beyond the legislative duties involved in the use of TDS for events, in terms of links to event design, Rutherford-Silvers (2008: 249) noted that any furnishings and structures included must ensure that suitable sight lines are maintained for both the focus of attention and means of egress, and they must be constructed, positioned and assigned with safety in mind. More specifically, many events will use colour-coded decorations or different themes to identify different activities and activity zones and equally, stages, platforms and other equipment are often used to enhance visibility and focus attention on specific activities or features (Rutherford-Silvers 2008). This 'zoning' feeds into the concept of site legibility (Getz 2005) as discussed previously in section 3.2.1.

3.2.7 Site modelling

Taking into consideration each of the above factors involved in site planning, a crucial step for event organisers to undertake in relation to effective crowd management and control is to model the site in terms of crowd density, flow and accessibility and at different time points within the event in order to determine potential pinch points on site and aspects of the event that may require more detailed crowd management and control planning (Still 2015). Site maps are drawn of the event site, which map key factors such as site legibility, zones and ingress/egress points, special needs and accessibility, site logistics and operational routes, hubs and points of interest, as well as staging and structures (Getz 2005; HSE 2015a; Rutherford-Silvers 2008) against the more changeable elements such as capacity (Yeoman et al 2004), queuing and bottlenecks (Helbing and Mukerji 2012), traffic and flow (Fruin 1984; 1993), and special needs and accessibility (Getz 2005).

Pertinently in terms of site modelling, Kemp, Hill, Upton and Hamilton (2007) argue that profiling the audience year on year in relation to expected norms and values associated with genres of music as well as issues relating to the placement and timing of an event, builds up a focused demographic and behavioural representation of the type of audience who will be attending the event and this is considered extremely useful in effectively tailoring the event's crowd

management and safety strategy accordingly. This viewpoint is supported by Still (2013; 2015; 2022) who defines effective site and crowd modelling activities under the acronym RAMP analysis (which stands for routes, areas, movement and profile) and whereby the behaviour profile of the audience in attendance underpins and will have a likely impact on an event's routes, areas and movement mapping. Furthermore, defining the audience profile can uncover specific risks for an event. For instance, Kemp et al (2007: 134) note that if an artist or genre of music has been experiencing a pattern of behaviour which has caused on-site issues, the organiser is forewarned and thus can implement an informed risk assessment and management strategy in advance of the event that can be fluidly assessed and fine-tuned up to the point of delivery.

Another key approach as defined by Still (2013; 2022) in relation to crowd safety planning and modelling at the pre-event planning stage is based on the theory that causality of major incidents is focussed on three primary influencing factors (design, information and management) and linked to three phases of crowd behaviour (ingress, circulation and egress). From this, the DIM-ICE meta-model was developed to enable safety organisers to map likely crowd behaviour against these three primary incident-influencing factors with the objective to better understand crowd risk and manage event safety. Research by Still et al (2020) argued that the DIM-ICE model can be used to aid strategic planning at major events, assessing potential crowd risks to avoid potential crowd safety issues, and whereby application of the model contributes to the emerging field of crowd science research, which is primarily motivated by place crowd safety issues in congested places. Overall, site modelling activities are often used as a reference point for the crowd management and control planning that subsequently takes place given what is known about the site and its prospective audience both at the internal and external levels, with key event stakeholders including the emergency services and local authorities (Still 2015). This preliminary phase of crowd and site mapping must take into account all site planning elements (with particular reference to pedestrian flow considerations in 3.2.4) and also considers the CM and CC planning elements (discussed in 3.3 to 3.7 below) to enable the thorough and safe planning of events.

3.3 Crowd management planning

Getz (2005: 108) defined crowd management (CM) planning to include security measures and a number of site design and operational factors that do not entail force, and that enhance customer service and the overall event experience. Moreover, Abbott and Geddie (2001) identified a range of elements involved in effective crowd management planning to include communication, signage, ushering and security, event conditions, and alcohol issues. It should be noted that whilst signage has already been discussed in legibility (section 3.2.1), the remaining elements will be explored in depth hereafter.

3.3.1 Crowd management and communication

According to Tum et al (2006: 144), research has shown that movement as customers enter an event slows down as people look around to orient themselves and hence it is crucial that this is taken into account in both the site design and also communication strategy. O'Toole (2011) discusses the importance of on-site communication (OSC) both in designing the site and communicating changes or important information to the audience. Building on this, Watt (1998) argued that communication must be done with clarity and argues that there are five methods of OSC that must be used effectively by event managers: First and most frequently used in events is verbal communication although it is often less effective as it cannot be witnessed. Second is non-verbal communication such as body language and gestures, but this could be easily misinterpreted if used alone. Third is written communication, which is again common but often misused; lengthy messages are often disregarded, and so written messages should be kept succinct and to the point. Fourth, is visual communication, which is most often used to train employees or to promote a product. Fifth and most pertinent nowadays for events is electronic communication including two-way radios, mobile phones, social media sites, app technology and the Internet generally, which provides the ability for instant communication at distance and to large audiences simultaneously; this is particularly useful when the event environment changes, and new information must be communicated as a result.

In his research into modern crowd dynamics and policing strategies, Borch (2013) argued that whilst many authors discuss the need for visual and oral communication in terms of crowd control policies whereby welcoming, informative and friendly actions and presence exhibited by security staff and law enforcement officers can be helpful in controlling a crowd (Drury 2020; Filingeri et al 2018; Stott and Radburn 2020). This 'rationalist' approach to communication, which suggests a crowd can be reasoned with may not work on certain types of audiences, such as those which are no longer thinking 'rationally'. It could be argued that this is true of emotional crowds and rioting crowds for instance, or those in the midst of dense and suffocating crowds (Berlonghi 1995; Borch 2013) and thus, alternative strategies may be required to suit these audiences. Abbott and Geddie (2001) suggest that non-verbal communication by security staff and law enforcement officers can be helpful in these scenarios. However, it must also be noted that this approach refers back to a more traditional view of the crowd as one whole negative entity that needs to be controlled rather than communicated with (Borch 2013) and this can incite its own issues such as the crowd violence that erupted at a student protest in Birmingham in January 2014 when police used heavy-handed tactics to 'contain' and 'kettle' the protestors for several hours which was met with anger and outrage (BBC News Online 2014).

Whilst there is clearly no one-size-fits-all approach to crowd management and communication strategies, O'Toole (2011: 217) identified the necessity of a broad range of specific elements and activities in relation to effective OSC strategies for events, to include:

- On-site promotion and sponsor promotions
- Signage – directional, statutory, operational and facility
- Voice communication through radio, PA announcements, mobile telephones
- Event operation manual
- Digital communication through SMS, Twitter, and web announcements
- Information booths

- Visual and audio cues
- Onsite briefings
- Print – programmes, leaflets and newsheets

A lack of efficient means of communication has been attributed to crowd disasters such as the 2010 Duisberg Love Parade, whereby the organisers and event staff lacked appropriate means of communicating with the crowd about the evacuation plan, given the absence of basic tools such as loudspeakers and megaphones, which are crucial in communicating to dense crowds of people (Helbing and Mukerji 2012). Through their analysis of real-world incidents and emergency communication planning, Van der Wal, Robinson, Bruine de Bruine and Gwynne (2021) found that all emergency communication strategies reduced panic and running during evacuations to some extent compared to no communications, with staff guiding people to exits followed by live announcements and pre-recorded messages promoting faster crowd evacuation responses. However, they found that the more impersonal and indirect communication approaches (such as use of evacuation alarms and pre-recorded messages rather than live, staff-assisted evacuation methods) were linked to delayed evacuation responses and crowd members stalling to film incidents rather than evacuating swiftly. Consequently, effective crowd communication should lead to successful coordination between employees and guests and between management and guests, and the communication process should therefore remain flexible in case the event environment changes (Abbot and Geddie 2001).

Building on this, Hill (2004: 164) referenced communication according to the Event Safety Guide (1999) as having two main perspectives, namely inter-professional communication and public information and communication. They continued by noting that the two independent perspectives will likely require different approaches and must be considered both within the event planning phase as well as having a communication strategy in place for the dynamic operational phase of an event. Utilisation of the incident control room to disseminate information during dynamic event operations is perceived to be fundamental within an event's communication strategy for event safety (Still 2013, Still 2022). Ultimately Seppänen, Mäkelä, Luukkala, and Virrantaus (2013) argued that it is the fluency of communication that affects the formation of an adequate shared situational awareness for strong safety management, which is crucial in dynamic event management during the operational phase. Whilst the operational phase of crowd safety management planning is discussed in greater detail in 3.6 below, it is pertinent at this point to also recognise the lines of communication essential to dynamic event safety management. With this in mind, the Green Guide to Safety at Sports Grounds (2008:158) and Kemp and Hill (2004: 169) summarise these as communication between members of the safety management team (in particular, the safety office) and:

1. the stewards and other safety personnel
2. all points of entry (including the monitoring of counting systems) and all points of exit
3. the police, other emergency services and medical agencies
4. spectators, inside and outside the ground
5. other members of staff
6. officials in charge of the actual event
7. officials from the British Transport Police, the Highways Agency and public transport

3.3.2 Crowd management, ushering and security

Event staff (those working either in a paid or a non-paid capacity) also have an important role to play in effective crowd management. Abbott and Geddie (2001) discuss the distinct roles held by ushers (also known as stewards and commonly volunteer-based, Van der Wagen 2007) and security personnel at events. They state that ushers are useful in assisting with audience communication, through the guiding, observing and provision of important information for visitors, whilst security personnel are crucial in terms of crowd control, by handling disputes and providing an overall safe and secure environment for events. Van der Wal et al (2021) found that having staff guide people to exits was the most effective strategy for promoting faster and more effective responses during emergency evacuation scenarios. Whilst specific crowd control measures and action plans will be discussed in greater detail later (in section 4.4) staff roles in effective crowd management at events present their own unique considerations for the event manager.

Specifically, due to the temporary nature of usher and stewarding roles whereby transient teams (Van der Wagen 2007) of casual paid staff or volunteers are often recruited close to event delivery (Getz 2005), then effective site safety and induction briefings for these members of staff are crucial in order to ensure they are sufficiently knowledgeable about the event site layout, information that the audience might require, the details of their specific role on the day, health and safety and crowd management responsibilities, as well as lines of communication in the case of any problems (Shone and Parry 2010; 2014). Supporting this notion, Getz (1997) suggested that whilst volunteers are often enthusiastic to help and have good intentions, they can be unreliable and often lack experience, thus highlighting the importance of training.

Equally, as security personnel are often required to deal with disputes or to action emergency procedures, they must be carefully selected to be experienced and well trained in dealing with crowd disorders (Abbott and Geddie 2001), able to restrain troublemakers and restore order before having to end the event and send everyone home (Berlonghi 1995: 241). That said when crowd situations become unmanageable by the organisers and the events' staff, then Rutherford-Silvers (2008) notes that this is the point at which law enforcement officers will be called in. In such instances and due to the fact that a broad range of event occurrences (see 4.3.3) can have negative legal impacts for the event organisers, a crowd management strategy should include board members trained to manage risk and provide legal counsel in order to ensure the highest level of safety possible from the beginning to the end of the event (Abbott and Geddie 2001). It should be noted that emergency procedures and crisis planning will be discussed further in section 4.4 in relation to crowd control planning.

3.3.3 Crowd management and event conditions

According to Abbott and Geddie (2001) audiences may act differently depending on the event and aspects unique to it and thus organisers must consider the specific event conditions to predict and manage crowd behaviour effectively. Rutherford-Silvers (2008:247) argued that design of the event setting must strive to encourage desired behaviour in a range of ways linked to the functional environment of the event by considering the following elements: access, atmosphere, escape routes and plans, availability of services, signage, staging and structures (including external environmental forces, such as the weather). In the case of the Indiana State

Fair in August 2012, two consulting firms hired by the state of Indiana to investigate the deadly stage collapse that occurred due to a strong gust of wind ahead of a storm cited improper construction of the stage rigging and inadequate emergency preparations (discussed previously in 3.2.6) as contributing factors to the loss of life caused by the freak weather incident (Tuohy and Ritchie 2012). What is clear is that the organisers of the fair had overlooked certain elements of their site plan and crowd management strategy which then failed under the strain of an unexpected event condition, such as the weather incident.

In certain circumstances, other external factors such as high crime levels in the local destination area can create opportunistic theft and petty or organised crime incidents against visitors (Abbott and Geddie 2001). This was a key concern for organisers of the 2010 World Cup in South Africa for its visitors, given the country's poor reputation for crime (George and Swart 2012) and is something that must be factored into the control and security plan of any event if identified as a potential condition of the event. Often events aim to communicate to their audiences about the potential risks of theft and crimes against visitors at an event in advance to mitigate the likelihood of visitors falling prey to such incidents. Glastonbury Festival, for instance, has a page dedicated to visitor safety on its website, which highlights clearly the risks posed as well as information on how to avoid becoming a victim or where to go on site and what to do if targeted (Glastonbury 2017). According to Grimm and Needham (2012) this communication with the audience relating to personal safety, allows consumers to see for themselves the quality of the security effort in place and ways to avoid becoming a target, which can help to reduce perceived fear of crime and risk to personal safety. However, with some criminal acts this warning relating to personal safety is not possible. A crucial consideration in any crowd safety plan due to the current political climate is the risk and threat of terrorism to an event. Events are ever-popular targets for terror attacks due to the considerable number of people in attendance, the resulting emotional impact as well as the ability to impact on a range of industries in one go, the constant flow of visitors which makes it difficult to identify threats, and often global media coverage (Getz 2005; Rutherford-Silvers 2008; Tarlow 2002). Due to the complexities associated with planning for these types of scenarios, the threat of terrorism and the resulting impact of this external event condition on crowd management planning will be explored in more depth in section 3.5.

Linking to previous discussions in earlier sections, more internal influences unique to the event itself have also been found to be linked to the consideration of event conditions in crowd management strategies (Abbott and Geddie 2001); these include but are not limited to excessive queuing and its impact on crowd mood and emotional arousal, crowd social factors and subcultures, cancellations and no-shows, and even the presence of provocative performing acts (Abbott and Geddie 2001; Berlonghi 1995 Borch 2013; Templeton 2021).

3.3.4 Crowd management, alcohol, and drug-related issues

In an article about difficulties in planning the 2022 Qatar World Cup in relation to Western and Muslim fans attitudes towards alcohol at events, Dun (2014) stated that for many tourists [in this case, sports event visitors] alcohol is an inherent part of their experience on holiday or at an event, often representing a sense of escapism from normal life. Nonetheless, according to Rutherford-Silvers (2008: 252) studies have shown that the number one risk management concern is the serving of alcohol at an event as it can change the nature of an audience and

'cause reasonable and well-behaved individuals to abandon their typical social mores and controls, resulting in an audience or crowd that is more dangerous and difficult to control'.

As discussed in Chapter 2 (section 2.3.2), parallels are often drawn between subculture and event issues; within the literature, excessive alcohol consumption on holiday or at events, and certain subcultures known for their hedonistic attitudes, destination and event choices and / or affiliation to certain societal norms, such as the youth market (Fuller et al 2018; Josiam et al 1998; McKay 2018; Ryan et al 1996; Smith and Foxcroft 2009) and the sports fan market (Dun 2014; Menaker and Chaney 2014) are closely linked. In an attempt to explain the potential reasons behind excessive alcohol consumption and the problems it can generate, Jayne, Gibson, Waitt and Valentine (2012) identify through their research that tourists [and by association event visitors] often use alcohol to bond with their fellow visitors, 'pass the time' and escape daily routine. Meanwhile, a study by Glassman et al (2007) found that at sports events fans drank significantly more on game day than they did the last time they partied or socialised, and it has also been noted that they also view alcohol consumption as a key component of fan identity, finding it difficult to conceptualise attending matches in which they cannot drink alcohol before, during or after (Dun 2014: 196).

However, it is the impacts of these perceived norms to consume heightened volumes of alcohol at events that presents cause for concern at many events. Tarlow (2002) noted the links between excessive alcohol consumption and the youth market in terms of rude and obnoxious or confrontational behaviour as well as incidences of sexual harassment and in some cases, assault. Moreover, Menaker and Chaney (2014) highlighted that the profile of those in attendance, alcohol sales policy and match start times directly influence an increase in crime at sports events, with temperature, the nature of the match [friendly or rival], and those in attendance, in addition to law enforcement policy, influencing the frequency of alcohol-related ejection reports. Inappropriate fan or audience behaviour at events is known to diminish the visitor experience (Glassman et al 2007) and therefore, it is the role of the organiser to plan the event in such a way as to enable the crowd in attendance to be managed more efficiently. In an article about the 'civilising' effect of a more balanced night-time economy on Bournemouth, Haydock (2014) suggested that placing emphasis on atmosphere rather than the homogenized mainstream 'on the cheap' offer that exists on most night-time high streets, whereby more relaxed environments are created, so 'people will sit rather than stand and simply pour lager down their throats'(p180), could promote a 'better' drinking style through the audience it attracts, and thus exert a 'civilising influence' on the venue and its crowd. In support of this, McKay (2018) noted more recently a shift in public culture away from the 'on-the-cheap' and excessive drinking behaviours of the late 90s and early 2000s in the UK, with the recent demise of the Club 18-30 holiday hedonistic brand. However, whilst public behaviour around excessive drinking and intoxication is evidently changing, excessive drinking and intoxication (alcohol and drugs usage) remains a key challenge for event organisers, especially sports and music events as well as festivals frequented by the youth market and sensation seekers profiles, as previously discussed in Chapter 2.3, different or additional approaches and practices are most likely required.

To address the issue of intoxication more directly, it is commonplace event policy that highly intoxicated individuals will not be let into a venue or will be ejected from it if found to be overly intoxicated on-site (Abbot and Geddie 2001; Menaker and Chaney 2014). Moreover, Glassman et al (2007) and Rutherford-Silvers (2008) suggested some options for events to include zoning

for alcohol-free alternatives and plenty of options and opportunities for visitors NOT to drink, as well as paying attention to start time versus venue opening, to limit the time audiences are able to 'tailgate' or binge-drink on site before the game starts; in the UK for example, the consumption of alcohol at football events is indeed forbidden within the view of the playing area (Safety at Sports Grounds 2013). However, this alone would arguably not address the 'tailgating' phenomenon. To address this issue, Rutherford-Silvers (2008) indicates that placing limits on serving times by closing the bar before the end of the end or not opening too far in advance of the event start time.

Building on this, Abbot and Geddie (2001) argued that policies concerning alcohol consumption should be created prior to the sale of alcohol and should encompass five key points. First, alcohol should not be sold at events where crowd problems are foreseeable. Second, age requirements must be strictly enforced, with ID checks. Third, security must always be positioned where alcohol will be sold. Fourth, intoxicated individuals must not be served, and a purchase limit should always be established. Fifth and finally, alcohol should never be the event's primary source of income. Furthermore, the use of identification systems (wrist-band systems) and portion control as well as enforced prohibition of bring-your-own via security checks are now commonplace (Rutherford-Silvers 2008). What is also important to consider in terms of managing this type of event visitor is the UK Alcohol Strategy, designed to cut alcohol fuelled crime and anti-social behaviour (2012); as discussed in chapter 2 (section 2.3) the introduction of an Early Morning Alcohol Restriction Order for local areas, a late night levy for serving alcohol to contribute to policing costs, ending the availability of irresponsibly priced alcohol, and devolution of power to local authorities to revoke licenses more swiftly in tackling alcohol-related harms undoubtedly impacts on the planning and delivery of events for the management of this issue. Moreover, research into links between the youth market, alcohol and events by Fuller et al (2018) suggests that this is still a commonplace issue for UK events that requires careful consideration in event safety planning.

That said, in addition to the alcohol issues associated with some event types and their negative impact on behaviour, so too should the issue of drugs among event audiences be recognised, alongside their unique impacts. Again, as identified previously in chapter 2 section 2.3, according to Verkooijen et al (2007) identification with the pop, skate/hip hop, techno and hippie subgroups among youth crowds, each of which has strong groundings in the current music event scene, was associated with higher risks of substance use. The youth market could therefore be said to seek out events where they can indulge in deviant drug-based behaviour, and this could be pertinent to consider in the context of special events aimed at this group. This is supported by Tarlow (2002) in his recognition of drugs as one of the main contributing factors to incidents affecting student events and parties and also music festivals (known to attract a younger audience). As such, Abbott and Geddie (2001) noted that security personnel at events likely to attract a younger, more revellous (Berlonghi 1995) crowd should be trained to recognise the various types of drugs likely to be in use and the symptoms they create. Moreover, they cited Waddell (1997) who stated that security personnel should be positioned strategically in dark areas like dark corners, parking lots, etc, as well as the use of CCTV monitoring at the concession stands and in spectator areas to spot trouble and allow for immediate intervention (p264). These aspects remain important planning considerations for events today along with the introduction of on-site drug testing facilities and attendee education rather than a zero-tolerance approach (Busby 2018). Finally, as Rutherford-Silvers (2008) notes servers in the food and beverage areas

of the event as well as security personnel should be trained to look for the signs of intoxication (through alcohol or drugs) to enable a safer event through the swift identification of potential 'problem' individuals as well as to mitigate the risk of legislation breaches from the event organiser's point of view.

3.4 Crowd control and emergency planning

If successful crowd management is considered to be linked to forward operational planning and security measures to enhance the audience experience (Getz, 2005), then crowd control involves devising measures that include 'a progression of triggers or thresholds for implementation', that take into account orderly crowd situations through to those involving unlawful or unsafe behaviour and beginning with the limiting of the number of tickets sold or a ceiling capacity for the event to try to prevent overcrowding in the first place (Rutherford-Silvers 2008: 297). Crucially, crowd surges and safety scenarios are not always avoidable as crowds are often unaware of the domino-effect dangers involved in dense crowd situations (Helbing and Mukerji 2012) and therefore as Abbott and Geddie (2001) argue, crowd control must be planned for and addressed at three key stages of the event: pre-crisis, crisis and post-crisis (each of which is to be discussed in further detail hereafter). The fundamental distinction is that strategies for crowd management are proactive and plan for orderly movement and assembly, whilst strategies for crowd control adopt more reactive tactics and aim to restrict or limit behaviour (Berlonghi 1995; Rutherford-Silvers 2008).

3.4.1 Crowd control: pre-crisis stage

As previously stated, crowd control plans represent the steps and procedures that should be taken once a crowd is beyond control and the first phase of such plans must focus on the pre-crisis stage (Abbot and Geddie 2001: 264). This involves factors such as provision of clear and detailed staff safety briefings ahead of the event, presence of emergency services on site as well as risk management professionals on the event board to ensure the event runs smoothly, clearly visible staff, stewards and security in uniforms who are trained and ready to respond, the use of plain-clothed security officers and CCTV if possible designed to identify and locate any trouble as it erupts, a designated control or command centre on-site designed to make the major safety and security decisions during emergencies and to facilitate the orderly operation of the event through a chain of command. Moreover, it is important at this stage to ensure that site planning site modelling activities have been coordinated effectively, to minimise potential safety hazards and crowd scenarios (refer to 3.2) and to ensure that capacity limits as event visitors begin to arrive are adhered to (Yeoman et al 2004).

3.4.2 Crowd control: crisis stage

In some situations, and despite these cautionary measures, crowd incidents can still erupt and as has been discussed previously, often these are either caused or exacerbated by external event conditions beyond the organiser's control (George and Swart 2012; Rutherford-Silvers 2008;

Shone and Parry 2010; Tuohy and Ritchie 2012). In emergency situations Abbott and Geddie (2001) suggest that it is crucial to have procedures for rapid but orderly evacuations in place and yet all too often, disasters happen that can be at least partially attributed to the poor execution of this element. Drury (2020: 13) notes that the main danger in emergency evacuations often is not overreaction but underreaction. For example, in January 2013 a fire in a Brazilian nightclub led to the death of 223 people, which reports have said was caused by poor evacuation procedures, blocked exit routes and generally poor safety practices (BBC Online 2013b). Similarly in crowd surge and crush disasters such as the 2010 Love Parade incident (BBC Online 2010; Helbing and Mukerji 2012) and the Mihong Bridge fatalities (Zhen et al 2008), often these types of incidents are caused by a dereliction of duty in monitoring the flow of people through a particular site node (in these cases, through the only event entrance/exit point and onto the Mihong Bridge respectively) and a miscalculation of the number of staff needed to steward the area of limited space, which ultimately leads to an inability to effectively evacuate the densely populated crowd caught in the crush. This links to the concept of emergency preparedness and Sharma, McCloskey, Hui, Rambia, ,Zumla, Traore, Hafi, El-Kafrawy, Azhar, Zumla and Rodriguez-Morales (2023: 4) argue in relation to this that sudden crowd rush, surge and crush events, should be anticipated and planned for, and crowd management should be a regular feature of emergency preparedness so that even with unplanned spontaneous mass gatherings there will be some capacity and resilience in the local system to prevent or deal with minimal deaths. In recent UK research with event organisers, Filingeri et al (2018) found that organiser experience in relation to crowd safety differed considerably among those interviewed, whereby often no crowd specific training had been received, causing a knowledge gap among organisers with limited practical experience, whereas others did not feel crowd-specific training was necessary, regarding it as 'common sense'. This identified knowledge gap and blasé perception among some organisers of crowd safety training could arguably impede on the quality of decision-making required to undertake effective crisis planning and emergency response (as discussed in 3.4.4 below) and thus could arguably contribute to the escalation of safety incidents at events.

With effective immediate incident response in mind, according to Abbott and Geddie (2001), evacuation procedures should be communicated by an experienced announcer to ensure the announcement does not evoke further panic and event staff should remain calm, whilst security should prohibit and control re-entry to avoid contraflow problems. However, Kemp et al (2007) identified a show stop as one of the most contentious issues in concert and festival management, that should only be implemented as a last resort measure if there is imminent danger to either the external or internal customer. Their research with a collection of European event promoters, producers and managers highlighted six scenarios deemed appropriate for a show stop: electrical failure, crowd collapse, structural collapse, dangerous weather conditions, fire, or terrorist attack, the latter of which will be discussed in greater depth in section 3.5.

Whilst emergency evacuation and show-stop procedures are often reserved for the most serious crowd incidents and scenarios, other control methods should be implemented by event staff, security and law enforcement officers to control on-site audience incidents such as in-crowd fighting or violence (Abbott and Geddie 2001). Linking to this in terms of effective crowd enforcement strategies, Borch (2013: 15) states that whilst the traditional physical presence of security and law enforcement can evoke anger among an audience, equally the modern and more 'rational' approach to crowd management (implies that as a crowd is capable of rational thought and its members can therefore be reasoned with) does not adequately address the

impact of internal crowd dynamics on emotional arousal and that 'this ignorance may produce an important blindness in strategies for the proper management of crowds'. Thus, a balanced strategy is needed between welcoming, friendly communication to diffuse situations by security and law enforcement whenever possible (Filingeri et al 2018) so as not to escalate or initiate conflict through a heavy-handed approach (Stott and Reicher 1998) as was seen in the containment and kettling exercise against protesting Birmingham students and management of the Hong Kong riots more recently (BBC News Online 2014; Stott and Radburn 2020). Yet, whilst in less volatile situations, positive crowd interaction can be implemented as a means of policing through conversation with groups to communicate desired actions and conduct (Fuller et al 2018; Stott et al 2008), covert tactics such as the use of 'spotters' to identify and locate incidents before they escalate as well as more forceful strategies such as ejection from the event (Menaker and Chaney 2014) can also be important in the right context (Abbott and Geddie 2001; Stott et al 2008).

3.4.3 Crowd control: post-crisis stage

Finally, as Abbott and Geddie (2001: 269) state, all crimes, arrests, injuries, pedestrian/traffic accidents, property damage and crowd disturbances should be properly documented in an incident report that specifies dates, times, locations, witnesses, victims and suspects, the incident itself, and all actions taken. Linked into this, Tarlow (2002) added that collecting data on event crowds and incidents that can occur as well as near misses (Still 2015; 2022) is often a good way to gain information for the planning of future events. Moreover, following the event, a team debrief, planning review and event evaluation should be undertaken in order to learn from any mistakes and rectify issues and procedures for the future (Abbott and Geddie 2001).

3.4.4. Emergency planning: crisis management and resilience

Ritchie (2009) argued that information can assist crisis prevention through reducing exposure to risks, increasing resilience and the capacity to recover quickly or improve signal detection. With this in mind, according to Still (2013, 2022) there are four key phases or 'pillars' to crisis management for events that outline the pre- and post-incident cost analysis, defined as 'anticipate', 'prepare/prevent', 'respond' and 'recover'. With the objective of avoiding incident occurrence, he states that there must be investment in the initial two planning phases as well as in monitoring and early detection responses (crowd monitoring is explored more fully in 3.6 below). Although specifically related to the threat of terror attacks, the National Counter Terrorism Security Office (NaCTSO) developed guidance in 2017 related to *Managing Crowded Spaces* which has direct applicability to event crisis management. Specifically, in terms of risk management planning it identified five key stages, namely, to identify the risk, identify what must be protected, identify measures to reduce the risk, create security plans and record this activity, plus, review security measures (training, and rehearsing where possible). This guidance correlates strongly with HSE guidance for the creation of risk assessments and other risk-reducing activities (2022).

According to Børve and Thøring (2022) risk management planning is a cyclical process that often engages a range of stakeholders working in a systematic way to eliminate and minimise the impact of threats, implement strategies, and assess the process. It has been observed, however,

that risk assessments for music festivals and mass gatherings have generally dealt with traditional workplace hazards and risks without taking into account the dynamics of the crowd or those factors that might influence its behaviour (Raineri 2013). What is more, Filingeri et al (2018) found organiser experience in relation to crowd safety was often impeded by no crowd specific training and a knowledge gap among organisers with limited practical experience, as well as a perception among some organisers that crowd-specific training was unnecessary and 'common sense'. The potential impact of these oversights on the quality of decision-making required to undertake effective event safety crisis planning could arguably contribute to the escalation of crowd safety incidents at events. Furthermore, it could be argued that the inherent multi-agency collaborative nature of risk management planning for temporary events and the lack of specific crowd safety training among event organisers increases susceptibility to decision-making error in emergency crowd safety planning.

Regarding incident management specifically, the Disaster Recovery Cycle according to Still (2013:215) centres around the notion that 'crowd congestion builds up from the point of the incident occurring to recovery, because the crowd may be unaware of a problem in the system and so keep moving to the incident location'. Around this central notion there are five phases within the cycle:

1. operational detection of a failure in the system that could lead to a crisis occurring
2. incident identification whereby the initial alert is raised
3. detection of all affected areas and parties through onsite monitoring techniques (see 3.6 below) as early response is crucial to minimise the incident impact,
4. control of the incident as it occurs by ensuring strong communication among the safety team and a well-informed chain of command and decision maker with primacy who holds a clear understanding of the site, its capacity, crowd density and flow
5. recovery whereby the first responders and emergency services are deployed if needed as well as managing bystander crowds and coordinating evacuations and other tasks to be facilitated by the event staff, security and stewards.

Following on from this, a schematic was introduced by NaCTSO (2017) detailing the five phases *in response* to terror attacks in crowded spaces, to include emergency services, incident management, crisis management, business continuity and recovery. Whilst the first two phases are linked to the response and safeguarding life as well as command, control and communication in incident management (demonstrating association with the Disaster Recovery Cycle above), the third and fourth phases look strategically towards maintaining stakeholder confidence and organisational reputation, as well as the critical operational activities that must continue during and after the incident, leading into the final phase that is focussed on rebuilding, restoring and rehabilitation. These concepts establish the fundamental principles involved in incident management and emergency response planning. That said, effective safety and risk management planning for events must also include a behavioural assessment of crowd dynamics and collective behavioural patterns *beyond* assessment of generic workplace risks (Raineri 2013) and should be undertaken by experienced individuals trained in crowd safety planning (Filingeri et al 2018). These event-specific considerations should underpin a carefully considered crisis management plan, as well as ensuring appropriate investment in risk planning activities and collaborative, experienced and well-informed incident and response management, to arguably strengthen organisational resilience.

3.5 Terrorism and crowd safety planning

As previously identified in 3.4.2, a crucial consideration in any crowd safety plan due to the current political climate is the risk and threat of terrorism to an event. Events are ever-popular targets for terrorists who believe that gaining attention for their views is justification for disrupting or harming the lives and businesses of others (Getz 2005: 285). Moreover, Rutherford-Silvers (2008) noted that in today's world, such acts are possible anywhere and at any time, with planned events being likely targets due to the considerable number of people in attendance, the resulting emotional impact and often global media coverage. Building on this, Tarlow (2002) rationalised that events are often targeted for a multitude of reasons; namely, they tend to be held close to major transportation centres, they impact others industries such as hotels, restaurants and entertainment, there is often little information known about attendees in advance, plus, there is commonly a constant flow of guests which makes it difficult to identify potential threats, and lastly, events are often attended as a means of escape, enjoyment and relaxation so guests in attendance tend to let down their guard.

Recent global attacks on large scale public events such as the Paris attacks of November 2015 at the Stade de France and Bataclan theatre, plus other hospitality businesses in the vicinity (Peters 2015, as well as the suicide bombing at the Ariana Grande concert at the Manchester Arena in May 2017 (Kerslake, Wahlstrom, Deeming, Goodwin & Lund 2019), indicate the all too real threat that exists for events that draw large crowds of people into a small space. Whilst fear of attack diminishes over time between incidents, venue managers and event organisers have had to adjust their thinking in recent years [specifically since the start of the new millennium] and develop better security systems (Getz 2005). According to FEMA (2001) mitigating actions in response to the threat of terrorist activity at events include standard safety and security precautions such as procedures for handling unattended packages or unauthorised parcel deliveries, pre-event security sweeps of the site, limiting concealment areas where weapons or perpetrators may be hidden, and employing appropriate admittance controls (as cited by Rutherford-Silvers 2008: 134). Additionally, Tarlow (2002) indicated that instructing staff not to discuss the incident with anyone (especially the media), practicing of evacuation procedures and crowd calming measures, strong knowledge and communication of all escape routes, stringent employee checks and special security instructions for those working at front desks and points of ingress or egress as well as policies for dealing with secondary crises (e.g. breakout of fire after a bomb) are all imperative crowd safety and risk management strategies to be implemented by event organisers as a result of the threat of terrorist activity or in immediate response to it.

Furthermore, authors such as Pielichaty, Els, Reed and Mawer (2017) observe that political risks including threat assessment relating to terrorism, can lead to the cancellation of an event altogether. Research conducted by Kemp et al (2007) with event promoters, producers and managers from across Europe indicated that acts of terrorism are deemed to be one of the few scenarios where a show stop procedure is imperative for crowd safety. However, they also argued that the main difficulty with implementing a show stop is the judgement used to identify when an event should be stopped; too soon and with a threat that vanishes and the organiser is

perceived a liability, but too late and where people die due to the decision, then the person stopping the show must take full accountability after the event (Kemp et al 2007: 188).

That said, in the event of a terrorist incident, Tarlow (2002) suggests that not only is safe and swift evacuation, plus effective communication according to emergency planning procedures crucial, but so is the recovery plan after the attack. He adds that strong communication and leadership with employees and guests during evacuation and immediately afterwards, visible police and security personnel, high levels of lighting wherever possible to make people feel more secure, public reassurance and proactivity in terms of looking out for suspicious activity as well as vigilant checks on all sub-contractors, employees and volunteers plus the review of CCTV footage to identify security breaches, are critical aspects to be included in an emergency incident checklist for an event risk and crowd safety manager. It should be noted here that whilst responding to terrorist incidents calls for emergency planning in terms of life safety and property protection on the part of the event organiser, such incidents will ultimately fall under the control of law enforcement in the event of an attack (Rutherford-Silvers 2008). This emphasises the importance of close collaboration between event organisers, law enforcement and other emergency services when planning and delivering events, particularly for larger scale events with a high public profile on a national or international level that could arguably be deemed more susceptible to the risk of attack (Makarenko 2004).

3.6 Dynamic onsite crowd management strategies for safe events

On reflection, crowd management is essentially a set of collaborative practices between a number of different stakeholders (e.g., event planners, emergency services, local authorities, transport authorities, stewards, and the crowd itself) resulting in a live process, with data-driven approaches and support within the safety team from the planning phase to implementation, and between events (Martella, Conrado and Vermeeren 2017). Furthermore, Martella et al (2017) continue by arguing that a more systematic approach to CM could have avoided recent incidents in large, high profile and crowded events, illustrating the need for the implementation of dynamic onsite CM techniques. Following on from the pre-event crowd modelling and safety planning, which is crucial to identification of crowd safety risks and management (discussed previously in 3.2.8) is the need to monitor and observe the crowds in attendance during the operational phase of an event for the purpose of early incident detection relating to crowding problems and effective management (HSE 2000). A key component of dynamic crowd management is crowd monitoring and designation of 'real-time' support (Still 2013; 2022) in the form of Decision Support Matrices whereby locations around a site can be mapped against event timings to identify points in time and locations within the event that will either be extremely busy / nearing capacity (more than 80% of site capacity), busy with between 50%-80% capacity and quieter, with less than 50% capacity. Often, these matrices are colour-coded to visually represent the risk level using the red-amber-green traffic light system. Further to this, Still (2013) notes that documenting arrival time profiles in terms of expected numbers arriving by buses, trains or walking, and cross referenced against the time remaining prior to the event start is also crucial to successful on-site CM planning. Together, these tools enable event control to

effectively predict likely arrival patterns and event congestion patterns in order to plan the locations and points in time for the event that may require additional resource and support.

As noted by Anderson et al (1997) facilitating crowd flow around a site helps to create functional density and enhance crowd experience, thus highlighting the importance of monitoring crowd density vs flow rate. With this in mind, Still (2013; 2022) notes that a moving crowd needs more space than a standing one in order to keep congestion levels to a minimum and so the more dense a moving crowd is, the more congested it becomes. Specifically, he adds that 2 people per m² can move freely and would be considered as free flowing whereas 4-5 people per m² cannot and the crowd is reaching the point of instability (beyond maximum capacity is upwards of 3) and towards critical congestion. According to Fruin's Force, Information, Space, Time model (FIST) developed in 1993, the configuration, capacity, and traffic (flow) processing capabilities of assembly facilities (*spaces*) determine degrees of crowding, and this includes standing and seating areas, projected occupancies, and the practical working capacities of corridors, ramps, stairs, doors, escalators, and elevators. It is this measure of density per m² that contributes to an assessment of a venue or spaces' risk severity level in terms of safe crowd management, and it is noteworthy that as density increases, pedestrian flow decreases (Still 2013, 2022).

Further to this, Wijermans, Conrado, van Steen and Martella (2016) identify CM practice to involve accessing and interpreting a wide variety of information sources via event control, predicting crowd behaviour, and deciding on the use of a range of possible, highly context-dependent intervention mechanisms. Moreover, Seppänen et al (2013) argue that for responses to be efficient and goals to be achieved in complex environments, cooperation and communication is needed in the form of shared situation awareness or a common operational picture. The three-level model of Situational Awareness was developed by Endsley in 1995 to understand aviation tasks in a dynamically changing environment, and follows a chain of information processing, from perception of the elements in the environment (level 1), to comprehension of the current situation (level 2) and prediction of future status (level 3). Several authors discuss the concept of situation awareness and analysis as an important method in understanding more clearly the nuances involved in dynamic crowd safety management (Martella et al 2017; Nicklasson et al 2008). The process involves:

- Identifying all crowd safety components, event areas, and routes to site and implementing crowd monitoring, stewards and security as spotters, and CCTV, helicopter and/or drone surveillance
- Communicating about issues, hot spots, congestion, trouble through liaison between ground staff and control, and liaison with support services (police, ambulance, fire crews)
- Using situational knowledge to inform tactical decision making by event control, with action(s) communicated via the chain of command and delivered by teams on the ground

Martella et al (2017) argue that for dynamic crowd management (and the situation analysis and awareness that underpins it) to be truly effective, then a bigger emphasis on the adoption of technology within the crowd surveillance and management role is required. They go on to state that whilst many events involve complex and sophisticated event planning and monitoring, they do so with little support from technology. Yet its use (i.e., smart barriers, mobile phone traces or signals and computer-vision image analysis) would be extremely beneficial to the real-time monitoring required in dynamic onsite crowd management.

A further technique in real-time crowd monitoring is explained through the concept of the OODA loop (Boyd 1998), which stands for observe, orient, decide and act (similar to the plan, do, check act risk management approach, HSE 2022). According to Brehmer (2005; 2006), the OODA loop has three basic functions of sense making, planning, and information collection, whereby the crowd observations feed into a knowledge-gathering stage based on real-time observations as well as past event learning and experience, which in turn informs the CM decisions made and the actions that are taken to resolve or mitigate the issue. This process is also cyclical, with the information-gathering exercise, its resulting decisions and actions taken, then informing the crowd observation activities going forwards (O'Toole et al 2020) and there are strong links between this activity and the crisis management planning cycles discussed in 3.4.4, as well as the identification of incident fail points and crowd behavioural issues linked to the Swiss Cheese and FIST analysis models (Fruin 1984; 1993; Reason 2020) discussed in 3.2.4.

Ultimately, as O'Toole et al (2020) argued, the three main crowd metrics to be observed on site for safe event management are crowd density (ppm²), crowd flow rates and crowd mood, and it is likely that many crowd incidents that occur at events are linked to one or more of these factors. With this in mind, the use of real-time live surveillance of the crowd, if possible, would enable event organisers and crowd safety planners to monitor any pressure build-up, increase in crowd density, or blockage of pedestrian movement that may escalate into, or contribute towards a crowd safety incident at an event (Sharma et al 2023). Drury et al (2021) also argue that sophisticated systems of surveillance and communication could also be beneficial in identifying crowd behavioural issues and developing approaches to improving adherence.

3.7 Event safety legislation and implications for the events industry

The concepts of event design, crowd management and control planning are critical to an event's success but are crucially underpinned by a core requirement of any event organiser to understand event risk and safety legislation (Abbot and Geddie 2001; Berlonghi 1995). According to Bowdin et al (2011: 594):

“Events are particularly susceptible to risks. A unique venue, large crowds, new staff and volunteers, movement of equipment and general excitement are all a recipe for potential hazards... The event manager who ignores advice on risk prevention is courting disaster and foreshortening his or her career in the event industry.”

Furthermore, Shone and Parry (2010: 178) add that in all events, but especially high-risk events, the need for adequate planning and sufficient staff training, especially of volunteers is absolutely vital. Together, these observations go some way to highlight the importance of understanding the range of legislation that has a direct impact on the management of events. This understanding is crucial in order to avoid claims of liability against an event organiser in the case of a tragedy or incident occurring, which as can be seen in chapter 2, section 2.2.1, is an all-too-common occurrence. Therefore, the following discussion will focus on some of the most salient factors in understanding legislation for the safe planning of events.

Regarding general operational management of events, imperative for the majority of events held in the UK is adherence to the Licensing Act (2003), which seeks to address four key licensing objectives based upon prevention of crime and disorder, public safety, the prevention of nuisance and protection of children from harm; upheld by local authorities across the UK, this is a single integrated system that covers alcohol, public entertainment, cinemas, theatres, late night refreshment houses, and night cafes as well as temporary event venues. Another important general consideration during the event design and site planning phase (sections 3.1 and 3.2 above) is knowledge and adherence to the Disability Discrimination Act (1995 and updated in 2005) and Equality Act (2010) duties that must be followed (Legislation.gov 2019). From an audience perspective related to event attendance, these act makes it unlawful for a service provider to discriminate against a disabled person in three ways. First, by refusing to provide (or deliberately not providing) any service which it provides (or is prepared to provide) to members of the public, second in the standard of the service which it provides to the disabled person, or the manner in which it provides it, and third, by the terms in which it provides a service to the disabled person. Adherence of these principles during the event design and site planning phase is imperative due to the fact that many countries have legislated equal access to events and facilities (Getz 2005) and accessibility remains one of the key legal issues that can arise in relation to planning for those with disabilities (Darcy and Harris 2003).

As Bowdin et al (2006: 339) observed, “a fundamental legal principle applied to events is that of taking all reasonable care to avoid acts or omissions that could injure employees, contractors, users, participants and visitors”. With this in mind and given the fact that it is a key element of negligence, event organisers must adhere to the Health & Safety at Work Act (1974), which requires all employers to protect their employees’ health, safety and welfare as well as that of any person not in their employment (such as an event attendee) who may be affected by their actions. Specifically, under the Health & Safety at Work Act, an employer should provide the following: a safe system of work, a safe place of work, safe equipment, plant and machinery, and safe and competent workers (because employers are also liable for the conduct of their staff and managers), whilst providing instruction, arranging the provision of relevant training and ensuring appropriate supervision is provided (Van Der Wagen 2007). This links into the CDM (2015) regulatory act placing legal duties and obligations on organisers around the use, build and safety management of temporary staging and structures.

The Health and Safety Executive (HSE) maintains a dedicated website and library of resources and guidelines specifically for running events safely (HSE 2015a). This website holds information for event organisers, site owners, contractors and workers as well as key policy guidelines around venue and site design, temporary demountable structures and crowd management including site safety at sports grounds, and frequently asked questions. Linked into this from an advisory perspective, are the available guidelines on pedestrian capacity limits and density limits provided through documents such as the Fire Safety Risk Assessment Guidelines, and the Green Guide for Sports Events in the UK. The Fire Safety Risk Assessment Guidelines for Small / Medium and Large Places of Assembly (2006) detail escape route capacities for standard width (750mm) and wider width (1050mm) doors of 80, 100 or 120 people for high, medium or low risk venues respectively, as well as establishing that wheelchair users require a door width of 900mm minimum, and whereby the number of people in attendance (capacity) must determine the number of escape routes (doors) that must be provided. Furthermore, the Fire Risk Assessment for Open Air Events and Venues (2006) identifies occupant densities and escape route times and

capacities. Occupant densities (measured in m² per person) differ depending on the activity being conducted. For example, acceptable density for standing crowds (unseated) would be 0.3 or 0.5 for a dancefloor area, yet 1.0 for a seated dining area, 2.0 for a skating / sports area, 5.0 for a gallery viewing area or 6.0 for a festival camping area. As can be seen through these figures, more space per person is required for activities that require movement, physical activity or where space is a part of the expected experience. Regarding escape route times and capacities, the advised escape route times for higher, normal and lower risk open air venues are < 5 minutes, >5 minutes<10 minutes, or <10 minutes respectively. Moreover, the rates of passage through escape routes are advised to be 73 people/meter/minute on uneven ground (with ramps, steps or in seated areas), and 109 people/meter/minute on all flat even surface areas or standing areas. Guidance is also provided for calculating the width and capacity of the escape routes required, as follows:

$$\text{Total Exit Width} = \frac{\text{No of People}}{\text{Flow Rate} \times \text{Escape Time}}$$

Similar to the above guidance, the Green Guide to Safety at Sports Grounds (DCMS 2008) provides recommended rates of passage for flow capacity; for a width of 1.2m, on a stepped surface 79 people can reasonably exit in one minute (equal to 66 spectators per meter width per minute), and 100 people on a level surface (equal to 82 spectators per meter width per minute). These figures are the same for spectator facilities too (BSI 2012).

A common thread across all HSE guidelines for the events industry is the need for a strong risk assessment that evaluates the level or severity of the risk (Shone and Parry 2010), crowd management and evacuation plans, and clear lines of contact with the emergency services. As Van Der Wagen (2007) suggested, in order to ensure staff and audience safety at events, health and safety inductions must be provided to all individuals working an event to cover the structure of command, event layout, potential event-specific risks, prohibited items and what to do with suspicious packages, evacuation procedures, potential hazards and personal risks, accidents and injuries, as well as first aid treatment and accidents and injuries involving the public. For example, guidelines on giving a firework display (HSE 2005) are available as a free-to-download book for use in event safety planning and safety briefings provided to staff working such events. The book provides detailed and up to date guidance underpinned by current legislation linked to key points such as: selecting a site, provision of site facilities, storing fireworks safely, crowd control, bonfire safety, firing the display and clearing up after the display.

Moreover in terms of support for the industry, in August 2021, to coincide with the lifting of the majority of social contact restrictions in England and the reopening of live events following the outbreak of Covid-19 globally in late 2019/early 2020, and the resulting series of lockdowns and measures imposed on the UK, the UK Government announced a support package for the events industry to support events open to the general public in covering the costs incurred due to cancellation linked to Covid restrictions (HM Treasury and DCMS 2021). The scheme, which was open to events businesses until September 2022 and enabled organisers to purchase cancellation cover from insurers for circumstances when Covid-related circumstances legally prohibited the event from taking place, has contributed to the post-covid recovery of the UK live events industry.

As has been documented previously within this chapter and in Chapter 2, section 2.2.1 around event catalysts, accidents and incidents at events do happen, some of which occur as a result of a natural disaster as was the case for the Indiana State Fair stage collapse (Tuohy & Ritchie 2012) and some which are directly attributable to audience behaviour such as the crowd crush mosh pit incidents at the Pearl Jam and Roskilde Festival (Shone and Parry 2004) or organiser error as seen as the 2010 Love Parade in Duisberg, Germany (BBC News Online 2010; Helbing and Mukerji 2012). As a result of such incidents among others, new legislation was passed by the HSE (HSE 2015b) which came into effect on 6th October 2008 in the UK in the form of the Corporate Manslaughter and the Corporate Homicide Act (2007). As a result of this Act, juries are required to consider breaches of health and safety legislation in determining liability of companies and other corporate bodies for corporate manslaughter or homicide. Moreover, juries may also consider whether a company or organisation has taken account of any appropriate health and safety guidance and the extent to which the evidence shows that there were attitudes, policies, systems or accepted practices within the organisation that were likely to have encouraged such serious management failure or have produced tolerance of it. This Act could have a devastating impact on an organisation's ability to operate and also on reputation and thus demonstrates the importance of ensuring good practice within the event industry whereby health and safety, accessibility and licensing guidelines are strongly adhered to.

3.8 Chapter summary

A review of the literature linked to design of the event setting and effective crowd management strategies has identified a further set of factors to inform the study going forwards alongside the factors of importance identified in relation to audience behaviour (Chapter 2). In addition to understanding audience behaviour, organisers must be mindful of the effects of event stimuli on behaviour; specifically balance between the physical, perceptual and social settings is needed. The literature has identified that in the design of the event environment 'blueprinting' is a crucial factor in the delivery of safe events and that design must have a focus, consider the use of space, and reflect the flow of movement. To link back to Chapter 2, event design must be informed by knowledge of crowd behaviour; for instance, to affect a cognitive response to an event space then fixtures and fittings can be used to give the audience sufficient clues. Emotional response can be affected through the use of colour, lighting or sound to create a certain feeling or mood, and behavioural responses can be affected by designing layouts that encourage lingering or speeding through specific areas, forming queues and other such intended actions. Furthermore, design of the event setting must be based on the profile of the audience anticipated to attend and the activities to be involved in the event in order to help avoid potential bottlenecks in staffing, service and physical capacity. A review of event design and event management literature into the factors that influence effectiveness of an event environment for safe and successful events found that careful organisation and arrangement of the site in relation to the activity as well as aesthetic and sensory influences were the most common factors discussed across the literature, whilst crowd density, flow, architecture, coherence, safety and timings are less frequently discussed in event design literature but are crucial factors in event safety. Given the apparent relevance of many of these aspects identified as less commonly discussed to the management of crowd behaviour, it could be argued that

there is a need for a more joined-up approach to the design of the event setting, with recognition that factors linked to crowd dynamics and audience behaviour also inform the event planning process from inception.

Following on from the design of the event setting is the need for detailed site planning which takes into account and enables the organiser to plan for (wherever possible) a range of typical hazards associated with event settings which can threaten audience safety or experience, ranging from confusing layouts, poor communication and obscured sightlines, signage and exits, through to temporary structures, expansive or multiple locations, the weather and overcrowding as well as the consumption of alcohol and / or drugs and the relationship to law enforcement among other things. Based on the ideas of a range of authors in the event management field, site planning looks at a series of key factors (legibility, capacity, queuing, traffic and crowd flow, CM and communication, special need and accessibility, and staging and structures) that underpin the site modelling and mapping that takes place to determine key pinch points around the site and at different times of the event. These plans ultimately inform the crowd management and control planning that is executed, given what is known about the site, its accessibility, the event timings and locale as well as its anticipated audience.

In terms of crowd management planning specifically, signage, communication, ushering and security, event conditions (linked to catalysts, section 2.2.1) and alcohol [and drug] issues must all be addressed in detail for the safe management of audiences to an event, on-site and as they leave. Site modelling in the form of site maps and site analysis such as RAMP (routes, areas, movement profile for events) is critical in identifying potential issues, challenges and constraints early in the safety planning process. Similarly, crowd control planning (which is a more reactive approach) must detail procedures linked to the pre-crisis, crisis and post-crisis stages associated with a variety of possible event incidents, including those that are outside of the organiser's control such as the very real threat in today's world of terror attacks. The DIM-ICE meta model according to Still (2013) enables organisers to effectively map key design, communication and management features of the event in a normal and emergency scenario across the event's ingress, circulation and egress periods to develop a complex and detail crowd management and control strategy that can be followed by the event team and key stakeholders during the event delivery phase. Other dynamic crowd management tools such as situation awareness analysis and application of the OODA loop (Brehmer 2006; O'Toole et al 2020) and Fruin's FIST model alongside Reason's Swiss Cheese Model (Alkhadin et al 2018; Fruin 1984; O'Toole et al 2020; Reason 2020) enable the organiser to monitor crowd safety as the event is being delivered during its operational phase and adapt strategies to cope with new crowd safety situations as they arise.

Finally, due to the susceptibility of risk involved in events, organisers must adhere to a broad range of legislation for the event including (but not exclusively, as each event differs in terms of its purpose and activities and thus applicable legislation) duty of care to all staff and visitors on-site, Health and Safety at Work (1974), the Equalities Act (2010) and Disability Discrimination Act (1995; 2005) and the Licensing Act (2003). Moreover, Fire Safety Risk Assessment Guidelines for Small / Medium and Large Places of Assembly as well as Open Air Venues (2006), the Green Guide for Safety (2008) and the BSI (2012) provide an event safety organiser with detailed regulatory guidelines for safe planning and operational event delivery linked to tackling density, congestion, crowd flow issues and safe evacuation. Furthermore, the Health and Safety

Executive (HSE) provides a wealth of online resources for running events in the UK safely through their dedicated website.

Pertinently, a common thread across all HSE legislation guidelines is the need for a strong risk assessment, effective site and crowd management strategies, coupled with thorough emergency and resilience plans (tackling the factors discussed throughout this chapter) as well as clear lines of contact and communication within the event team, to audiences and with the emergency services as well. As several recent high profile event disasters where liability has been attributed to the organisers have proved, such as the Duisberg Love Parade (BBC News Online 2010; Helbing and Mukerji 2012), the impact on the continuation of an event in future years and in some cases, on the continuation of the organisation itself can be devastating and insurmountable. Moreover, there are some inescapable factors that lie outside the control of the event organisers, but which can have a devastating impact on events and the industry as a whole, such as the Covid-19 pandemic in 2020 (Britain for Events 2020a; 2020b), and which will change the face of event and crowd safety policy and planning going forwards globally. Therefore, adherence to guidelines and legislation in the CM strategy development phase helps to develop good practice that could limit the liability of the organisation in the event of any safety incident that may arise.

Ultimately, this chapter has identified a set of key factors important to the development of effective CM strategies for events, all of which must be underpinned by a clear knowledge and understanding of the anticipated profile of the audience expected to be in attendance (identified in Chapter 2) as well as adherence to the guidelines and legislation of relevance to the event in question. Specifically, design of the event setting, site planning and modelling, plus effective CM pre-event planning as well as dynamic operational phase CM and CC planning, and emergency crisis and resilience planning (pre, during and post-crisis stages) must take place, in order to inform a thorough crowd management strategy for an event. The connectivity between the significant findings to emerge from Chapters 2 and 3 are considered in further depth within the conceptual framework hereafter (Chapter 4).

4. Conceptual framework

Underpinning the literature review for this thesis is the notion that understanding crowd dynamics and motivations, as well as strong design, planning and crowd management of an event site have equal parts to play in controlling or shaping audience behaviour for safe event management. As has been stated previously, there are a range of aspects that must be planned for ahead of an event and managed effectively during its delivery to enhance the visitor experience and help prevent misbehaviour or other crowd-related problems (Getz 2005: 108). According to Rutherford-Silver (2008: 248), 'crowding' is perception based whilst 'density' is a physical actuality and whilst both can 'relate to personal space preferences, which vary according to cultural, environmental and social environment factors, in addition, density can intensify the positive or negative magnitude of whatever is occurring at a given time' among a crowd or audience (increasing either pleasure or dissatisfaction).

What has become evident is that how an event site and environment is modelled and planned can thus have an impact on experience and safety (Still 2015). Similarly, understanding the profile of the intended audience can indicate likely patterns of behaviour that must be managed (Berlonghi 1995; Bladen et al 2012; Borch 2013; Brotherton and Himmetoglu 1997; Drury 2020; Lepp and Gibson 2007; Reicher et al 2004; Ryan et al 1996; Tarlow 2002; Templeton 2021). It then follows that how the crowd in attendance at an event is anticipated, managed and controlled can have a strong bearing on audience safety and experience (Abbot and Geddie 2001). With this in mind, the following chapter explores the theoretical influences of pertinence to the intended study and sets out the contextual framework for the study going forward.

4.1 Towards an adapted typology of crowd behaviour

Berlonghi (1995: 241) observed that crowds are regarded in the modern-day event setting to have multiple personalities and as such, this range of characteristics must be explored. According to Rutherford-Silvers (2008) there are five types of crowds at events (casual, cohesive, expressive, aggressive and explosive) ranging in the level of impact they can have on an event and its audience. Similarly, Canetti (1973) identified six crowd types (invisible, bating, fleeing, prohibition, reversal and feast) and used visual imagery to identify three main crowd symbols whereby he likened crowd movement to; the sea (dense and ever moving), fire (volatile with the ability to spread, destroy and behave expectedly), and the river (behavioural origins are taken more seriously than the goals). Building on this level of detail, Belonghi (1995) identified a series of eleven crowd types, again ranging in behavioural characteristics and the level of impact on an audience. The similarities and differences between these typologies are explored in Table 1 below to create a new series of grouped themes for the purpose of developing an adapted typology of crowd behaviour by risk level.

Table 1: Adapted typology of crowd behaviour

Crowd Typologies						
Berlonghi (1995)		Rutherford-Silvers (2008)		Canetti (1973)		
Crowd characteristics	Ambulatory	C,Ps	Casual	C,Ps	Invisible	C,D,P,R
	Disability/limited movement	C	Cohesive	C,E,P,T	Bating	D,P,T,V
	Cohesive/spectator	C,E,P,T	Expressive	A,E,P,T	Fleeing	Ps,R
	Expressive/revellous	C,E,T	Aggressive	D,P,N,V	Prohibition	A,N,P
	Participatory	E,P,T	Explosive	D,N,V,R,T	Reversal	A,N,P
	Aggressive/Hostile	D, N,P,V			Feast	A,E,T
	Demonstrator	C,E,N,P,T,V,	Key: Adapted Typology A = Allocentric P = Political C = Casual Ps = Psychocentric D = Deviant R = Risk to life E = Expressive T = Thrill seeker N = Non-conformist V = Violent			
	Escaping/trampling	R,Ps				
	Dense/suffocating	R				
	Rushing/looting	A,D,N, R,T				
	Violent	D,N,V,A,R,T				
(N.B. Allocentric & Psychocentric characteristics adapted from Tarlow 2002)						

What is interesting is that core themes emerge across these typologies which demonstrate a set of key behaviour profiles for audiences attending events. As can be seen in Table 1 above, ten grouped themes were identified when reviewing the characteristics linked to each category across the three typologies. These ten themes showed connections to much of the literature previously explored around classical and contemporary views of crowd behaviour as well as highlighting characteristics associated with behavioural catalysts, motivation and subculture (as discussed in sections 2.2 and 2.3).

A consistent theme thus far in relation to understanding crowd behavioural typologies has been that crowds are regarded in the modern-day event setting to have multiple personalities (Berlonghi 1995: 241), some of which contribute to positive event experiences and some, to more negative high-risk outcomes. What is evident from the literature is that crowd behaviour can be impacted by a range of internal and external, intended and unintended catalysts (Abbot and Geddie 2001; Berlonghi 1995; Drury 2020; Tarlow 2002; Templeton 2021; Zhen et al 2008), which can progress crowds from one category of behaviour to another. In some circumstances these behavioural changes can be positive, arguably adding to the event atmosphere, but it is also clear that some catalysts can provoke negative behavioural responses within a crowd.

Table 2 presents a visual representation of this discussion, cross referencing the range of crowd types that exist according to Berlonghi (1995) against a set of catalysts identified in the literature which could be argued to bear influence on the occurrence of specific crowd behaviour patterns. As can be seen in Table 2, operational circumstances, spectator and performer factors as well as the weather, natural or man-made disasters, and social factors of relevance to the specific types of crowds in attendance, can all have an impact on the audiences' behaviour exhibited and thus their safety and experience at the event (Abbot and Geddie 2001; Berlonghi 1995; Tarlow 2002; Zhen et al 2008). Whilst in some cases, these catalysts can produce positive outcomes, in many cases, these catalysts (either intended or unintended and incited by the event itself or incidents outside of the organiser's control) can have a potentially negative influence on behaviour across different crowd types thus presenting a risk to audience safety at the event.

Table 2: Crowd typologies and the impact of catalysts on audience experience

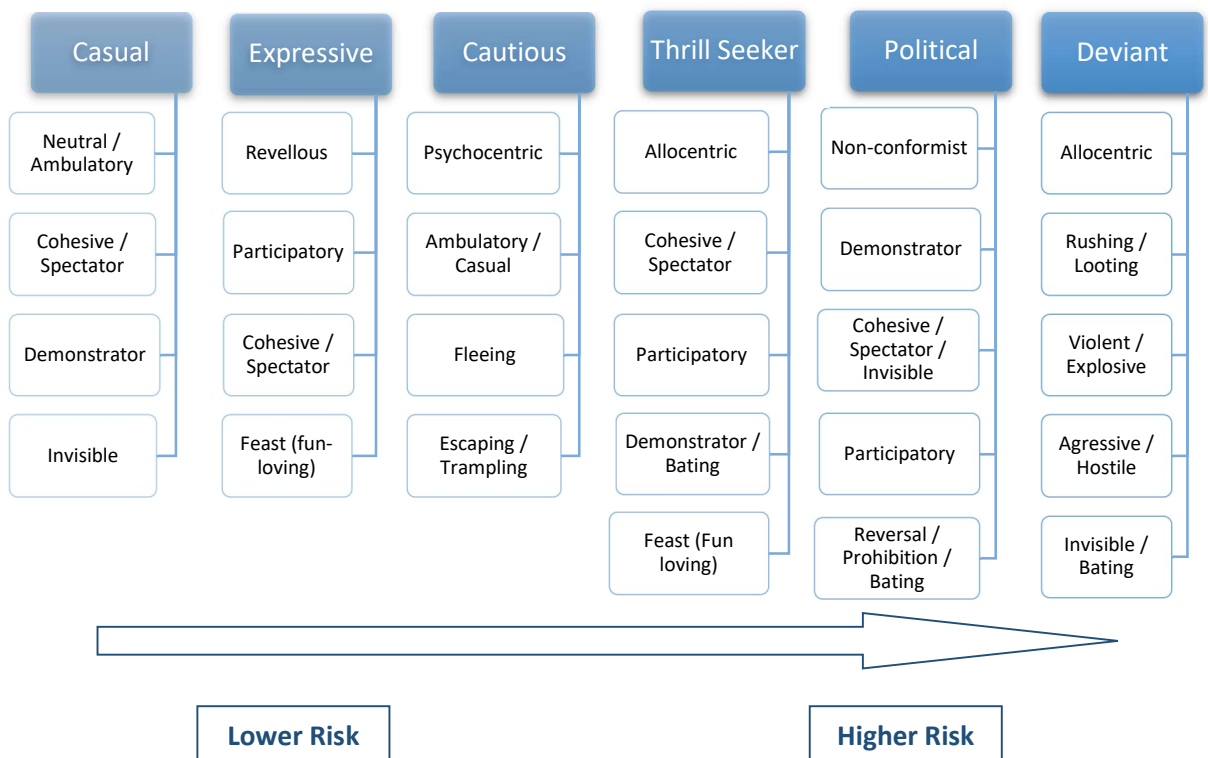
Types of Crowd (Berlonghi 1995)	Impact on Behaviour & Crowd Experience	Catalysts (Abbot & Geddie 2001; Berlonghi 1995; Tarlow 2002; Zhen, Mao & Yuan 2008)
Ambulatory Linked to ingress / egress, to and from parking areas, walking to use restroom or concession facilities	Potentially Negative	Operational circumstances: lack of parking Spectator factors: alcohol Weather factors: all can impact
Disability / Limited movement Limited or restricted in movement – issues with walking, sight, hearing, speech can require extra planning in comparison to other crowd members	Potentially Negative	Event activities: special effects (smoke, lasers, fireworks), music, loud noises, video replays Weather, natural and man-made disasters
Cohesive / spectator Watching event activities or scene of an accident. Interested / engrossed in watching something that is happening	Positive or Negative	Operational circumstances: cancellation/no-shows Performers actions: all Spectator factors: alcohol, cheering Natural / man-made disasters
Expressive / revellous crowd Involved in an emotional release – cheering, movement in unison, dancing, chanting, celebrating, singing	Positive	Event activities: music / effects Performer’s actions: all Spectator factors: cheering, alcohol, crowd activities Social factors: nationalism, rivalries
Participatory Involved in the actual activities of an event – professional performers or athletes, marathon runners, audience members invited onto stage	Positive or Negative	Performers actions: stage invitations Spectator factors: cheering, alcohol, waves, etc Security or police factors: use of excessive or unreasonable force Weather, Natural and Man-Made Disasters
Aggressive / hostile Verbally aggressive towards staff on site. Can become threateningly rowdy and very open to lawlessness – links to deindividuation	Negative	Operational circumstances: no-shows, cancellations, sold out event Performer’s actions: all can impact Spectator factors: alcohol, rushing, waiting, throwing objects Security or police factors: all Social factors: racial tension, team rivalries, gangs
Demonstrator Organised / led to engage in actions such as picketing, marching, chanting, demonstrating for a cause	Potentially Negative	Spectator factors: throwing objects Security of police factors: all Social factors: all Man-made disasters: structural failures
Escaping / trampling Escaping from danger (actual or perceived threat). Organised evacuation procedure, or panicked mob pushing / shoving without order	Negative	Performer’s actions: dare devil or macho challenges Spectator factors: alcohol, throwing objects Social factors: tension, gangs, riots Weather, natural, man-made disasters
Dense / suffocating Individual physical movement rapidly becoming impossible due to crowd density. People either swept along, fall on top of each other or trampled	Negative	Operational circumstances: sold out Spectator factors: rushing (e.g. for seating at an event) Weather, natural, man-made disasters (cause spectator rushing)
Rushing / looting Principle purpose to obtain, acquire or steal something. Rushing to get preferred seats, autographs, or to riot and steal property	Potentially negative	Operational circumstances: sold out full to capacity event Performer’s actions: stage invites Spectator factors: rushing for seats Social factors: gang activities, riots
Violent Attacking, terrorising, rioting with complete disregard for laws and rights of others in the crowd or at location	Negative	Spectator factors: alcohol Security or police factors: all Social factors: tensions, rivalries, gangs, rioting Man-Made disasters: all

To refer back to the ten themes identified in Table 1, these themes were then considered against what is known of event catalysts and the impacts they can have on a crowd and collapsed and refined further to generate the adapted typology of crowd characteristics presented in Figure 1

below. The significance of this adapted typology is the recognition and adaptation of existing theory across disciplines in order to fully understand the unique character profiles of common crowd types and their level of risk to the safety of an event. It is crucial to understand the range of specific crowd characteristics that event managers may encounter, how they are interlinked and the level of risk to safety they represent in order to understand the most effective way to plan crowd management for different types of audience.

The adapted typology in Figure 1 below presents six core crowd types, identifiable by a range of specific characteristics. These core crowd types are as follows: Casual, Expressive, Cautious Thrill Seeker, Political, and Deviant. It should be noted that some common characteristics straddle different themes. However, the combinations that fall into each of the core themes help to demonstrate the behaviour profiles linked to each and their subsequent level of risk in terms of threat to safety and in some cases, even life.

Figure 1: Adapted typology of crowd behaviour



The adapted typology presented within Figure 1 has been informed by a broad range of literature spanning the crowd behaviour, crowd catalyst and visitor motivation bodies of knowledge discussed previously within Chapter 2. The typology suggests there are four crowd types (casual, expressive, thrill seeker and political) that have the potential to create positive event experiences and the casual and expressive types in particular can represent a lower level of risk related to threat to audience safety. What is known, however, is that specific catalyst incidents (either internal or external to the event organiser’s control and intended or unintended) can generate feelings or provoke actions among an audience which can introduce new patterns of behaviour that could arguably be considered more detrimental to audience safety. The cautious, thrill seeking, political and deviant crowd types identified within this adapted typology all illustrate the types of behaviour associated with, and expected within, the

mid to high-risk types of crowds. It could be argued that these four crowd types are likely to be prevalent among events that attract audiences with demographic and motivational characteristics consistent with those identifiable traits linked to these categories. However as previously asserted, catalysts (such as those outside of the organiser's control, for example, the threat of a terror attack) may also shift the behaviour of a previously low-risk crowd type into exhibiting traits more consistent with one of these mid to high-risk categories.

To conclude, whilst it has been established that crowds contain multiple personalities, the typologies and catalysts discussed are not only based on behaviour resulting from event-specific situations and scenarios but are also impacted by the intrinsic behavioural patterns unique to the individual and borne out of a range of personal factors such as demographics, motivation, subculture, and perceived norms. The challenge that exists for event managers relates to the way in which crowd profile information is utilised to inform crowd management strategies.

4.2 Social Identity Theory, subculture and actual vs perceived density

Another key component of the audience profile discussion centres upon the understanding the social and psychological influences on crowds. The concept of 'Social Identity Theory' and collective behaviour is a much-debated modern view on how crowds react (Drury 2020; Reicher et al 2004; Stott and Reicher 1998; Templeton et al 2018). It is less about conforming to general norms and instead, related to gaining a social identity by conforming to situation-specific norms (e.g., support of a specific team, demonstrating for a cause, joining with other fans at conventions and other events). According to Postmes and Spears (1998), Social Identity Theory provides a counter argument to the more outdated, classical concept of Deindividuation (Borch 2006; Le Bon 2003) whereby the latter states that as the crowd grows in mass, people lose the ability to think as individuals and begin to act as one. Conversely, Social Identity Theory suggests that individuals in a crowd still know right from wrong, yet sometimes choose to become involved in atypical behaviour due to the cover of anonymity in collective behaviour and being able to 'get lost in the crowd'. Moreover, in his work around group pressures and conformity, Asch (1956) found that whether or not individuals remained independent in their perceptions or yielded to the majority view (or behaviour pattern) was likely based on three key factors: situational uncertainty, majority conformity and shared identity. In reviewing the Asch experiment, McLeod (2008) further simplified these factors to be twofold; either because the individual wants to fit in with the group (normative influence) or because they believe the group to be better informed (informational influence).

Closely connected to the debate around Social Identity Theory is the concept that events are closely linked to the celebration of subculture. By definition, subculture represents common goals, unity of purpose and intention (Green & Chalip 1998) and is primarily linked to the socialisation-based group of motivations discussed in Chapter 2, section 2.3. Connected to subculture is the notion of the fan, which Henderson (n.d) posits to encapsulate '*behaviour that reflects the satisfaction of different needs ranging from the nostalgic elements conjured up by the word memorabilia to the pure obsession of the completist.*'

As discussed in Chapter 2, Henderson (n.d.) defines the fan's situational framework as being three-fold; memorabilia-based, event-based and personal meetings-based, each with the potential to attract fan behaviour of varying levels of extremity. Building on this, Brotherton and Himmetoglu (1997) developed a sliding scale typology of the fan at events ranging from the dabbler and enthusiast, through to the expert and fanatic. Moreover, Bladen et al (2012; 2018) classified sports fans according to their level of involvement on a four-point sliding scale ranging from new fan, up to devoted. More specifically, Farrag and Althawadi (2022) developed a spectator typology of tennis fans, categorising them as pragmatists, Diehard fans, Entertainers, and Socializers. This range of fan typologies linked to events helps to demonstrate the way in which, subculture and fandom can influence a visitor's behaviour at events. With this in mind, an adapted typology of fans at events is presented below, in Figure 2.

Figure 2: Typology of fans at events



(Adapted from Bladen et al 2012; Brotherton and Himmetoglu 1997; Farrag and Althawadi 2022; Henderson n.d)

Figure 2 illustrates that event fans can arguably fall into three distinct categories of varying levels of commitment, and potentially posing unique risks to audience safety that could arguably be said to increase with their level of commitment or devotion. In addition to the varying levels of extremity exhibited in fan behaviour, it is commonly regarded that specific subcultures bring with them their own unique identities and behavioural traits too. For instance, the hip-hop subgroup are the only subculture perceived to carry the risk of violence at music events according to European managers and the rock and heavy metal subculture are perceived to be most like to engage in moshing and missile throwing behaviour (Kemp et al 2007). Moreover, it has been widely regarded that hedonistic-styled destinations and events tend to attract the youth market (Clarke 1992) and the youth subculture has been widely regarded in the literature to generally be likely to engage in excessive drinking and to be attracted to alcohol-fuelled events (Fuller et al 2018) as well as being inclined towards 'moral and criminal deviance' (Kelly 1993; Menaker & Chaney 2014; Seekings 1998; Verkooijen et al 2007). Often, events of this party atmosphere nature are considered a catalyst for negative behaviour (Brunt and Brophy 2004;

Tarlow 2002). Prideaux (1996) and Lepp and Gibson (2008) suggested that the way in which a destination [or event] is marketed and developed plays an important part in influencing the behaviour of visitors and, sometimes, can serve to increase levels of sensation seeking or deviant behaviour. Moreover, event organisers must take the time to explore and understand these subcultural behaviour patterns as a prevalence of attendees who fell into either the 'Enthusiast' or 'Devoted Fanatic' profiles could arguably have the potential to collectively exhibit the negative characteristics linked with more medium to high-risk types of crowds at events as identified previously in Figure 1, section 4.1. Crucially, it is these audience types that can become difficult to manage and present a threat to audience safety.

In addition to the social and subcultural influences on behaviour, the contemporary view of crowd dynamics would also arguably suggest that physical proximity to others in the audience can alter collective behaviour (Canetti 1973). There are distinct differences between the terms 'crowding' and 'density' at events. According to Rutherford-Silver (2008: 248), 'crowding' is perception based whilst 'density' is a physical actuality and whilst both can 'relate to personal space preferences which vary according to cultural, environmental and social environment factors, in addition, density can intensify the positive or negative magnitude of whatever is occurring (increasing either pleasure or dissatisfaction)'. The literature suggests that audiences often perceive crowding as a positive experience if it is found to enhance the atmosphere (Eroglu and Harrel 1986; Mowen et al 2003; Templeton 2021) and if the audience shares a like-minded identity, looking for the same experience (Templeton 2021; Wickham and Kerstetter 2001). Moreover, Eroglu et al (2005) note the concept of adaptation in relation to spatial crowding, whereby the individual no longer pays attention to the surrounding crowd in a negative manner because it becomes so familiar due to extended exposure to it; this adaptation concept which contributes to the concept of positive crowding, links to Canetti's (1973) theory of crowds acting in a rational manner.

Sometimes an audience may perceive crowding to be negative simply due to the physical density of large volumes of individuals in confined spaces (Eroglu et al 2005), and at other times it is due to specific incidences and event catalysts that interfere with an individual's own goals or norms (Tarrant et al 1997) such as queuing, long waits and cramped spaces with limited audience mobility (Berlonghi 1995) that can have a detrimental impact on crowd behaviour in restricted situations. This is even more pertinent given the current Covid-19 pandemic and its likely influence on perceived safety related to returning to mass gatherings and live events in crowded spaces. What is more, Social Identity Theory (Reicher et al 2004; Stott and Reicher 1998) and collective behaviour can impact on perceptions of both positive and negative crowding as those with similar situational norms feel a bond and are thus likely to be more tolerant of a crowded situation, perceiving it to be lower risk to their personal safety (Alnabulsi and Drury 2014; Drury 2020). Conversely, it is possible that individual groups in crowds construct their own social identities and thus hold negative perceptions regarding 'other' groups; this type of territorial behaviour translates in particular to sporting events, when fans who share a common love for a sport but support opposing teams come together, often with negative behavioural consequences (Bladen et al 2012; Hoggett & Stott 2010; Stott et al 2008).

In terms of events, the contemporary view of crowd dynamics could arguably suggest that physical proximity to others in the audience can alter behaviour. Moreover, it could be argued that connections exist between conforming to collective crowd behaviours and the impact of the event environment stimulus and external catalysts on audiences. Linked to this, the desire

to belong to a group and motivations of opposition in engaging in group behaviour tie in closely to the concepts of deindividuation but also collective behaviour and Social Identity Theory (Berlonghi 1995; Borch 2006; Drury 2020; Templeton 2021) as well as intrinsic sub cultural motivations. Pertinently, much of the modern theory around crowds points towards explaining potential indicators for situations in crowds where atypical, potentially harmful or deviant behaviour occurs, but this could be elaborated upon further. The adapted typology of fan behaviour presented above holds strong connections with the concept of subcultural association and together with the more general crowd behaviour and catalyst typologies explored in 4.2, serves to demonstrate the critical importance of audience profiling to the development of effective crowd management strategies for events.

Considering the nature of events and their purpose to deliver positive experiences for their audiences (Bladen et al 2018), it follows that understanding crowds would enable them to be better managed, thus limiting the occurrence of harmful behaviour (intended or unintended, and physical, or to the audiences' positive experience), which is crucial to an event's success.

4.3 The influence of perceived fear and risk on audience behaviour and safety

Whilst perceptions of risk to safety can indeed be moderated by strength of crowd identity as addressed in Chapter 2, nevertheless perceived fear of threats to safety among an event audience can have a truly detrimental effect on crowd behaviour and the success of the event. It should be noted here that organiser-specific and external event catalysts have previously been addressed and thus this section will focus on the perceived threat to safety from other attendees specifically. In summary, Figure 3 below demonstrates the influencing factors in perceived fear and event attendance.

Figure 3: Influencing factors on perceived fear and event attendance



(Adapted from: Abbot and Geddie 2001; Cohen 2002; Dean 2004; Ferreira and Harmse 2012; Inns 2004; Jeon et al 2023)

As discussed in Figure 3, in addition to personal experience and word of mouth, the media has the potential to influence fear of crime and risk perception (Jeon et al 2023) and it can be an extremely damaging factor for the events industry as it lowers attendance, causing financial issues and reputational damage (Jewkes 2010). For example, the South Africa World Cup in 2010 saw large financial investment with expectations of return on investment, yet less than half the

expected visitor numbers attended and the event only just broke even due to the country's poor image and potential visitors high perceived fear of crime (Ferreira and Harmse 2012; Plessisa and Maenig 2011); whilst broadcasts by organisers were designed to show the destination and event in a positive light and promote the destination to future customers (Cianfrone and Zhang 2006), the media also reported on bad news stories throughout about opportunistic and organised crime and it is these stories that shaped the perceptions of South Africa as a high risk destination, and the SA World Cup as a perceived risk to personal safety. Whilst there is arguably no way to avoid the negative press, it is believed by Roche (2006) that the broadcast of positive messages that highlight key performances as well as interviews from spectators on their experiences, promotes the positive event aspects, encouraging repeat attendance and new visitors in the future.

Media coverage, destination profile and awareness of crime and terrorism have also been found to influence the tourist decision making process. Quite often, certain destinations are avoided by visitors due to perception of their high risk either due to previous attacks such as the Boston Marathon (BBC 2012) or political instability in destinations such as the Middle East (Altheide 2006) and the influence on the decision to attend is personality dependant most likely to affect the more psychocentric event visitor (Tarlow 2002). This perspective was researched by Sonmez and Graeffe (1998: 124) who theorised via an adapted model of the international tourism decision-making process that a number of variables were considered to influence perceptions of terror risk and political instability of a destination and its impact on the individual's decision-making process. First, external factors such as media coverage of incidents and government travel advice were influential to the information gathering stage of the decision process. Second, internal factors such as the individual's personality type and attitude to risk were considered to impact on the nature of the travel decision made as a result. Third, demographics such as income, age, gender, education and having children in the household were also found to be internal influencing factors on travel decisions made. With this in mind, 'safe' destination choices demonstrate risk averse behaviours, whilst 'risky' destination choices exhibit risk-seeking behaviours, linking the outcomes to the sensation-seeking and allocentric/psychocentric personality type visit motivation concepts (Eachus 2004; Hoyle et al 2002; Plog 1991) discussed previously in 2.3.1.

4.4. Ensuring event design for safety

Taking into consideration the importance of the event environment to audience experience, many authors (Berridge 2007; Bladen et al 2012; Hoffman et al 2009; Pine and Gilmore 1999; Rutherford-Silvers 2008; Sonder 2004) have discussed the need to design an event for positive experiences, recognising the need to plan the event space with aesthetics, sensory influences and organisation / arrangement of the site in mind. Based on a review of the common aspects linked to the design of the event setting specifically as discussed in existing literature, Table 3 illustrates the suggested influences on perception and effectiveness of an event environment. It should be noted that this list is not intended to be exhaustive, but rather an indication of common features for illustrative purposes.

Table 3: Factors influencing perception and effectiveness of an event environment

Influencing Factors	Authors Reviewed							Count
	Berridge (2007)	Bladen et al (2012)	Hoffman et al (2009)	Pine & Gilmore (1999; 2011)	Rutherford-Silvers (2008)	Still (2013; 2022)	Sonder (2004)	
Activity	✓	✓	✓		✓	✓	✓	6
Aesthetics	✓	✓	✓	✓	✓		✓	6
Architecture		✓	✓		✓			3
Arrangement	✓	✓	✓		✓	✓	✓	6
Cleanliness				✓	✓		✓	3
Coherence		✓	✓	✓	✓	✓		5
Complexity	✓				✓			2
Crowd Density	✓	✓	✓		✓	✓		5
Familiarity	✓		✓	✓	✓			4
Flow	✓	✓	✓		✓	✓		5
Legibility	✓		✓	✓	✓	✓		5
Lighting	✓		✓	✓	✓		✓	5
Noise	✓		✓	✓	✓		✓	5
Novelty	✓			✓	✓			3
Organisation	✓	✓	✓		✓	✓	✓	6
Personal space	✓		✓	✓	✓	✓		5
Safety		✓			✓	✓	✓	4
Temperature			✓		✓	✓		3
Timings		✓			✓	✓	✓	4
Utility			✓		✓		✓	3

(Adapted from: Berridge 2007; Bladen et al 2012; Hoffman et al 2009; Pine & Gilmore 1999; Rutherford-Silvers 2008; Sonder 2004; Still 2013; 2022)

Whilst Table 3 shows that the careful design of the event space is cited as imperative for successful events and positive audience experiences through the presence of a range of planning factors, the literature reviewed concurred most frequently on those influences linked primarily to careful organisation and arrangement of the site layout in relation to the activity, as well as the aesthetics and sensory influences, and the familiarity, legibility and personal space afforded. It also more specifically illustrates that influences such as crowd density, flow, architecture, cleanliness, coherence, safety and timings (among others) have tended to be less frequently discussed within the event experience design literature. It should be noted that it was unclear at the time of writing the extent to which the impact of the COVID-19 pandemic would influence the field of event design theory, planning and practice and, more importantly, audience perception, going forwards. Nonetheless, as identified in the significant findings from Chapter 2, a more joined-up approach to the design of the event setting is arguably needed, with recognition that crowd dynamics and audience behaviour also inform the event experience and thus should be considered in the planning process from event inception.

To refer back to the design of the event environment, Rutherford-Silvers (2008:246) identified a range of typical hazards associated with event settings which can threaten audience safety or experience. These hazards linked to overcrowding, temporary structures, equipment faults

(defective or improper installation, restricted/unsafe décor materials), obstructions (signage, exits, sightlines and visibility), venue and location (inadequate lighting, water elements, confusing layouts, expansive/multiple locations and outdoor/remote locations) are equally important to effective event planning for safety, success, and ultimate reputation of the event and its organisers.

4.5 Approaches for effective crowd management and control

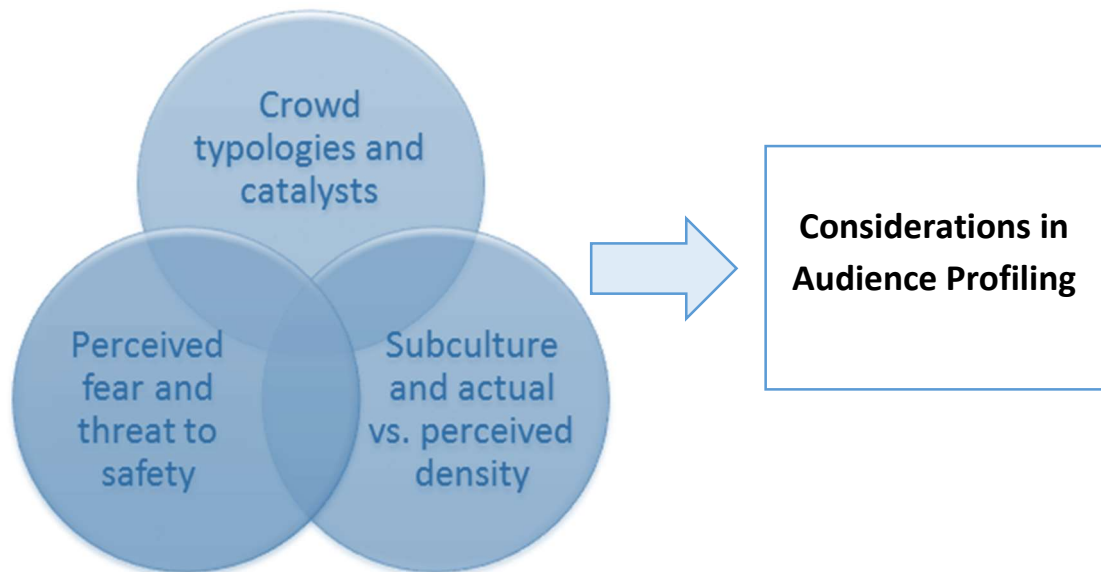
Ultimately, the review of event and crowd management literature suggests that a set of key factors emerge as important to the event planning process for the development of effective crowd management strategies for events. The three key elements relevant and to be included within a comprehensive crowd management strategy have been identified as analysis of the event environment, detailed site planning and clear crowd management and control planning for both normal and emergency scenarios (Abbot and Geddie 2001; Getz 2005; Rutherford-Silvers 2008; Still 2013, 2022). Furthermore, it has been suggested that these elements of the planning process must be underpinned by a clear knowledge and understanding of the anticipated profile of the audience expected to be in attendance well as adherence to the guidelines and legislation of relevance to the event in question. Specifically, design of the event setting, site planning and modelling, plus crowd management planning in relation to signage and communication, ushering and security, event conditions and alcohol consumption (and other substances) is important to consider; so too is crowd control planning in events of normal and emergency scenarios (to include the real threat of terrorist attacks) for event ingress, circulation and egress as well as pre, during and post-crisis stages and dynamic on-site crowd management analysis during the event to pick up on developing issues. Each of these activities is arguably pertinent to inform a thorough event crowd management strategy.

4.6 An emerging conceptual framework

Throughout the chapters in this review, the nuances between the interlinking concepts of crowd dynamics, site design and planning, crowd management and crowd control have been discussed in detail. The development of a theoretical framework represents beliefs on how certain phenomena (or variables and concepts) are related to each other (a model) and an explanation of why it is believed that these variables are associated with each other (Sekeran and Bougie 2009: 69) and, as such, Figures 4 and 5 summarise the proposed relationship between the concepts highlighted to be of importance for the purpose of this study. First of all, it is important to synthesise the considerations in audience profiling, which has been widely regarded within the literature as a necessary event planning tool for successful crowd management strategies (Still 2013, 2022; Still et al 2020). Therefore, Figure 4 identifies the relationship between the factors involved in audience profiling for events. As can be seen below, behavioural typologies are crucial to the understanding of how crowds react at events as well as the subcultural associations and perceived fear of threat to safety that will likely differ between individuals among an audience but impact on the way a crowd will collectively react to certain conditions

and catalysts at events. Several adapted typologies have emerged from the literature as discussed previously within this chapter to more closely refine likely audience behaviour at events in the context of demographics, motivation, fan behaviour and overall risk of threat to safety. Moreover, the factors that influence perceived fear at events of threat to safety and positive crowding versus over-crowding have also been established, to include aspects such as previous experience, word of mouth, media portrayal and destination profile as well as subcultural associations, collective group norms and preferences. It is proposed that these typologies and influencing factors could act as a series of indicators to be addressed in order for an audience profiling exercise linked to a specific event to be effective.

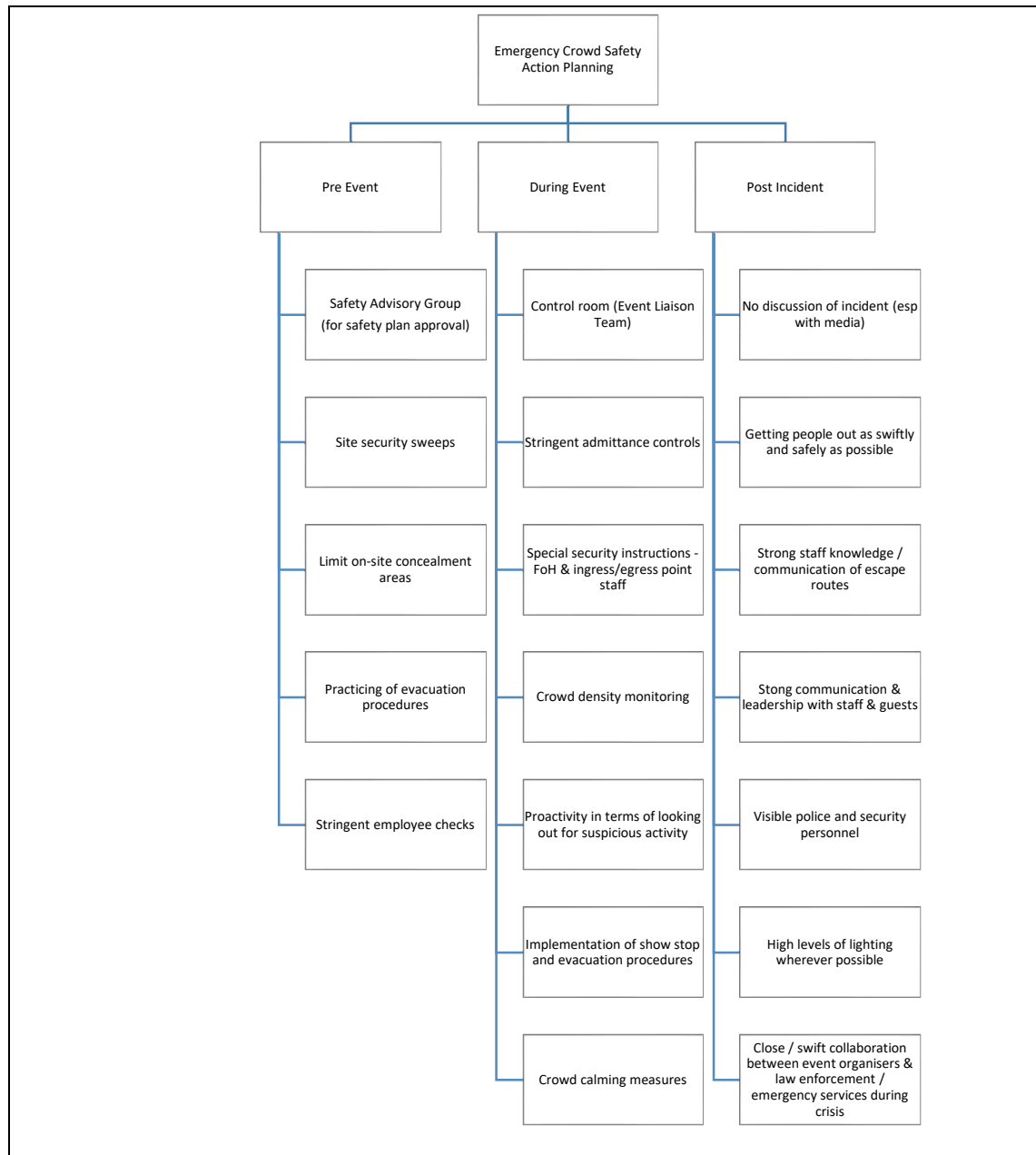
Figure 4: The key considerations in audience profiling for events



What has become clear from the literature is that crowd behaviour is a complex phenomenon that impacts on the success or failure of an event and is therefore crucial to the event planning process. Crowds at different event types will vary greatly and thus, it is likely that their behaviours will too (Abbott and Geddie 2001); equally, crowd behaviour in different areas of an event is likely to possess its own characteristics and influences (Fruin 1984; 1993). Building on this argument, Tarlow (2002) argued that different event types see a range of crowd incidents with a set of unique contributing factors inherent to the crowd present and the nature of the event activities taking place. When considering techniques for effective management, Borch (2013: 15) states that whilst the traditional physical presence of security and law enforcement can evoke anger and negative behaviour among an audience, equally the more modern and ‘rational’ approaches to crowd management (linked to positive communication and understanding of spatial density), as discussed within the literature by authors such as Filingeri et al (2018), Fuller et al (2018), Gorringer et al (2012) and Stott and Radburn (2020), do not adequately address the impact of internal crowd dynamics and external catalysts on emotional arousal and that ‘this ignorance may produce an important blindness in strategies for the proper management of crowds’. Dynamic operational phase crowd monitoring was found to be crucial to event safety planning, alongside strong site planning and crowd modelling, embedded within an event’s CM and CC strategy (Brehmer 2005, 2006; Endsley 1995; Getz 2005; Martella et al 2017; O’Toole et al 2020; Rutherford Silvers 2008; Still 2022). Moreover, Abbott and Geddie (2001: 262) stated that event organisers must consider the conditions of the event being hosted so as to predict crowd behaviour and implement appropriate security measures. Building on this

and given the prevalence of recent incidents such as the Manchester Arena bombing (Kerslake et al 2019) and the 2015 Paris attacks (Peters 2015), it is important to consider the impact of terror attacks and other emergency crises and disasters on likely audience behaviour and crowd safety planning. Figure 5 explores factors linked to crowd safety planning for emergency scenarios, pre-event, during event and post incident; these factors should be instrumental in the development of an event’s emergency plan.

Figure 5: Key factors linked to emergency safety planning for event crises and disasters



(Brehmer 2005, 2006; FEMA 2001 in Rutherford-Silvers 2008:134; Kemp et al 2007; Makarenko 2004; Martella et al 2017; O’Toole 2020; Pielichaty et al 2017; Still 2013; Tarlow 2002)

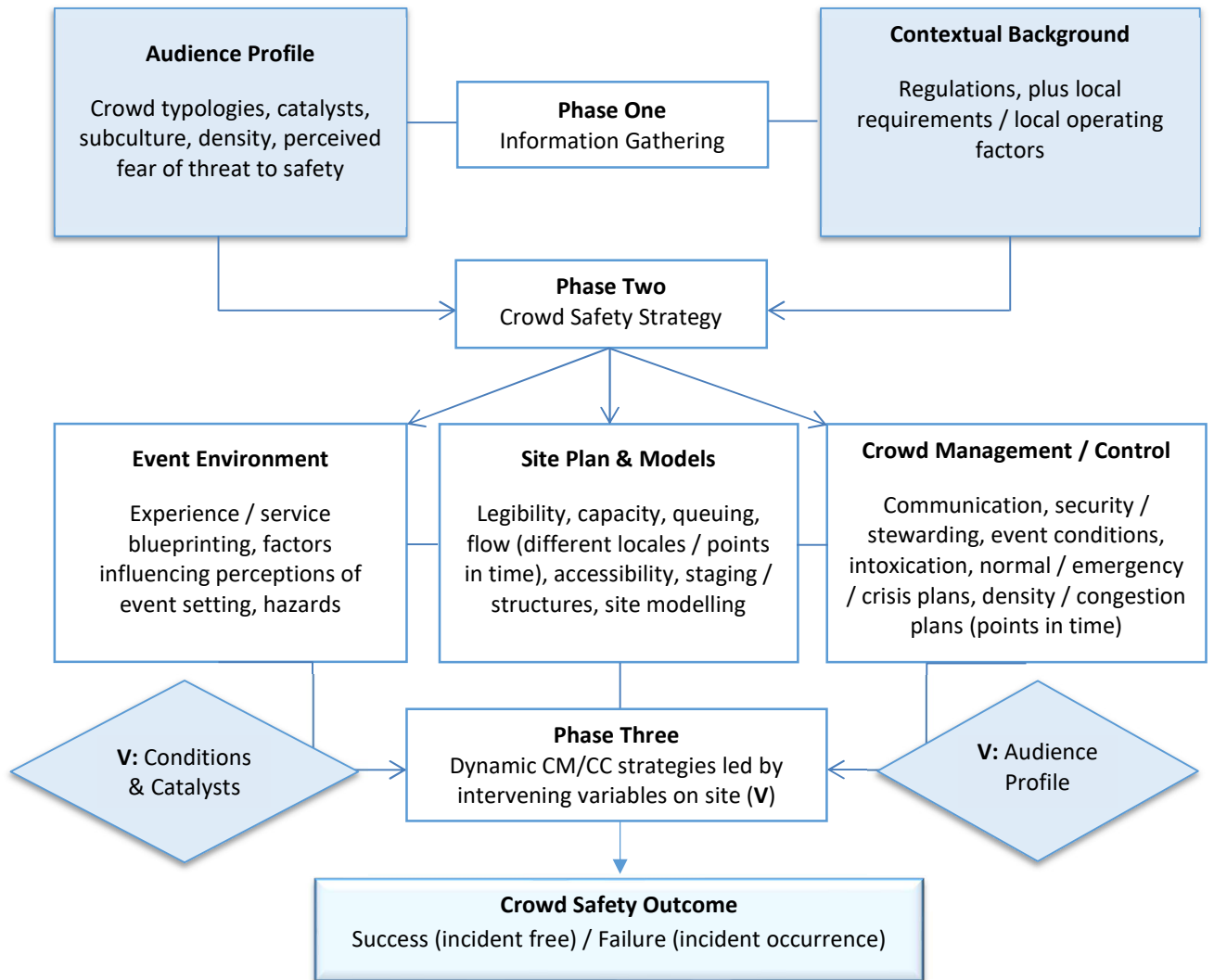
4.7 Chapter summary and conceptual framework

Finally, following a detailed review of the literature presented and discussed in Chapters 2, 3 and previously within Chapter 4, a conceptual framework is presented which is informed by and adapted from the existing literature pertinent to the topics of audience behaviour and dynamic crowd management strategies. Figure 6 therefore outlines the conceptual framework that will underpin the research activities for this thesis.

In summary, the conceptual framework (Figure 6) proposes that crowd management strategies should follow a three-tier developmental approach, whereby the *audience profile* and *contextual background* unique to an event (considering legislation and guidance regulations, plus local requirements and operating factors) are considered first during an initial information-gathering phase. The knowledge and insights obtained from this phase one activity then inform a second, detailed phase of site and crowd management safety planning which sees activities linked to *event environment, site and crowd management and control planning* conducted to provide a detailed structure for event set up and delivery. These phase two planning activities (informed by the phase one information gathering activities) form the event's *crowd management strategy*. This crowd management strategy then guides the safe set up and operational delivery of the event (Phase Three). During the operational phase of the event, a number of intervening variables have the potential to influence event safety and delivery. Specifically, these variables commonly discussed within the literature are summarised and grouped as the '*event conditions and catalysts*', and the '*audience / attendee profile*'. The impact of these intervening variables on event delivery influences the dynamic crowd management strategies employed during the event.

As the review of existing literature has indicated, the occurrence of a crowd incident at events and the ultimate *success or failure of the event's safety outcomes* are often influenced by the quality, thoroughness and appropriateness of its safety planning in relation to either one, or all of, the three distinct crowd management strategic planning phases identified. It may therefore be argued that by researching examples of crowd management failures and successes at events, as well as the audience perspective in relation to crowd safety management, a picture of common fail points and success factors, risk levels and audience profiles could emerge that would contribute to the existing knowledge in the field of managing crowds for safe and positive event experiences.

Figure 6: An emerging conceptual framework for effective crowd management strategies



5. Study aims and objectives

This study has been informed by the findings presented in the literature review and conceptual framework, and ultimately addresses the dynamics of crowds and audience behaviour alongside its influencing factors in order to find ways to manage crowds effectively for events. With this in mind, the intended aims are three-fold:

A1: To investigate crowd culture and behaviour at events to analyse the potential for behavioural and attitudinal differences that exist among event audiences.

A2: To undertake a detailed analysis of crowd safety incidents at events and the efficacy of crowd management strategies employed in relation to different event scales and types, to better inform planning for effective crowd management strategies and creation of safe audience experiences.

A3: To develop a matrix of crowd dynamics and safety management strategies by event and profile type to validate a contribution to the event management theory.

Furthermore, the objectives will explore the following key aspects:

O1: To create a database of historical crowd incidents at events to document their defining characteristics and outcomes for further analysis.

O2: To analyse audience behaviour at events and the influencing factors involved.

O3: To identify the audience perspective in relation to crowd management, control, and safety at events.

O4: To determine common triggers and catalysts for crowd safety incidents at events and explore patterns in occurrence.

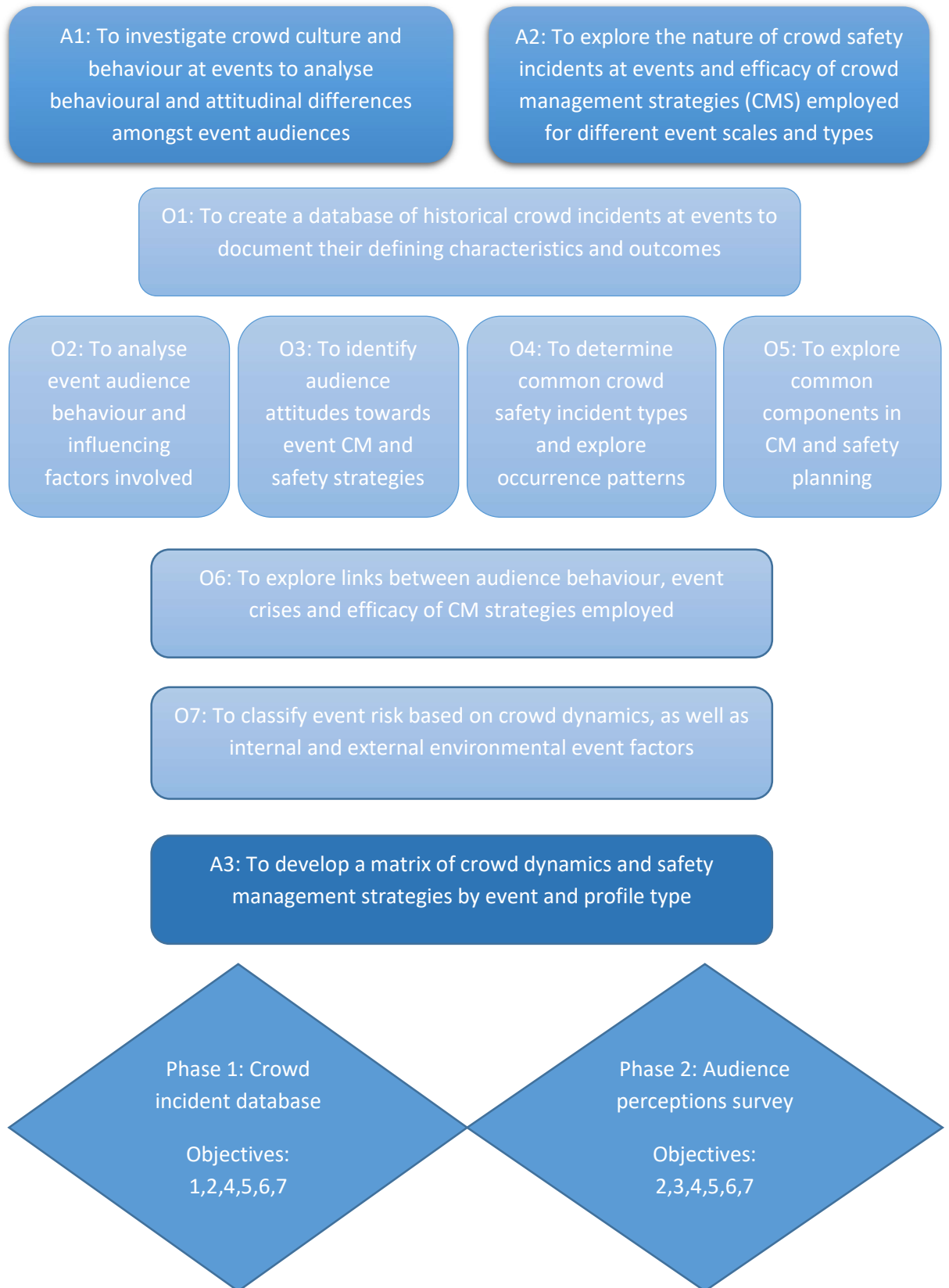
O5: To identify and explore the key common components in crowd management and event safety planning across a range of events

O6: To explore the links between audience behaviour, event crises and disasters and efficacy of crowd management strategies employed

O7: To classify event risk based on crowd dynamics as well as internal (event-specific) and external environmental event factors

The information contained within the literature review chapters combine to satisfy the study aims and objectives (Figure 7) in terms of existing literature on the topic, and subsequently contributed to the conceptual framework that underpins the thesis and its methodological approach, as discussed in Figure 6 and Chapter 6 respectively.

Figure 7: Aims, objectives and research method map



6. Methodology

A major influence on the research design is said to be the topic being studied (Maylor and Blackmon 2005: 137). To fulfil the aims and objectives as set out in Chapter 5, page 72, this chapter outlines the approach adopted for the research study undertaken. First, the rationale for the philosophical approach adopted will be discussed followed by a detailed account of the research design, data collection and analysis process. To satisfy the research aims in a balanced manner, it was deemed to be important to explore the phenomenon via the adoption of a mixed methods sequential research design approach. It has been observed that there is a dominance of mixed methods case study research in the business and management field, whereby it is common for several methods to be used within the same research study (Bryman and Bell 2015), and thus it is the intention of this chapter to outline and discuss the mixed method research approach taken in order to satisfy the objectives for this thesis.

Utilising more than one method of data collection to test the same research question is known as triangulation, and researchers often find it advantageous to triangulate methods wherever possible (Frankfort-Nachmias and Nachmias 1996) as it allows them to be more confident about their results (Oppermann 2000:145). One of the main benefits of triangulation according to Bottorff (1997) is that the findings related to each different method are used to complement one another to enhance theoretical or substantive completeness and Neuman (2011:164) adds that looking at something from multiple points of view improves accuracy. In support of this, it is argued that triangulation helps to reduce the study bias that is commonly associated with studies that use just one method (Oppermann 2000). Soft data such as words, sentences, photos and symbols dictate qualitative research strategies and data collection techniques that seek to produce a wealth of rich data to address the meaning behind the phenomenon being observed, whilst quantitative studies seek to collect hard data in the form of numbers in order to measure a phenomenon (Neuman 2011). In this study, a mixed methodology that utilises both quantitative and qualitative data has been adopted.

Phase 1 of the research process involved the compilation of a global crowd safety incident database spanning from the late 60s, to present day. Theoretical sampling was used to collect relevant resources available in the public domain via a keyword search using the Google Chrome search engine, to develop an extensive secondary data archive of global crowd safety incidents. A database of information linked to 65 separate historical crowd incidents at events (regional, national and international incidents) was collected, containing 173 individual sources drawing on media articles, images, video clips, eyewitness reports, safety reviews and inquiries. This phase of data collection was conducted first, drawing on the key emerging information from the conceptual framework to help inform the keyword search and analysed in an inductive and predominantly qualitative manner (Brotherton 2008) to enable the key research themes to emerge from the data itself. Moreover, the thesis aimed to generate new theory from the emerging findings, which again links to the concept of inductive reasoning.

Following this, Phase 2 of the research process entailed revisiting the literature and using phase 1 findings to inform the development and conduct of a quantitative questionnaire survey with event attendees to obtain the audience perspective in relation to crowd safety at events in the UK. This research activity was informed by the conceptual framework and also the emerging themes from the historical content analysis of the crowd incident database (Phase 1), making this part of the research process deductive (Botterill and Platenkamp 2012; Brotherton 2008; McQueen and Knussen 2002; Neuman 2011). Details of the questionnaire design and pilot study are discussed in the chapter hereafter and the most appropriate distribution technique of online completion was identified. Statistical analysis in the form of bivariate chi square testing was conducted to analyse the

questionnaire responses, as it was recognised that it would be most appropriate in helping to profile behaviour and effective management strategies (to satisfy the research aims). While Chi-square testing requires a large sample size and does not indicate the strength of an association, according to McHugh (2013) it is robust with respect to the distribution of the data, has an advantage that it does not require equality of variances among the study groups, permits evaluation of both dichotomous independent variables, and of multiple groups; thus, it was felt that it would provide considerable information about the nature of research data to enable understanding of variable variances.

The two outlined phases of data collection and analysis were implemented to achieve each of the seven objectives and contribute to the satisfaction of the three thesis aims (as presented in Table 4).

Table 4: Achievement of the thesis' aims and objectives

Research Objective	Research Phase P1 - Incident database P2 – Audience survey	Findings and Discussion Chapters
O1: To create a database of historical crowd incidents at events to document their defining characteristics and outcomes for further analysis	P1	Chapter 7
O2: To analyse audience behaviour at events and the influencing factors involved	P1 & P2	Chapter 7 Chapter 8
O3: To identify the audience perspective in relation to crowd management, control, and safety at events	P2	Chapter 8
O4: To determine common types of crowd safety incidents at events and explore patterns in the catalysts (triggers) for their occurrence	P1 & P2	Chapter 7 Chapter 8
O5: To identify common components in CM and event safety planning across a range of events	P1 & P2	Chapter 7 Chapter 8
O6: To explore links between audience behaviour, event crises and efficacy of CM strategies	P1 & P2	Chapter 7 Chapter 8
O7: To classify event risk based on crowd dynamics, as well as internal and external environmental factors	P1 & P2	Chapter 7 Chapter 8
A1: Investigation of crowd culture and behaviour at events to explore behavioural and attitudinal differences amongst event audiences	P1 & P2	Chapter 9
A2: To explore the nature of crowd safety incidents at events of different scales and types, and evaluate the efficacy of crowd management (CM) strategies employed	P1 & P2	Chapter 9
A3: To develop a matrix of event type by crowd dynamics and appropriate CM strategies	P1 & P2	Chapter 9

6.1 Research philosophy

The 'research onion' (Figure 8) offers a step-by-step approach to methodology and is used to reflect the distinct layers of the research process (Saunders et al 2016; Nunkoo 2018). This thesis explored the social phenomenon of crowd behaviour at events; as this is both causal and interpretive in nature (Baskar 2008 in Melnikovas 2018:36), the philosophy of pragmatism considers that no single viewpoint could give the entire picture and thus bridges the gap to enable adaptations of positivist and interpretivist positions to best address the research aims and enable both explanation and understanding (Melnikovas 2018; Sahay 2016).

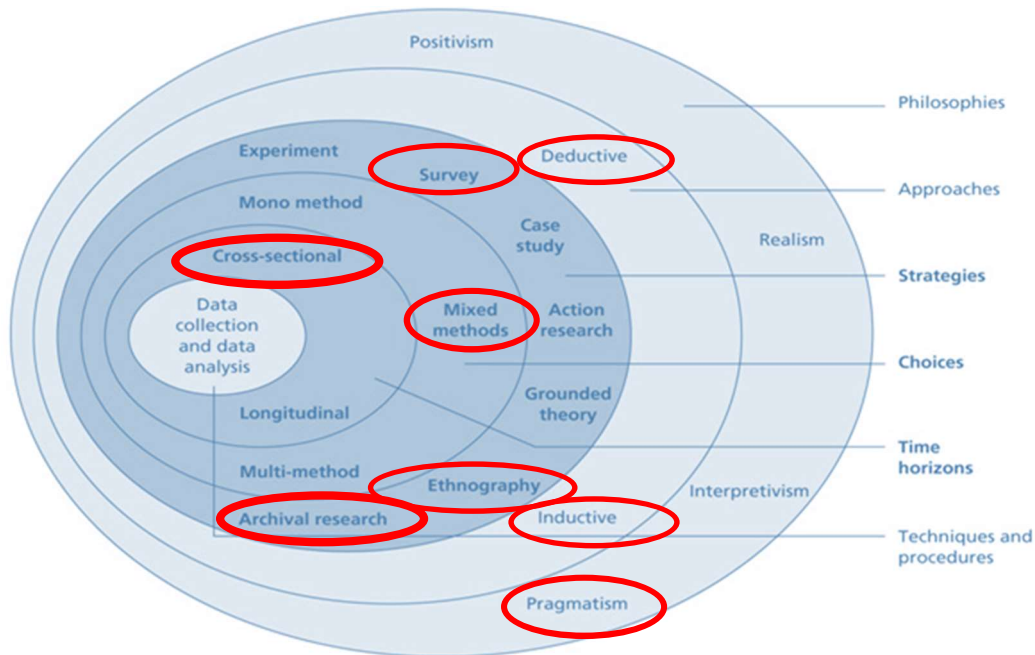
The literature review for this study generated a conceptual framework of theoretical knowledge (Chapter 4) that was the primary starting point and framework to inform the development of the first phase of archival research activity (historical crowd incident database) and to also test against the attendee findings (phase 2: attendee survey), showing some grounding in deductive reasoning and a positivist approach (Botterill and Platenkamp 2012; Brotherton 2008; McQueen and Knussen 2002; Neuman 2011). That said, the study purpose also focused on generating new theory and conclusions to contribute to the field of events management around audience behaviour and its effect on crowd management, which links to the philosophy of interpretivism and concept of inductive reasoning predominantly (Brotherton 2008). Currently, the literature around audience behaviour, crowd risk and crowd management straddle the disciplines of sociology, psychology, tourism and event management, with arguably relatively little in the events management field that fully connects these realms. Thus, a central study aim was to contribute to the body of knowledge in the events management field on the matter through development of theory with an event management practitioner's focus in mind.

Considering the interpretive stance, the study's first phase of data collection and analysis (crowd incident historical analysis) was not aimed at prediction, but insight (Melnikovas 2018) and was therefore ethnographic in nature, in that the research sought to explain the why and the how of the situation being studied; an ethnographic approach sees detailed observations of human behaviour to determine meaning (Maylor and Blackmon 2005; Marschan-Piekkari and Welch 2005). This approach arguably involves being led by the data in an inductive manner whereby the phenomenon is systematically observed, and conclusions are drawn from patterns in the research observations, with the evidence leading the researcher to the conclusion (Altinay and Paraskevas 2008; Smith 1995; Ryan 1995). Moreover, Brotherton (2008) notes that once data has been collected, the analysis involves looking for patterns, connections, and relationships to interpret significance and produce meaningful explanations or theories and as Maylor and Blackmon (2005) argue, this approach minimises the likelihood that data collected in the field will be determined by prior beliefs. With this in mind, the first phase of the study sought to explore crowd behaviour at past events in an interpretive manner, relying on subjective in-depth explanations of behaviours, issues and management strategies observed (Veal & Burton, 2014). This lends itself to the inductive approach, which establishes theories from interpreting the data gathered (Brotherton, 2008; Veal & Burton, 2014).

The findings of the archival secondary data analysis of behaviour at past events (phase 1) were used to inform the primary data collection with event attendees, to determine whether or not the relationships and behavioural patterns uncovered in the first phase of the data collection process (as well as the conceptual framework) were applicable to a range of event scenarios (Thompson 1985). From a positivist perspective, the study combined deductive logic informed by an initial conceptual review of the literature on the subject, with empirical observations of individual behaviour through the survey of event attendees (phase 2) to explain general patterns of human activity (Neuman 2011)

related to crowd behaviour and managing safety at events. As such, the pragmatic philosophical approach discussed at the outset of this section enabled positivist and interpretivist positions to be adopted to enable both explanation and understanding (Melnikovas 2018; Sahay 2016).

Figure 8: Research approach adopted (adapted from Saunders et al 2016)



6.1.1 Phenomenological approach

The philosophical concept of phenomenology was pertinent to this research as it seeks to know the world through direct experience of the phenomena and tries to deduce essential characteristics through reasoned inquiry (Boterill and Platenkamp 2012). It has been described as a way to broaden the way in which the world is viewed (Denzin and Lincoln 2000; Howell 2013) whilst advocating an inductive approach as the most appropriate for conducting research (Brotherton 2008). Thus, phenomenology is conducted by examining personal experiences rather than questioning what they believe might happen (Merleau-Ponty 2013). Analysing experiences (in this case, of attendees in crowds and audiences at events) both in a secondary and primary research manner (to be discussed in detail further on), allows the creation of a framework of reasoning to address the ‘what’ and ‘why’ behind relationships (Mooney and Dermot 2002).

More specifically, case studies involve in-depth, contextual analysis of matters relating to similar situations in other organisations (or in this case, events); those that are subjective and qualitative in nature are useful in applying solutions to current problems based on past problem-solving experiences, and they are also useful in understanding certain phenomena, and generating further theories for empirical testing (Sekaran and Bougie 2009: 109). Building on this, Maylor and Blackmon (2005) argue that case study research often involves secondary data analysis, which analyses data created from published or unpublished materials such as company archives, document analysis, or from observing people or organisations without interacting with them (unobtrusive analysis). The authors add that the approach helps to indicate how people actually reacted in a specific situation at the time and it is useful to adopt when someone else has already collected the data needed, which can be used to help answer

the study's research questions, or if the focus of the study is on a social unit that cannot be contacted directly because of geographic distance or other access problems, or because there is a need to study historical activities of social units (historical data). For this study, it was important to address the successes and failures in relation to crowd management at past events through phase 1 of the research process to help answer the study objectives and thus the use of online archived material about past events provided the opportunity to study a broad range of events that would otherwise be inaccessible to the researcher. The secondary data collection and analysis methodology used to address the study aims through phase 1 of the data collection process is discussed in section 6.2 below.

Whilst phenomenology provides a useful framework for the early phase of this research, according to Sekaran and Bougie (2009) though qualitative data may help the understanding of phenomena at the exploratory stages of a study, quantitative data becomes necessary for more descriptive and scientific studies (Maylor and Blackmon 2005). As it was determined in 6.1 that the study adopts a pragmatic philosophical approach, combining both interpretive/inductive and positivist/deductive reasoning, this again emphasises the need to incorporate mixed methodologies to the research design and the specific research process undertaken is therefore discussed in detail hereafter.

6.2 Method 1: Crowd incident database development and analysis

According to Veal (1997:76), 'previous research on a topic is a vital step in the research process' and has a number of important functions that include providing a source of methodological or theoretical ideas as well as a source for comparison. Building on this, Neuman (2011) discusses the rationale behind the use of historical-comparative research as enabling a researcher to address the macro-level study questions as it is well suited to examining combinations of social factors that produce a specific outcome, such as a civil war or in the case of this study, specific audience behavioural patterns; for this reason, he argues that it strengthens conceptualisation and theory building. Comparative studies can look to explain differences between phenomena in either a spatial or temporal context and can help to test the extent to which a theory can be generalised across different time periods and/or contemporary contexts (Brotherton 2008: 119). The author goes on to state that the greater the variation in contexts for comparison, the greater ability for generalisation, though where the contexts being compared are similar, these similar results may be transferable between the examined contexts but will not necessarily be generalisable to other, very different contexts. More specifically content analysis, by definition, is the gathering and analysis of the content of text and the systematic and objective use of techniques to quantify any form of communication (Lang & Heiss 1994; Neuman 2011). Its use has been most popular in cultural studies and mass communication research (Manning and Cullum-Swan 1998). Types of communication range from the conventional text-based documentary sources such as books, newspapers and periodicals to recordings of observations, advertisements, films or music (lyrics) and pictures, websites, or works of art (Lang & Heiss 1994: 85; Neuman 2011), and this type of research can either adopt a positivist, quantitative approach or something more closely linked to qualitative and interpretive methodologies (Neuman 2011). Yet, according to Slater (1998: 235) and Maylor and Blackmon (2005: 140) the central aim is often one of objectivity, to render issues of interpretation as controllable and non-contentious as possible in order to move quickly onto the more 'scientific' process of counting things.

Frankfort-Nachmias and Nachmias (1996) suggest there are three applications or purposes of content analysis, namely, to describe the attributes of a message, make inferences about the sender and its causes or antecedents, or to make inferences about the effects of messages on recipients. In the case of this thesis, content analysis was utilised in both a basic quantitative and in-depth qualitative manner (Mason 2002), in order to collect and analyse information from a broad range of sources in order to count and describe the attributes and influences involved in audience behaviour and safety issues at a range of events (Frankfort-Nachmias & Nachmias 1996; Lang & Heiss 1994; Slater 1998). This produced literal, factual data about the cases within the crowd incident database (top-level findings) and also interpretive data through the thematic analysis (Fox et al 2014). Due to the type of crowd incident content analysed, it can be argued that comparisons can be drawn with structured observation research, in that analysis of the data collated explored what happened, what someone did or how they behaved. It arguably provided a direct record of 'what people do' or patterns of movement in certain situations, useful for analysing how people behave in certain spatial and temporal instances in real time; as seen in non-participant observation, the observer is able to distance themselves from the area and / or subjects observed so that they do not influence the movement or judgement of the participants (Fox et al 2014: 112).

The conceptual framework (Chapter 4) as well as the research design put forward for this study adopted a set of key characteristics and principles that broadly connected it to the historical-comparative approach to secondary content analysis, as set out by Neuman (2011:471) to include:

1. Evidence – reconstructs from fragments and incomplete evidence.
2. Distortion – Guards against using researcher's own awareness of factors outside the social or historical context.
3. Human role – includes the consciousness of people in a context and uses their motives as causal factors.
4. Causes – sees cause as contingent on conditions, beneath the surface, and resulting from a combination of elements.
5. Micro/Macro – compares whole cases and links the micro to macro levels or layers of social reality.
6. Cross-contexts – moves between concrete specifics in a context and across contexts for more abstract comparisons.

Several authors discuss the advantages and limitations of content analysis, as seen in Table 5. As the intention for using historical-comparative content analysis was to support and inform further research activities as well as to enhance end conclusions, the advantages of this method arguably provided a sound rationale for its use in helping to describe the attributes associated with audience behaviour, safety issues and incident management at events. The method's identified limitations were duly noted but could also be reasonably overcome as it was never the intention for content analysis of secondary data to stand alone as the sole method of data collection. Moreover, to manage the large volume of source materials, data was collated and stored in two ways for different purposes. Triangulation of data analysis by researching the crowd incident database in both literal and interpretive ways enhanced the reliability and validity of the results by reducing systematic errors linked to replicability and truthfulness of findings, ultimately strengthening the results (Opperman 2000). First, an excel database was created to enable all cases to be displayed visually in chronological order containing all source materials pertaining to each case, alongside some key indicators linked to the case itself to aid in headline literal comparisons between cases and enable some preliminary counting of aspects such as case types (incidents), causes and identifying characteristics of the case (scale, event type, triggers,

outcomes). Second, all source materials were imported and stored in the NVivo qualitative analysis software so that the content of all source material could be coded and indexed prior to exporting to excel for thematic analysis in depth (see 6.5). Most crucial to this element of the research process was that the information reviewed provided grounding on which to base further research, and thus triangulated and strengthened the study findings (Frankfort-Nachmias and Nachmias 1996; Johns and Lee-Ross 1998; Neuman 2011; Oppermann 2000).

Table 5: Advantages and limitations of content analysis

Advantages	Limitations
<ul style="list-style-type: none"> - Procedures operate directly upon text or transcripts of human communications - It is unobtrusive. Neither the sender nor the receiver of the message is aware it is being analysed, eliminating bias - Can be obtained quickly - Generalisations can be made across a social field and represented in meaningful numerical terms - It is cost effective - Access to high quality data - Opportunity for longitudinal analysis 	<ul style="list-style-type: none"> - Limited to examining recorded messages - Ineffective for testing causal relationships between variables - Objectivity can be suspect - The data held is rarely current - It can rarely be used to determine the truth of an assertion - Language can be complex to analyse - Can be time-consuming to collate - Management of large/complex datasets - Lack of control over data quality - Not always seen as being as rigorous or relevant as purposefully collected data

(Berg 1998; Holsti 1969; Maylor and Blackmon 2005; McQueen and Knussen 2002; Slater 1998; Weber 1985)

6.2.1 Sampling

Several authors (Brotherton 2008; Fox et al 2014; Sekeran and Bougie 2009) argue that secondary data can come from sources beyond those that are academic including books and periodicals, government data and statistics, the media and annual reports, websites, social media discussion boards, photos, videos, films and blogs, and it may be quantitative or qualitative, though typically analysis is more qualitative in nature. For the purpose of this study, an archive of secondary data (documents, images, and other data in an unprocessed form) related to a broad range of past events (nationally and internationally) was collated as a first stage of the data collection and analysis process and was transformed into a database of past events against a range of indicators used to attempt to:

- identify potential causes and themes in audience behavioural and crowd incident patterns at a range of global historic events from different sub sectors of the events industry
- explore the efficacy of crowd management strategies employed at past events to help identify (through quantitative and qualitative analysis) the emerging failings and success factors involved in crowd management strategies for events.

According to Maylor and Blackmon (2005) an archive is a series of documents, images, and other data in an unprocessed form, whilst a database is a structured data set using a consistent research design or protocol, that presents a matrix of data allocating a row to each social unit (in this case, event) and a column to each variable or other measure related to that social unit (such as audience profile, incident statistics, event environment factors, triggers and catalysts, and observations around crowd management or legislative issues, for the purpose of this study).

As discussed previously, Maylor and Blackmon (2005) noted that secondary data can be gathered from a wide range of possible data sources, including social surveys, online articles, company reports, government statistics, online images and social media forums and thus, sampling for the sources to be included within the study's analysis considered a broad range of potential (and accessible) sources for secondary information. Moreover, the data collated within this database contained numerical information as well as images, findings from video clips and words, which were counted in order to identify the factors associated with event crowd management success or failure. Punch (1998:193) and Miles and Huberman (1998) argued that methods which involve collection of qualitative data for analysis rarely use probability sampling, but rather use some sort of 'deliberate or purposive sampling', which means sampling in a deliberate way, with some purpose or conceptual focus in mind. Furthermore, Mason (2002:124) described theoretical sampling as constructing a sample that is meaningful theoretically and empirically because it builds in certain characteristics or criteria, which help to develop and test the theory or argument. It is said to be based upon concepts that emerged from analysis and that appear to have relevance to the evolving theory (Strauss & Corbin 1998:202). Elaborating on this, Flick (1998:65) stated that theoretical sampling decisions aim at that material which promises the greatest insights, viewed in the light of the material already used and the knowledge drawn from it.

For this study, key insights emerged from the literature review and conceptual framework, and these insights helped to inform the key word search terms entered into the online search engine Google Chrome, to identify past event crowd incidents for inclusion within this study. Specifically, articles were selected for analysis via key word searches (Table 6) on a wide range of relevant terms or phrases that emerged from the literature to inform the study's conceptual framework (Figure 6, p71), with the aim of reaching a broader range of data:

Table 6: Key word search terms

1. event crowd incident	9. organiser error at events
2. venue disasters	10. event incidents by event type
3. crowd safety incidents	11. crowd surges at events
4. crowd disasters	12. audience behaviour at events
5. event terror attacks	13. fan behaviour at events
6. event crimes	14. drug/alcohol issues at events/festivals
7. event disasters	15. crowd safety reviews
8. crowd crush at events	16. event safety reviews

Moreover, snowball sampling was incorporated into the sampling strategy to access any further related sources of interest, which in this case relied on previously identified sources providing web links to other articles and sources of relevance and thus, the sample snowballs in size (Fink 1995; Ryan 1995). For the purpose of this study, articles and sources identified for inclusion from the initial key word searches outlined above provided (on occasion) links to other relevant articles and sources of relevance that were subsequently included, and the content analysis data collection phase for a specific crowd incident case ended once theoretical saturation was reached (Flick 2002) and no new information was obtained from further data sources found to be available.

Articles identified via the key word searches were archived and added to the crowd incident database for analysis, providing they held sufficient information for analysis against the pre-determined set of indicators. This introduced an element of judgement sampling (Mason, 2002) in that cases were selected for their relevance to the research question. Maylor and Blackmon (2005) advocated the use of a broad range of sources for archive material and therefore, relevant sector-related reports, media articles, statistics and images and video links were included for analysis where appropriate to the aim and objectives of this study in some way. It is important to note here that the approach to data collection of crowd incident sources was non-probability-based and therefore it was arguably not generalisable of all crowd incidents globally; this is recognised as a possible limitation of the overall study. However, the purposeful sampling approach adopted (Teddlie and Yu 2007) served to provide content from as broad a range of incidents as possible within the study timeframe to enable insights to be drawn on patterns and themes evident in relation to the conceptual framework from past events, that would inform the second phase of research. What became evident from the crowd incident database resources, was that the audience perspective was lacking and thus the decision was made to conduct a UK-wide event attendee survey to explore audience perceptions of crowd safety at events with the aim to address this research knowledge gap. This second phase of research is discussed in more detail in 6.3 below.

6.2.2 Content analysis research design

Several authors discuss the ways to conduct content analysis (Berg 1998; Hinds 2000; Maylor and Blackmon 2005) and the steps involved. In discussing the historical-comparative approach to content analysis utilised for the purpose of this study, Neuman (2011) identifies a series of six steps which can be summarised to involve:

1. Conceptualising the 'object of inquiry' (p.475) by starting with a loose model of set preliminary concepts which are applied to a specific setting.
2. Locating evidence and sources through extensive bibliographic work, perhaps focusing on specific nations or units and in particular kinds of evidence within each.
3. Evaluating the quality of the evidence by asking questions around how relevant the source is to the research questions and evolving concepts, as well as the strength and the accuracy of the source. It is also important here to look for differences in reporting on specific cases across different sources to identify any 'silences' – factors not expressed in the data.
4. Organising evidence and categorising according to generalisations, themes, theoretical insights, and interpretation of meanings to look beyond what has been reported.
5. Synthesising the data whereby the emerging concepts are continuously revised and refined, moving toward a general explanatory model. The process involves looking across time or units to draw out similarities or differences, organising divergent events into sequences and grouping these together to create the larger picture and develop plausible explanations that link the specific evidence with an abstract model of underlying relations or causal mechanisms.
6. Reporting involves assembling evidence, arguments and conclusions into a report whereby the evidence is distilled and woven together with logical, plausible arguments to communicate a convincing picture for readers.

According to Neuman (2011), the issue of equivalence is critical to any historical content-analytic study whereby there is a need to be aware of avoiding the misinterpretation of actions, behaviours, reactions and viewpoints displayed and thus recorded in relation to either a different era or a different culture;

therefore, the issue of equivalence was considered in relation to the sources analysed at this stage of the study in terms of avoiding mistranslations in lexicon, context, conceptual understanding (of social relations) and ensuring comparative measurement for thoroughness. Moreover, the guidelines put forward by both Neuman (2011) and Hinds (2000) informed the analytical framework developed for this preliminary stage of data collection in relation to the study. In addition to these steps, Ryan (1995: 111) has noted that when thinking of conducting content analysis, it is advantageous for the researcher to develop categorisations that refer to other studies derived from the literature. Therefore, for the purpose of this thesis, to satisfy the study aim and objectives, the content analysis employed was required to capture information linked to the factors identified in the conceptual framework (Figure 6, p71). An initial top-level analysis was therefore conducted on the compiled database of crowd incident cases as a whole, to identify prevalence of these factors (Appendix 1, p245).

According to Mays and Pope (1995) observation frameworks should incorporate a checklist of measures, consisting of grids, rows and columns to allow for data to be collected in a clear and effective manner, and this notion was adapted for the purpose of the secondary data collection and historical case study-related database for the top-level literal data analysis (Fox et al 2014: 113); to do this, data about type of event, type of incident, severity of incident (fatalities and injuries) as well as activities, incident triggers and patterns of behaviour witnessed, and places and time points within the event was collected. Moreover Berlonghi (1995) argues that recording of different periods throughout the event is also essential. It is also suggested that to enable the capturing of more detail within the data, an ‘additional comments’ column should be included in the measurement framework to aid in conceptualisation, interpretation of meaning and analysis of the data (Mason 2002). Taking these research design aspects into consideration, a content analysis framework was developed to accommodate these features, whilst behavioural and management indicators to be measured were developed from the factors identified in the study’s conceptual framework (Table 7).

Table 7: Historical comparative content analysis framework of measures for data collection

1 Case No	2 Year	3 Incident Description	4 Location	5 Event Type	6 Event Scale (size)	7 Fatalities	8 Injured approx	9 Issue
10 Cause	11 Case notes	12 DIMICE/RAMP links	13 Data Type	14 Title /Source	15 Author	16 Date of Source	17 Date of Access	18 Ref - Via (web link)

Once top-level literal and factual content analysis of the cases in the database had been conducted as outlined above to count more quantitatively the prevalence of factors emerging from the data linked to the conceptual framework, more complex qualitative analysis of the documents linked to each individual case identified within the database was conducted to explore crowd incidents, behaviour and associated management in great detail. Discussion of this method of analysis can be found in 6.4.3.

6.3 Method 2: Event attendee survey - Audience perceptions questionnaire

The deductive approach to this phase of the research study utilised the constructs and their specific measures identified in the literature review, conceptual framework and from the emerging headline and thematic analysis obtained from phase one of the study’s data collection (detailed in Chapters 2,

3, 4 and 7 respectively) to test relationships. With this in mind, a cross-sectional survey was chosen to capture perceptions at a specific point in time (Brotherton 2008) in a quantitative manner. A quantitative study was appropriate because it enables testing of the relationship between the concepts against previous research (Brunt, 1997; Gursoy et al., 2019) and gathers this information from individuals using a formally designed schedule of questions (Veal 1997). A questionnaire containing 24 questions (Appendix 2, p247) was designed to investigate the constructs from the proposed conceptual model (Figure 6, p71) and the preliminary findings from Phase 1 of the research (qualitative crowd incident database findings, Chapter 7.7), to gather reliable and objective data (Veal 2017) suitable for the ‘investigation of perceptions of crowd safety among event audiences in the UK’.

A self-completion on-line survey methodological approach was adopted, with the survey link posted into a range of event group pages on Facebook after receiving approval from the page admin to access the group and population of interest (Patton, 2014). Details of the sampling approach can be found in section 6.3.1. The data collection period for this part of the research was affected by the COVID-19 pandemic and UK lockdown, which saw the cessation of live events and requirement to stay at home. Conducting an online survey and posting the links in groups of interest on Facebook therefore allowed the best reach to a large population of eventgoers given the circumstances, giving large numbers of people access to the questionnaire and the ability to complete it within their own time and at their own leisure (Veal, 2017). It has been argued that anonymous online surveys can generate more answers that are greater in honesty (Comley, 2002), which was particularly important in relation to the questions being asked as they touched on the participants own experience and behavioural patterns at events linked to crowd safety, which otherwise they might not want to disclose. That said, it has also been argued that surveys administered over the internet can achieve low response rates and, at times, provoke negative attitudes towards receiving unsolicited messages and content, emphasising the importance of keeping survey length as short as possible and ensuring clarity regarding its opt-in nature (Bartel Sheehan 2001). With this in mind, the advantages and limitations of administering self-completed surveys specifically are outlined in Table 8 below:

Table 8: Advantages and limitations of self-completion online questionnaires

Advantages	Limitations
- Can be distributed quickly / widely	- Questions must be simple to understand
- Self-response surveys can reach more people	- Poor presentation of questions - confusion
- Opportunity to study specific groups	- No probing is possible
- Standardisation / easier correction of errors	- Response rates are lower – ignoring invites
- Less interviewer bias / more honest answers	- Distribution takes time (including reminders)
- Respondents complete questions at leisure	- Little control over completion / finishing
- Cheaper and quicker to conduct and analyse	- Missing data – ‘skipping’ through questions
- Automatic coding / construction of data files	- Answering in a non-genuine way
	- Sampling problems – i.e. reaching population

(Bartel Sheehan 2001; Brunt, Horner and Semley 2017; Comley 2002; Veal 1997)

In order to maximise response rates and increase validity and reliability it is clear from the advantages and limitations explored in Table 8 that thoughtful design of the questionnaire and launch process is crucial. The design of the questionnaire and launch process adopted has thus been explored and discussed in detail, in 6.3.2.

6.3.1 Sampling

A sample, by definition, is a sub-set of the population, that is, a smaller number of items picked from the total population, and for the purpose of this study, as the sample population was dispersed across the UK due to travel restrictions resulting from the COVID-19 lockdown and forced cessation of UK events, travel to locations where respondents were likely to be (i.e. events) was impossible at the time of data collection, and so a distributed method was found to be most suitable (Brotherton 2008: 115). Moreover, according to Bryman and Bell (2015) non-probability sampling can be used particularly for studies which often do not permit random sampling for some unavoidable reason. In this case, the second phase of this study required the conduct of an audience perceptions survey around crowd safety at events in the UK and prior to the survey launch, the COVID-19 pandemic resulted in a UK-wide lockdown necessitating the data collection process to take place online. Veal (2017) notes that sampling should involve cases appropriate to the study context (those who attend events) but also provide suitable conditions for analysis and be representative of the range of sites (in this case, events) to be studied. As the main focus of this thesis involved studying audience behaviour, incident types and methods of management linked to different event types, ensuring the distributed survey reached audiences who attended a broad range of events became important for representativeness and therefore needed to be acknowledged within the sampling approach. As events could not be attended during the time of data collection, reaching the target population (Table 9) had to be addressed by other means; in this case, an online survey was administered via the membership-only events group pages on the social media platform Facebook (to be discussed in more depth further on).

Table 9: Event selection sampling framework

Size / scale	Sources	Local	Regional	National / Major (UK cities and stadiums)	Hallmark (Name synonymous with place)	International / Mega (global draw and media coverage)
✓ sampled X declined no reply						
General Event type						
Business (exhibitions, trade shows, meetings and conferences, corporate hospitality, incentives, networking)	Bladen et al (2012); BVEP (2020)	✓	✓	✓	✓	✓
Arts and Cultural (Music, The arts, food & wine, community events, protests / marches, celebrations)	Allen et al (2008); Ali-Knight & Robertson (2004);	✓	✓	✓	✓	x
Sports (competitions, displays, tournaments, physical activity, participants/spectators)	Bladen et al (2012); BVEP (2020)	✓	✓	✓	✓	✓
Music Core event content is music (inc. Festivals, concerts, tours and programmes)	Bladen et al (2012); BVEP (2020)	✓	✓	✓	x	✓

(Framework adapted from Bladen et al 2012; Bowdin et al 2011; Getz 2005)

Bowdin et al (2011) classify events into four categories in terms of size, from regional and major through to hallmark and mega events. Moreover, Getz (2005) presented a classification of events based on their nature, including business events, arts and cultural. Delving deeper, Bladen et al (2012) provide specific typologies useful in categorising music and sports events. Taking these event typologies in terms of size and scope into account, a quota sampling framework (Brotherton 2008) was developed that ensured representativeness across each of the specified categories. Although the sample subjects were not selected randomly, so the sample is arguably less representative than probability-based strategies, quota sampling is closer to these strategies than other forms of non-probability-based sampling (Brotherton 2008: 173). That is to say that proportionate quotas for subjects to be included reflected the wider sample population.

Table 9 above maps this audience focussed selection framework against representativeness achieved via the social media groups, forums, and sites sampled that reflect audience attendance across the range of categories. It should be noted that representative groups from the full range of event types and size were approached to request posting of the audience survey link on their pages; as can be seen in Tables 10 and 11, almost all categories from the framework were successfully sampled with at least one representative group included from each except for ‘international mega arts and cultural events’ (due to an absence of relevant groups to approach on the platform used for distribution) and ‘hallmark music events’ (Glastonbury official fans page was approached but declined involvement in the study).

Table 10: Final reach of the attendee survey

Survey Reach		
Music, Arts & Culture		49,536
Music		65,092
Sports		74,865
Business (All genres and sizes) - staff, not organisers		28,757
All types and sizes		18,170
Arts and Cultural (celebration / awareness specifically)		430
		236,850

Table 11: Sampled social media group pages (UK only)

Social Media Page (Facebook)	Event Type / Scale	Declined / Approved
BBC Good Food Show	Arts and Culture, Business (Food, exhibition)	No reply
1 Camp Bestival Facebook Group	Music (All genres), Arts & Culture, Families with small children - Medium (c.30k attendees)	
Creamfields Social	Music (EDM), Outdoor National Festival - Large	Declined
2 Download Festival	Music (Rock), Outdoor National Festival - Large	
3 Equestrian Sports UK (Formerly Eventing UK)	Sports (Equine), all sizes	
4 Festival and Event Staff Network	Business (All genres / sizes)	
5 Festival Traders UK	Business (All genres / sizes)	
6 Festivals & Events UK	Arts and Culture, Music (All types and sizes)	
Food Festival Finder	Arts and Culture, Business (Food, exhibition)	No reply
7 Football Stadia & Grounds	Sports (Football)	
Football Supporters Association	Sports (Football)	Declined
8 Free London Events Info	Arts and Culture, Music, Sports, Business (All types and sizes)	
Glastonbury Festival Fans	Music (National) - Large	Declined
9 Music Festivals & Concerts UK	Arts and Culture, Music (All types and sizes)	
10 Notting Hill Carnival	Arts and Culture, Music (World music) outdoor street festival - Large, regional/national	
11 Pride Events UK	Arts and Culture (Celebration / awareness), outdoor street marches, regional/national	
12 Rave Events UK 25.06.20	Music, EDM (all types) Small/local/underground - indoor/outdoor	
13 Shambala Festival Photos & Chat Group (Unofficial)	Music (All types), Arts & Culture, Outdoor Festival - Medium (c.20k attendees), Bohemian	
The Commonwealth Games 2022 Birmingham		
14 Volunteers (Unofficial Page)	Business, Sports (All types). Mega / national event	
15 UK Car Events & Shows	Sports (Motor), All sizes	
16 UK Triathlon Events	Sports (athletics), National, regional and local scale	
17 Wembley Stadiums Fan Page	Arts and Culture, Music, Sports, Business. Mega / national stadium events	
18 Wimbledon Recreated	Sports (Tennis), National	

The thesis introduced a rigorous selection framework informed by the literature and scale of the event sector, coupling this with targeted and focussed purposive, proportionate quota sampling (Fox et al 2014) to ensure survey reach and coverage across all aspects that reflected the events sector and its

sub-sectors. It is therefore arguable that the limitations associated with quota sampling for quantitative research, including the researcher influence over which groups were selected for inclusion (Brotherton 2008) have been, as far as possible, mitigated to enhance the validity of the method.

In order to collect an appropriate sample for the questionnaire, the purposive quota sample was drawn in the form of posting a link to the survey on the social media platform, Facebook, (with prior permission of the relevant admin teams) to reach all members of event pages or groups from the categories outlined in Tables 9, 10 and 11 above. Whilst this is still a form of non-probability sampling, it does take strata into account (Fox et al 2014: 98) and an advantage is the convenience of being able to select a certain group of people (Fink 1995). It was then established in the post that the questionnaire would only be relevant for anyone who has attended events in the past year. The decision to sample social media membership-only captive user group pages that fit the framework outlined in Tables 9-11 on Facebook was made so that access to the target population was easier to come by, allowing a faster response rate. Facebook was chosen as the sole social media platform for distribution due to its growing and widespread popularity with UK residents; in September 2020 there were 45.85 million Facebook users in the UK (Dixon 2022). Groups that represented the categories from within the sampling frame were approached for permission to post the survey link, due to the likely existing interest in the topic among its members and the increased likelihood that they would be willing to complete a questionnaire about their experience. One of the main factors affecting response rate is often topic interest, so this was always kept relevant to the sample (Bartel Sheehan 2001; Comley, 2002). Sharing the questionnaire with multiple groups, enabled adherence as far as possible to the quota sampling frame created.

6.3.2 Survey research design

It should be noted that peoples' responses to survey questions tend to reflect what they are prepared to say, or reveal, about their true feelings on the issue and not necessarily what they feel or believe; this raises questions of validity of the data collected (Brotherton 2008:113). To overcome this limitation, questions were designed to ensure that wherever possible, respondents were not asked about their own behaviour at events, but instead to reflect on the behaviours and actions of those around them at the events they most frequently attend.

Brotherton (2008:114) notes that surveys can be used for two purposes, either descriptive or analytical; an analytical survey approach was adopted for the analysis of the audience survey and was concerned with the collection of data to test hypothesised relationships and ascertain the mechanisms underlying such relationships. Based on headline and detailed thematic findings from the content analysis process in research phase one and also from the conceptual framework (Chapter 4), a series of questions for the audience data was developed. Questions designed for this study aimed to determine the '*what, when, how often, how many, and why*' aspects of people's behaviour or actions. The questions were developed to help produce explanations (Brotherton 2008) in capturing audience perceptions of the event and crowd safety at a specific point in time. Whilst the Pandemic was not recognised as a primary objective of this study, the timings of the survey development and launch (April to June 2020, during the UK's first full lockdown) meant that the impact of the influence of COVID-19 on perceptions of safety had to be recognised within the survey questions, as participants would be likely to have it in mind when answering and, if not addressed through clear instruction and targeted questioning, this factor could skew the findings of the study.

The structured, online questionnaire was self-completed (Brunt et al 2017) during the Spring and Summer of 2020, via the Facebook social media platform by eventgoers who had previously visited and affiliate with a range of event types. The list of questions utilised (Appendix 2, p247) was specific to the study aims and linked to the concepts derived from the review of existing literature (Brotherton, 2008) as well as the phase one analysis findings. The questions developed contained a mix of categorical, ordinal and cardinal data, and were predominantly closed questions which are amenable for statistical analysis (Finn et al 2000; Brunt, 1997; Brunt et al 2017). In total, the questionnaire contained 20 core questions plus a further 4 demographic questions. Several questions branched to explore an answer in greater depth, with a variety of dichotomous, multiple choice, likert scale and matrix questions that produced various styles of response. Regarding design, questions were kept short where possible, and with simple yet precise language, plus, some open questions were utilised as they were necessary to gather opinions, and specific information such as age (Brunt et al., 2017); these were either analysed in a qualitative and thematic manner or collapsed and recoded later.

The questionnaire consisted of five parts and as previously noted, its design was informed by the conceptual framework culminating from the literature review (chapters 2, 3 and 4) as well as the headline findings from the phase one research (Chapter 7). A map of survey questions against key literature is provided in Appendix 3, p271. The first page provided an introduction to the study and an ethical statement to ensure respondents had the right to refuse participation (see 6.5 for ethical considerations). It contained the University of Plymouth logo to demonstrate the bona-fide nature of the research and explained the purpose of the research and content of the questionnaire as well as enabling respondents to decline from participating, with the aim to inform respondents of the process to reduce respondent attrition after starting the survey. Freedom of choice to participate, the right to withdraw, the ability to disguise identity and a lack of provision of consent are common issues to affect the online survey approach (Bulmer 1982; Gilbert 2001; Veal 1997). Block 2, which was the first section for completion, explored event attendance patterns to enable analysis by factors such as event type, scale, frequency of attendance and other social identity factors, linked to the audience profile section of the conceptual framework (Figure 6, p71). Block 3 explored the event environment and site linked into phase two of the conceptual framework around the 'event environment' which concentrated on exploring common behavioural patterns, hazards and influencing conditions (catalysts). Categories adapted from Abbot and Geddie (2001) Berlonghi (1995), Canetti (1973), Rutherford-Silvers (2008), Tarlow (2002) and Zhen et al (2008) explored typical crowd behaviours witnessed, and catalysts, event conditions and hazards that can affect perceptions of safety and satisfaction at events. Block 4 was designed to explore attendee perceptions of crowd management strategy efficacy experienced at events. Primarily, a matrix exploring communication type by scenario (adapted from Watts 1998 and O'Toole 2011 among others) and likert scale questions (5 = High effectiveness, 1= Low effectiveness) exploring crowd management strategies and perceived efficacy (adapted from sources such as O'Toole 2020; Rutherford-Silvers 2008; Still 2013, 2022) were developed. Furthermore, crowd incident recollection was explored to determine common incident hotspots in relation to Still's (2013; 2022) ICE (ingress, circulation, egress) and RAMP (routes, areas, movement, profile) concepts and perceived incident management. Block 5 considered factors linked to feeling safe at events with questions drawn from the relationships proposed in Figure 6 of the conceptual framework (Chapter 4); namely, that audience profiling for events must arguably consider the relationship between crowd typologies and catalysts, perceived fear and threat to safety as well as subcultural differences and actual vs. perceived density. Questions therefore centred on personal and witnessed crowd behaviours, ranking of personal safety and influencing factors on future event attendance as well as perceived influence of COVID-19 on feelings of safety and likely future attendance. Block 6, 'About you', determined

demographic characteristics (age, level of education and gender) to aid in the creation of respondent profiles, alongside data collected through part one of the questionnaire 'The events you attend'.

The validity and reliability of the questionnaire were assessed through a mix of procedures. First, a thorough literature review (Chapters 2, 3 and 4) and headline and thematic findings from the phase one qualitative content analysis identified the adequate scales to measure the constructs in the conceptual framework (Chapter 4), which eliminated extraneous variables and increased the 'representativeness' of this research (Finn et al., 2000). The questionnaire also maintained validity through careful design and layout, not using leading questions, and following a natural order from 'general to specific'; placing the 'crux' questions at the midpoint onwards whilst concluding with personal demographics-based questions (Brunt et al 2017; Veal 2017).

Furthermore, to ensure validity and reliability, a pilot study was conducted via the same social media platform to be used to distribute the final survey (Facebook) and responses from fifteen individuals were collected alongside the additional feedback by email from five individuals to identify any potential issues and errors in usability and understanding. The intention was to test wording, sequence, layout, and completion time (Veal 2017) of the questionnaire designed to ensure that it was fit for purpose and to reduce participant confusion. Based on the feedback obtained, minor changes were implemented, complicated wording was corrected, and familiarity improved by emphasising meaning and providing definitions for key terms identified as confusing (Finn et al., 2000; Veal 2017).

Finally in relation to the distribution of the questionnaire, a record was kept of the specific dates the survey invite was posted to different respondent groups identified for the sampling frame, so that a reminder was able to be sent two weeks after the initial invitation to participate. This follow-up invitation again contained the link to the survey to facilitate and encourage participation.

6.4 Data collection and analysis

The data collection and analysis methods for both phases of the research programme implemented (phase one, historical content analysis and phase two, audience perceptions survey) are discussed in the following sub-sections.

6.4.1 Content analysis data collection

Data sources for the historical comparative content analysis were collected between July 2017 and Spring 2019 (with a few late additions to reflect significant crowd incidents including the COVID-19 pandemic that occurred beyond the data collection period). In total, a database containing information linked to 65 separate historical crowd incidents globally at events was compiled (including documented local, regional, national and international incidents). The database contained 173 individual sources in the form of articles, inquiry reports, eyewitness accounts, images and video links. First, an excel database was created to enable all cases to be displayed visually in chronological order containing all source materials pertaining to each case, alongside some key indicators linked to the case itself to aid in headline comparisons between cases and enable some preliminary counting of aspects such as case types (incidents), causes, and identifying characteristics of the case (scale, event type, triggers, outcomes). Second, all source materials were imported and stored in the NVivo qualitative analysis

software so that the content of all source material could be coded and indexed fully for in-depth thematic analysis before exporting the framework matrices to excel for in depth analysis later.

6.4.2 Audience survey data collection

The questionnaire platform Jisc Online Surveys was used to create and launch the survey. Data collection for the audience perceptions survey took place between 1st June and 15th August 2020 to allow sufficient time to approach and receive permission to post to the various identified Facebook groups, pages and sites as well as sufficient time to re-post the survey link once on each sampled site beyond the original post (in most cases re-posts were made within one to two weeks of the original post to avoid research fatigue). The survey was closed on 15th August 2020 and a headline findings report was produced within Jisc Online Surveys to aid in preliminary analysis. Findings were then exported to SPSS for quantitative analysis.

6.4.3 Approach to qualitative data analysis

Qualitative analysis was employed predominantly to explore in depth the findings of the database created for content analysis, and the same principles were applied to the open questions from the audience survey, which produced in-depth responses to be explored. It is important to note the recognition that the researcher may wittingly or unwittingly make choices about what to register and what to leave out (Miles and Huberman 1994: 56); to address this possible limitation and reduce researcher bias, a decision was made to code all visual and written content captured in the documents linked to each database case, to be refined and sorted into themes as the analytical process progressed. An excel file containing the full crowd incident database was stored in an accompanying one-drive folder for future reference.

According to Ritchie and Spencer (1994) and Brunt (1997), the framework analysis approach is a thematic technique involving five interconnected stages (Table 12). It is a systematic approach that is transparent and allows for pattern recognition, useful in developing theories by assessing and interpreting measures from the perspective of the people they affect, applied to the study context (Ritchie, et al 2014; Ritchie & Spencer, 1994). Each category is studied individually to determine commonalities and unique aspects, which provides in-depth understandings of the complex phenomenon (Braun & Clarke, 2006).

Table 12: The five-step framework analysis process

Stage	Explanation
Familiarisation	<ul style="list-style-type: none"> • The researcher is involved at all stages and therefore, is already aware of the topic. • The researcher further familiarises themselves with the transcriptions and recordings. • There is development of understanding and recognition for the emerging topics of interest. • The research aims and objectives are consulted to ensure relevant data is recognised. • This may require only a selection of the data set if time is limited.
Identifying a thematic framework	<ul style="list-style-type: none"> • Rationalisation and structure is implemented for the topics identified in the familiarisation. • The range of responses are recorded to identify patterns and themes within the data. • Once the key concepts are identified, a framework is created to allow further examination. • The main themes are often between five and seven, with more detailed subthemes. • The researcher must be open-minded to avoid forcing the data to fit prior assumptions.
Indexing	<ul style="list-style-type: none"> • The transcripts are systematically coded for using the thematic framework. • This process is time and labour intensive, requiring time management from the researcher.
Charting	<ul style="list-style-type: none"> • The key themes are separated into charts to determine the sub-topics recognised. • Referenced quotations are inserted into the charts as evidence of the original text. • Referencing is required as the quotes are lifted from the context of the transcripts.
Mapping and Interpretation	<ul style="list-style-type: none"> • The chart information is reviewed to determine consensus, majority and minority views. • The data are compared and contrasted to the overarching research objectives. • Explanations are developed to potentially form a schematic diagram of the phenomenon. • The conclusions should reflect the true opinions and attitudes of the participants.

(Adapted from Brunt 1997; Miles & Huberman 1994; Ritchie et al 2014; Ritchie & Spencer, 1994)

This framework approach was applied manually to conduct analysis on the qualitative open survey questions from the quantitative audience perceptions questionnaire data (see 6.4.2) and via the qualitative software package NVivo (stages 2 and 3 – for coding and indexing), due to the large volume of qualitative source material involved in the crowd incident database (see 6.4.1). Both methods adopted the same analytical approach. NVivo is a qualitative software package that can implement the framework approach effectively; just as for manual analysis, documents were saved into the NVivo software and a coding framework was developed depicting general dimensions, higher order themes and specific sub-categories (Fox et al 2014: 175). Coding was revisited periodically to re-code and re-categorise the data, with themes then emerging in a more purposeful manner by addressing patterns in codes that were explanatory or inferential in some way (Fox et al 2014; Miles and Huberman 1994: 69).

The initial familiarisation stage of the framework analysis process (Step 1) was conducted using the NVivo Qualitative Analysis software to enable a simpler storage solution for the documents, files and texts of relevance and thorough categorisation of the data. All documents sourced and identified in the Crowd Incident Database (excel file) linked to the specific crowd incident case studies (in many cases, one incident contained reference to a range of supporting documents) were imported into the NVivo Qualitative analysis software for analysis. Once the import was complete, all documents linked to the crowd incident database were saved for storage, and initial documentation of incident type, crude coding, and indexing of the emerging themes linked to the specific documents contained within the database was conducted. To familiarise with the extensive range of qualitative information generated, documents were initially coded according to the crowd incident to which the information related to as well as the type and scale of event. Following this, each document's content was reviewed in depth and an initial, crude set of nodes (themes) that was refined over time (Step 2, thematic framework) were generated, linking and indexing these to the specific supporting quotes from the document transcripts for all documents contained within the database (Step 3 - indexing). The initial list of themes or 'nodes' created in conjunction with the detailed content indexing exercise was refined via several iterations in the NVivo database to produce some guideline themes and once satisfied, the framework matrices (Step 4 – charting) were created by scale of event and exported to an excel file for refinement and further qualitative analysis. The excel database containing each of the five framework stages of analysis was stored in an accompanying one drive folder for future reference. It was constructed containing the full and final framework of themes, quotes and relevant associated data for thematic analysis. The tabs contained within this excel database hold the refined and final thematic framework (Step 2), index of incidents and themes (Step 3) and subsequent thematic charting of these overarching themes and associated sub themes (Step 4). The detailed information contained within this thematic analysis database was used to inform the findings discussed throughout Chapter 7 alongside the content analysis data. Therefore, it should be noted that Chapter 7 and, following on from this, Chapter 9, evidence the mapping and interpretation (Step 5) of the framework process.

6.4.4 Approach to quantitative data analysis

Headline quantitative descriptive numerical comparisons were drawn from the crowd incident database where like-for-like information existed around aspects such as crowd size, fatalities, injuries, event type, scale, incident catalyst/trigger and incident types (Appendix 6, p300). For the audience survey, statistical analysis was conducted in SPSS using a range of statistical analysis techniques to analyse the survey findings.

Interpretation by analysing data is necessary to test hypotheses and potentially generate new ones (Brotherton, 2008; Hair, Black, Babin and Anderson 2014). This data analysis was completed using SPSS, which involves organising data through applying each construct and its measure with a variable (Brunt et al 2017; Altinay and Paraskevas, 2008; Veal 2017). SPSS is a data management program designed to conduct statistical analysis including descriptive statistics as well as inferential and multivariate procedures such as factor analysis, cluster analysis and categorical data analysis (Sekaran and Bougie 2009); specifically, inferential statistics (using either bivariate or multivariate analysis) allow inferences to be made about populations to draw conclusions about hypotheses.

The data collected was imported to SPSS along with its coding scheme and was cleaned to identify any missing data and participants who incorrectly filled the survey out, to establish a response rate (Brotherton, 2008). Subsequently, a profile of the respondent characteristics, different variables, and groups was evaluated using descriptive statistics (Veal, 2017) to begin to reveal patterns in the data and go some way to indicating potential respondent and behavioural profiles for further categorical analysis.

Explanatory analysis was then conducted to test the validity of the hypotheses, which involved Chi-Square testing in finding the nature of the association (Finn et al 2000; Veal, 2017). In this case, the high number of valid and significant associations found meant that Cramer's V testing was not required. Chi square tests are non-parametric in that they do not make assumptions about underlying population distribution (Pallant 2013). They explore bivariate relationships between any two variables used in the study measured on a nominal or an ordinal scale (Sekeran and Bougie 2009) by comparing the values measured against what would be expected if there was no association. The conduct of these tests provided further information about the cohort to aid in the creation of a new matrix of safety risk by audience and event type. For the reasons explained in Appendix 4, p296, cluster and factor analysis were not considered to be appropriate for this study.

6.5 Ethical considerations

Both research methods applied to the collection of data to satisfy the thesis aims and objectives highlighted ethical issues to be considered in the collection and analysis of the data obtained (Veal 1997). Ethical considerations are essential pre-requisites for achieving honest and creditable research because of its use of human subjects (Brotherton, 2008; Veal, 2017). Various codes of ethics have been established and span all aspects of the research (Brotherton, 2008).

As for all research conducted with support from the University of Plymouth, the University's ethical guidelines had to be adhered to and an application for ethical approval of research was submitted to the Faculty Research Ethics and Integrity Committee (FREIC), which was approved on 20th December 2018 (Appendix 5, p299). It should be noted that the ethical approval application noted an additional phase of research in the form of a small number of depth interviews however as the data collection exercise progressed, this phase was found to be superfluous and was subsequently omitted from the research process. In total, the ethical approval form outlined six areas for consideration and thus the following procedures were put in place to adhere to the ethical standards throughout the research and data collection process:

a) Informed Consent:

Participants for the online audience survey were given the opportunity following the detailed ethical statement and introduction to either consent to take part in the survey and continue or to withdraw at any time.

b) Openness and Honesty:

Data obtained from the content analysis phase (1) was collated solely from information available in the public domain and participants approached to take part in the online audience survey (phase 2) were made fully aware of the study aims and purpose through a detailed introduction statement provided on page 1 of the online survey, prior to commencement of data collection. This ensured full openness and honesty throughout the data collection process involving human participants.

c) Right to Withdraw

The information (introduction) sheet for the online survey stated that participants may withdraw at any time. This resulted in a considerable number of 'close-outs' from the audience online survey on the first page and subsequent pages, which were then deleted following survey closure and export to SPSS. In total, 679 participants started the survey yet only 512 respondents continued through to completion for use in analysis, resulting in a 75% completion rate.

d) Protection From Harm

No minors or vulnerable adults were knowingly contacted for the purpose of this research. Whilst the nature of the sampling approach for the audience survey relied on participant choice to respond, all data recorded and included was anonymised before inclusion in the results to ensure that the responses of all those individuals involved were unidentifiable within the thesis. The same anonymity procedure was applied to any such individuals requiring protection from harm that could have been identified through the crowd incident database analysis.

e) Debriefing

The audience survey participants were thanked for their participation in advance of and also following their participation. They were also told how to contact the research team and provided with a contact email address if they would like to request any further information about the project or how its findings would be used.

f) Confidentiality

Regarding the online audience survey, respondents accessed the survey via a link from host social media websites that they had visited (and were members of), who were approached in advance via their admin contact details to obtain permission and support of the survey. These host sites included national event and venue-related member groups as well as event-specific online interest groups (all of which were found on the Facebook social media platform). Within the survey responses there was some socio-demographic information, but nothing was required for completion that recorded the respondent's name for analysis or allowed answers to be traceable back to a specific individual in the findings. Participants were offered the opportunity at the end of the survey (prior to submitting their response) to add their email address if they would like the opportunity to enter a draw to win an Amazon voucher. However, it was clearly stated in the questionnaire that this question was non-compulsory, and participants had the opportunity to skip this question if they chose not to provide their details. Contact details provided were used solely to contact the winning respondents and a final check was made after exporting the survey data to SPSS to ensure that any such identifiable data for a specific respondent was deleted prior to analysis, to preserve full anonymity.

Moreover, specific cases from the crowd incident database (phase 1) and the online audience survey (phase 2) participants' information were kept confidential and no individual was identifiable in the report or any further academic publications that may be produced as a result of this study; only agencies and specific events or case studies were referred to where necessary. The primary data will be kept on a CD and stored by the 1st supervisor for 10 years after which time it will subsequently be destroyed.

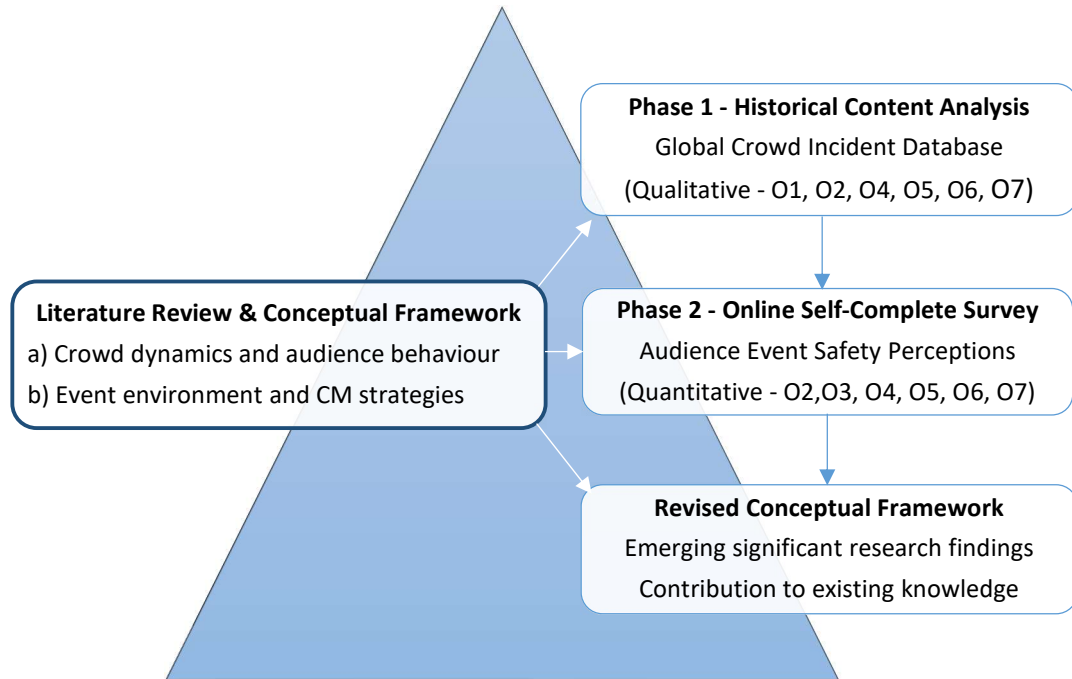
In summary, for content analysis conducted on the crowd incident database, all data obtained and analysed already pre-existed within the public domain and, as such, this reduced issues linked to such considerations as informed consent, privacy and confidentiality; however, ensuring anonymity for any identifiable individuals within the historical sources analysed was of utmost importance, as too was the need to make interpretations of results consistent with the data, and striving for accuracy through high methodological standards (Neuman 2011: 155).

6.6 Chapter Summary

Detailing and exploring the theoretical approach to the research has been crucial in effectively addressing the study aims and objectives and providing a rationale for the research methodology employed. The study adopted a two phased approach to data collection and analysis to fully satisfy the study aims (Figure 9). Phase one of the study involved the creation and analysis of a crowd incident database related to events globally and nationally, dating from the late 1960s up to present day. Following analysis of the findings from this database (predominantly in a qualitative manner) an online audience participant survey was conducted with individuals known to be fans of and attending a range of types of events across the UK, to explore perceptions about crowd safety practices and audience behaviour at UK events.

The intention of this study through satisfying the aims and objectives, has been the development of an event safety management risk matrix that explores crowd dynamics and appropriate safety strategies for different event types, scales and user profiles from the study findings, through detailed and coordinated analysis and exploration of the data generated from the two phases of research. Chapters 7 and 8 explore the research findings from the two-stage research process, and Chapter 9 discusses these findings from the perspective of developing new theory, and introduction of the risk matrix of crowd dynamics, event type and safety strategies. The methodological limitations have been noted throughout this methodology chapter and are discussed again where appropriate in Chapters 9 and 10 as an outcome of this thesis.

Figure 9: Two phased approach to the research study mapped against the objectives



7. Discussion of crowd incident data findings

The purpose of this chapter is to analyse and discuss the information obtained from phase one of the research study through the development of the global crowd incident database (available upon request). Initial content analysis in the form of quantitative counting of key information contained within the crowd incident database was conducted on the database itself to identify emerging headline findings. This content analysis approach was adopted initially to explore prevalent characteristics among the cases in terms of country of incident, breakdown by event type and whether the incident occurred indoors or outdoors, country of incident by incident cause and resulting crowd incident issue, and finally, relationships between the occurring incident and categories of the RAMP and DIM-ICE meta-analysis models (Appendix 6, p300). These headline findings created early indications of relationships and prevalent crowd incident characteristics as findings to be explored further through more detailed qualitative analysis of all related case content documents compiled for each incident contained within the database. Therefore, following the preliminary content analysis of the database, in depth qualitative framework analysis was implemented to provide greater detailed insight on the full range of thematic areas to emerge organically from case information contained within the crowd incident database. The framework analysis process and findings are evidenced in the framework analysis database (stored for future reference and viewing upon request) and the emerging findings and key supporting quotes taken from the case documents are embedded throughout the chapter, alongside the headline content analysis findings.

With this in mind, content analysis and textual framework analysis on the specific cases within the crowd incident database revealed findings in several key areas to be presented and explored throughout this chapter:

- 1) Incident cause by event scale, type and country
- 2) Incident management by event scale and event type
- 3) Event scale and type by incident fatalities and injured
- 4) Incident association with crowd risk analysis factors; and
- 5) Event scale, type, location and incident against crowd incident analysis models

7.1 Findings linked to incident cause by event scale, type and country

When summarising the findings from the content analysis conducted on the crowd incident database, a series of five key themes emerged for discussion linked to the country of incident, issue and its causes or triggers (Table 1, Appendix 6, p300). Further qualitative framework analysis of the case content documents contained within the incident database highlighted supporting detail linked to these themes related to event scale (discussed in 7.3) and event type as well as country. All associated findings have been presented and discussed hereafter.

7.1.1 Behavioural causes

Behavioural causes, specifically those that were negative in origin, were found to be the most prevalent incident trigger overall across most countries with cited incidents, mentioned 37 times. They were cited as triggering a range of incidents including drugs use, riots, gangs and mobs, crowd surges, crushes and trampling, sex attacks and poor social distancing. Pushing, panic, deviance & criminality, social / cultural identification, rushing & fleeing, and rule avoidance were all mentioned multiple times as well. Rivalry was also noted as a cause of the issue on two occasions (both of these cases were associated with football matches).

Further thematic framework analysis conducted on the content of documents linked to the crowd incident case studies contained within the database (see accompanying available framework database) indicated that almost all of the aforementioned incident types, with the exceptions of poor social distancing and rule avoidance (i.e., crowd surges, crushes, trampling, riots, drugs use and sex attacks), were found to be triggered by the presence of the *behaviours and attitudinal mind-sets* mentioned. Scrutiny of the qualitative content uncovered in relation to these themes identified the following key findings:

1. **Panic, fear, fleeing (leading to surges, crushes and trampling):** Almost all cases were linked to **music** events; specifically, and predominantly, *nightclubs at the smaller venue level or major outdoor festivals and concerts*. In smaller venues the causes were linked to *overcrowding, overcapacity venues* and a trigger (i.e., *fire, pepper spray, spooked by a noise that sounded like gunfire, wanting to get out, or real gunfire*). In larger venues, causes were focussed on *terror attacks or the perceived threat of one, to critical density and crushes triggering screaming and pushing to get out*:

"People panicked [seeing the fire], fleeing and screaming immediately afterwards." (Fire, local indoor music event)

"People start screaming and yelling and we start running, said Andrew Akiyoshi... "You could feel the panic. You could feel like the bullets were flying above us. Everybody's ducking down, running low to the ground." (terror attack, mass shooting, music, outdoor, major)

"All of a sudden there were scenes of pushing, panic, shouts, then the music stopped, replaced by howls and screams. It was unbearable." (crowd crush / surge, critical density, major outdoor music festival, rock)

"That's gunshots," a man could be heard saying emphatically on a cellphone video in the nearly half-minute of silence and confusion that followed. A woman pleaded with others: "Get down! Get down! Stay down!" Then the pop-pop-pop noise resumed. And pure terror set in." (terror attack, mass shooting, music, outdoor, major)

2. **Rushing and pushing (leading to surges crushes and trampling):** Mainly found to affect **larger events (major scale)** that are *outdoors*, or *indoor* events where attendees are *rushing to obtain unreserved seats on ingress* (most common for indoor event incidents) or *rushing to get out of a venue or escape something* instead:

“more than 1,000 people - many drunk and high-spirited after a rock concert - rushed into the underpass to escape a sudden spring thunderstorm.” (music, outdoor, regional)

“I saw the entire piazza went in the direction next to the screen to escape, all in a panic,” [after mistaking firecrackers for an explosion or gunshots]... “crowds rushed away from the centre of Piazza San Carlo, crushing people against barriers.” (sports, football, outdoors)

“fans mistook the sound check for the gig, and rushed the doors to get to the stage” (music, major, indoor)

“An Orlando Pirates equaliser sparked a further surge by the fans trying to gain entry as they scrambled to see what had happened.” (sports, football, large scale stadium)

3. **Deviance, disorder and crime (drugs usage):** The underpinning characteristics of incidents of this nature were **EDM music** and **outdoor festivals** of either a **regional or major scale**.

“Anyone who's ever been to a festival knows that drugs are integral to the experience. Police say illegal drugs will slip through the net, but word of mouth after drug-testing can cut risks to festivalgoers” (music, EDM, outdoor, festival)

“Drugs do get in, they can't stop them getting into prisons and as best we try, we can't stop them getting into festivals,” (music, EDM, outdoor, festival)

“...Georgia Jones, 18, and Tommy Cowan, 20, died at Mutiny Festival in Hampshire. Thirteen other people were taken to hospital, with one remaining critically ill... high-strength ecstasy tablets called Silver Audis, which are three times as potent as normal doses of the drug, were in circulation.” (music, EDM, outdoor, festival)

4. **Deviance, disorder and crime (riots, vandalism, mob behaviour, violence):** Either linked to **protests** and strong social identity for a specific cause or connected to **music events of a major scale**, either triggered by cover of anonymity or in protest at sets being cut short or organisers / police pulling the plug on a performance.

“Riots broke out after a peaceful picket of the police station -attacking police, ransacking shops and burning cars” (local, protests / riots, mob attacks)

“the venue was in ruins after a riot that erupted after GNR ended their set early.” (music, major, disorderly fan behaviour)

“due to the intoxicated nature of the crowd and emotionally charged atmosphere, one fan (Meredith Hunter) pulled a gun and was stabbed...” (music - rock, indoors, concert)

“performer Nathan Gale shot old bandmate whilst on stage with new band Damageplan and then fired shots into the crowd, killing 3 others before being shot by police” (music, regional, indoor)

5. **Deviance, disorder and crime (sexual assaults):** Solely noted in relation to **music** events though scale and type of music event was less relevant.

“Zara Larsson added: ‘Damn you people who shamelessly rape a girl in public. Damn you guys who make a girl feel unsafe when they go to a festival.’” (music, pop, outdoor festival, major)

“‘We’ve been angered and saddened to hear reports of sexual assault and harassment in the audience at our shows’, the band wrote” (music, live band, indoor, regional)

6. **Social identity (protests / riots underpinned by racial tension):** linked in the case studies to **protests of a more local / regional scale** initially gathering to *voice public outrage about racially related treatment of an individual*. Typically starting as peaceful, *highly emotional crowd and easily triggered*. On occasion (i.e., 2011 London Riots) *gaining momentum and media attention*, thus attracting others to the cause to *become more widespread incidents*.

“the violence was a rebellion against years of “racist injustice” by police in an impoverished area plagued by racial tension” (protest / riot, regional)

“Witnesses have reported hearing groups of black youths shouting “Killers, killers” at the police...” (protest / riot, regional)

7. **Social identity (fighting underpinned by rivalry):** Cases predominantly linked to **sports events**, specifically **football supporters** (most common) and **horse racing attendees**, and leading to *crowd crush and rioting, fighting or vandalism* incidents.

“Crowd trouble culminated in a surge by Liverpool supporters towards the Italian team's fans.” (sports, football, major, stadium)

“More than 60 people took to Twitter to complain about disorder, with fans clashing, missiles thrown, and children caught up in the trouble.” (sports, football, indoors grounds)

“a group of 10 men appeared to be responsible for the fighting. They were fighting amongst themselves” (sports, horse racing, major hallmark)

Headline content analysis of the database indicated that some behavioural causes of incidents were arguably positive or well-intentioned in origin; such causes were mentioned as an incident trigger 6 times. Key themes included empathy for others (helping), subcultural identity, excitement, revelry & moshing. Specifically, moshing and dancing was a behavioural trait noticed as an issue that caused several incidents within the database. Never bad-intentioned, it was found to contribute to structural failings (mentioned 2 times), earth tremors and even death (mentioned once each). Further thematic framework analysis conducted on the content of

documents linked to the crowd incident case studies contained within the database identified the following key findings:

1. **Moshing and Dancing:** Linked to recorded themes of *physically expressive crowds* (moshing, head banging and crowd surfing) and *excited crowds* (revelry, happiness). Cases were typically connected to **music events** of a **major scale and outdoor**:

“The vibrations were caused by the crowd dancing to the band’s biggest hits.” (music, mixed genre / indie, outdoor festival, regional)

“Our efforts to pull people off of the pile were hampered by the fact that people behind us climbed onto our backs in an attempt to what we now know to be crowd surfing. In some cases, these people dived over our heads onto the pile of bodies.” (music, rock, outdoor festival, major)

“Fellow concertgoers say that some mosh pits formed in the lawn section at the back of the venue, and that Valadez had joined in on a few of them. At one point, about an hour into Slipknot’s set, while the band was performing “Sulfur”, Valadez was apparently hit hard and fell out of the pit and onto the grass.” (music, rock/metal, outdoor, concert, major)

“when the beat kicked in, the front few rows of a crowded outdoor EDM event began to mosh and head-bang...” (music, EDM, outdoor, festival, major)

2. **Excitement:** Linked to themes of *expressiveness, revelry, and happiness* this type of behaviour was most commonly noted in relation to **music events** of a **major scale and outdoor**, with the exception of **sports events**, and specifically **football supporters**, in relation to pitch invasions.

“People dancing at a popular music festival had so much fun that they caused minor earthquakes, a scientist has claimed.” (music, mixed genre / indie, outdoor festival, regional)

“The crowd show excitement on their faces. Once the head-banging stops, the crowd are happy and smiling” (music - EDM, outdoor, festival, major)

“Since their promotion to the Premier League we have seen several cases of away teams scoring a late minute winner or equaliser, the players rushing over to celebrate with their supporters. Consequently, several fans have ended up on the area next to the pitch either because they’ve jumped the barrier or been forced over it due to fans behind them surging forward....” (sports, football, indoor, stadium, major)

3. **Empathy:** This behavioural trait was cited solely in relation to **music events** of a **major scale and outdoors**:

“He seized as people were trying to help him up, so we start calling for help,” said Anthony Mackey, who added that he and other concertgoers tried to push back the crowd to protect Valadez while he was on the ground.” (music, rock/metal, outdoor, concert, major)

"Can we make a path?" he asked. "There's somebody who's very ill out in the audience that we need to get out." (music, mixed, outdoors, hallmark)

Further thematic analysis highlighted performer influence as a trigger for some of the incidents documented. Specifically, this thematic area and its related subthemes were observed most frequently in **music** events and those of a **regional or major scale**. The *impact of negative communication, non-adherence to safety plans* and *misconduct* were all noted as an influencing factor on more than one occasion. Also present once were the *positive influence of communication, performer error, late starts/short sets* and *performer celebrations*.

"The hearing was told revellers raced to leave the club after a DJ announced all coaches outside were about to leave." (music, regional, indoor, nightclub)

"Fred Durst [Limp Bizkit] encouraged hyped and rampaging fans 'not to calm down'" (music, major, outdoor, mixed genre)

"the fire began when the band ignited a pyrotechnic device (similar to a signalling flare) while performing on stage. The flare then ignited flammable acoustic foam in the ceiling. The singer admitted in his testimony to the Civil Police that he held a flag lighted during the show the band did not warn that it would use flags that night." (music, indoor, local nightclub)

"...the venue was in ruins after a riot that erupted after GNR ended their set early." (music, rock, indoor, major)

"...we have seen several cases of away teams scoring a late minute winner or equaliser, [and] the players rushing over to celebrate with their supporters. Consequently, several fans have ended up on the area next to the pitch either because they've jumped the barrier or been forced over it due to fans behind them surging forward." (sports, major, outdoor, grounds and stadia)

"The root cause of the crash was found in the pilots violating the plan and performing "difficult manoeuvres they had not done before." (cultural, regional, outdoor air show)

With regard to the *positive influence of communication* as noted above, framework analysis findings revealed that this was in relation specifically to **music events** of a **major and hallmark scale**. This theme was evident in show stop situations, to encourage the crowd to calm down, make space for emergency services or medical help:

"At the same time I sent a message to the stage to ask the singer with Guns `n Roses to stop the show as we had a problem. The singer immediately stopped the show, and he then used the stage PA to calm the crowd and advise them of the problem." (Music, outdoor, festival, rock, major)

"At a show in San Bernardino, California last month, frontman Corey Taylor went as far as to halt the show until the band's fans calmed down." (Music, rock & metal, outdoor, major)

"Can we make a path? he asked. "There's somebody who's very ill out in the audience that we need to get out."(Music, outdoor, festival, mixed, indie, hallmark)

Lastly in relation to behavioural causes, a range of associated themes were found to be linked to *deviant, thrill seeking and or criminal behaviour*; specifically, these included (all on more than one occasion each) drugs usage, sexual assaults, gangs and mob violence, riots and terror attacks. The majority of qualitative findings and textual evidence linked to these sub-themes were discussed previously near to the beginning of 7.1.1, with the exception of terror attacks (to be explored in detail in 7.1.3 below).

This factor (*deviance, thrill-seeking and or criminal behaviour*) considers the audience as the offender and perpetrator. With this in mind, drugs use was noted as an incident issue on 6 occasions and primarily linked to behavioural traits such as subcultural identity (often dance event-related) and deviance; drugs usage incidents identified were almost all **linked to the UK**. Riots and protests were noted as crowd incidents on 5 occasions mainly linked to behavioural traits such as subcultural identity protest, violence, and looting. Gang and mob behaviour was noted in both the UK (3 occasions) and Italy (1 occasion). Associated traits included rivalry, subcultural identity and violence. All were football-related, as were the incidents attributed to heavy crowd control tactics.

7.1.2 Crowd surges and crushes (capacity and density issues)

Content analysis of the crowd incident database identified that crowd surges, sometimes cited as ‘trampings’ were observed in 13 incidents. Most often these were caused by pushing and rushing either to ingress or egress, or panic, fear and / or fleeing from something. Occasionally these incidents were caused by audience over-excitement and pushing.

“It is believed the stampede was the result of a panic sparked by someone using pepper spray at the venue in the town of Corinaldo...“We were dancing while waiting for the concert to begin when we smelt an acrid odour... we ran towards the exit” (music, local, indoor, nightclub)

“Over 200 injured and 100 killed (including the band’s guitarist) in the rush and panic that ensued to get out of the venue.” (music, local, indoor, nightclub - fire)

“As the crowd surged to gain seats and see the pitch, they over spilled into press boxes. An Orlando Pirates equaliser sparked a further surge by the fans trying to gain entry as they scrambled to see what had happened.” (sports, indoor stadium, major)

Linked to this, crowd crushes were also listed as a prevalent issue, mentioned in 12 incidents. Incidents of either a crush or surge nature were primarily due to problems associated with critical density (i.e., congestion, contraflow & capacity), but also often behavioural causes including pushing, rushing and occasionally, organiser error or poor capacity management procedures.

“The Saudi Interior Ministry stated that the stampede was triggered when two large groups of pilgrims intersected from different directions onto the same street. The area was not previously identified as a dangerous bottleneck. The junction lay between two pilgrim camp sites.” (cultural, religious, outdoor, mega event)

“The victims were crushed to death or suffocated when panic broke out in a congested tunnel... That it turned to panic in a situation like this is fully expected.... there was lots

of pressure and screaming...We told the police that it would soon come to a mass panic...." (music, EDM, major, outdoor)

"a density of approximately 0.5 allowed room for lateral surges (crowd pushing), which were becoming a problem. I witnessed crowd surges that ran across the complete front of the stage." (music, rock, outdoor, major)

"There was a huge number of people at the top of the stairs and the crowd was getting restless. We told people not to push but they continued." (music, regional, indoor)

"fans mistook the sound check for the gig, and rushed the doors to get to the stage" (music, rock, major, indoors)

"He made several requests and at 14.52, Mr Duckenfield gave the order, and the gates were opened. About 2,000 fans then made their way into the ground. Most of those entering through Gate C headed straight for the tunnel leading directly to pens 3 and 4. This influx caused severe crushing in the pens." (sports, football, indoors, major)

Pertinently, **density** was noted in relation to 12 incidents as a contributing factor for multiple crowd incidents documented within the database. Predominantly this was linked to congestion and full or over-capacity pedestrian flow at peak times around nodes, ingress or egress points. Further thematic analysis of incidents linked to the capacity and density issues discussed above, found that congestion-related factors such as *bottleneck and contraflow* issues specifically, affected events of a major or mega scale were a notable trigger of crowd crush and surge incidents (linked to critical density). Event *type* was not as significant as *scale* of event in these cases. As illustrated through the thematic quotes linked to crowd crushes above, incidents observed were commonly connected with too many people trying to go through areas with physical obstructions (i.e., gates, tunnels, terrace pens) and also extremely large crowds of people coming together at ingress/egress points at peak times.

Moreover, textual analysis also found that several incidents were recorded where numbers of attendees far exceeded legal capacity, but these were all noted in **overseas cases** (US, Guatemala, and South Africa) and with the exception of the first example below, were all linked to **sports events** and more specifically, **football**:

"400 people were inside the venue which only had a 250-person capacity." (music, nightclub fire, crowd surge, trampling, US)

"...an excessive number of fans attempted to enter the General Sur section... an excess of attending public... It is believed that near 50,000 people were trying to attend the stadium that day, which days before the event had been determined to be capable of 37,500 people and of a maximum "congested" seating of 47,500." (sports, football, stadium, Guatemala)

"There was a 60,000-capacity crowd in the stadium, but reports suggest a further 30,000 more fans were trying to gain entry to the stadium. Reports also suggest that 120,000 fans were admitted into the stadium." (sports, football, stadium, South Africa)

Where poor capacity management planning was found to be linked to an incident, this was connected to overseas cases, such as those above. It resulted in show-stops, casualties or

fatalities. Interestingly, being over-capacity was not observed in the database as a trigger factor in UK cases of crowd incidents recorded, however, *critical spatial density* due to the strain of peak arrival times upon ingress was a factor in most cases regardless of country (including UK incidents of this nature), for example:

“The high volume of home supporters arriving and the impact of this on the North Stand underpass... the balance of supporter attendance numbers at the match, which was attended by 56,294 supporters.” (sports, football, indoor, stadium)

When examining the outcomes of cases identified within the crowd incident database, incidences of overcapacity observed, whether this was in terms of critical spatial density and bottleneck incidents or poor capacity management, were typically noted to trigger high-risk-to-safety issues including crowd surges, crushes, structural collapses, and crowd disorder.

7.1.3 Terror attacks

Terror attacks were noted in 5 different countries, often with these countries documenting more than one attack incident. Bombings were cited most often across countries. However, some differences in mode of attack by country were evident. Vehicular attacks on crowds, for instance, were more closely linked to European attacks, bombings were solely noted in UK attacks documented within the database, whilst shootings were not noted at all in UK attacks, though were cited in both the US and European countries where terror incidents were recorded.

Table 13: Qualitative evidence linked to the most frequently noted type of terror incident

Attack	Case Details	Textual Evidence
Bombing	US, sports, major	<i>“The bombs exploded 12 seconds apart near the marathon’s finish line.”</i>
	UK, cultural, major	<i>“A huge nail bomb... was detonated by remote-control as the soldiers rode past.... Around two hours after the first blast, a second device exploded under a bandstand in Regent’s Park”</i>
	UK, music, major	<i>“Salman Abedi detonated his suicide bomb on Monday 22 May 2017... the visibly frustrated fire officers were not immediately allowed on to the concourse to help because of communication errors between “risk-averse” officers in charge”</i>
	Norway, political, regional	<i>“Before his attack on Utøya, Anders Breivik killed eight people with a truck bomb outside government offices in Oslo”</i>
Shootings	France, cultural, sports, major	<i>“...further into the centre of Paris, gunmen stormed cafes and restaurants... The gunmen enter the small concert hall and open fire as a performance is underway ... Ninety people are killed...”</i>
	US, music, outdoor, major	<i>“...a gunman, identified as Stephen Paddock, opened fire from the 32nd floor of a Las Vegas hotel, targeting a crowd at a concert some 500 yards away. At least 58 people were killed and about 500 others injured... the attack is coming from a space the venue simply doesn’t control...”</i>
	Norway, political, regional	<i>“I saw Anders Breivik’s police uniform, and thought he was there to help. Then he started shooting.”</i>
Vehicular	Germany, cultural, local	<i>“Terrorists drove a lorry into a busy Christmas market, killing 12 event visitors and injuring a further 56. Eyewitness reports recall the truck demolishing the busy bar.”</i>
	France, cultural, major	<i>“When we stood up, I knew it was a terrorist attack: police were shooting at the truck. We were the only ones in the area to stand up again.”</i>

When specifically exploring the framework analysis data, the threat to events of off-site attacks directed towards on-site attendees (i.e., from a distance or initiated from outside the venue itself) also became apparent in relation to a small number of cases. Several terror attack incidents observed in the UK, European and US examples were affected by this issue:

“9:20 p.m. An explosion occurs outside Stade de France, a sports stadium in Saint-Denis, a suburb north of Paris. 9:30 p.m. - A second explosion occurs outside the stadium. Both blasts happen on the same street, Avenue Jules Rimet. 9:53 p.m. - About 400 meters from the Stade de France, a third blast occurs on Rue de la Cokerie. A total of four people are killed: three suicide bombers and a man who had been walking by....” (sports, culture, music, major, France)

“I would define this as more of a nightmare scenario. The venue, Live Nation, and the various promoters are all focused on securing the facility. This threat was external - via the hotel, where they have no jurisdiction or operational control or ability to manipulate the variables around security, so that in and of itself makes this very complicated and very dangerous. Because if you’re a promoter or an operational entity, it’s difficult to account for those [external] things.... “The painful thing to say here is... this is a situation where the attack is coming from a space the venue simply doesn’t control,” (music, country, outdoor, major, US)

“Salman Abedi detonated his suicide bomb on Monday 22 May 2017... the visibly frustrated fire officers were not immediately allowed on to the concourse [outside venue doors] to help because of communication errors between “risk-averse” officers in charge.” (music, indoor, pop, major, UK)

7.1.4. External factors – weather, fire, and timing issues

Preliminary content analysis on the crowd incident database found that the weather was cited as an incident cause or contributing factor across many countries (cited 11 times). Predominantly it was recognised to be a natural event catalyst (most typically, storms and high winds), forcing cancellations and event evacuations. Cases were most often linked to events of a **major scale** and either **outdoor music events** (non-location specific and either high wind or rain) or **indoor sports events in stadiums** that required evacuation (typically places such as US where extreme weather such as tornados, cyclones, etc, are more common). Many severe weather incidents were linked to structural collapses, crowd crushes / trampling, show-stops, evacuations and cancellations:

“A big gust of wind came through. You could see a lot of people panicking. All the scaffolding and speakers -- all that came crashing down -- and the whole stand just collapsed, said Aaron Richman at the time, who witnessed the collapse.” (music, country, outdoor, major)

Hasselt officials and festival organisers described Thursday's weather conditions as exceptional, and said weather forecasters in the area had not predicted a storm of that intensity.... Within 10 minutes, the storm turned the festival site into a scene of mud and destruction. The sky suddenly turned pitch black and we took shelter waiting for the rain," said festival-goer Catherine Blaise, according to Le Soir newspaper. Then suddenly,

there was a downpour. The wind blew violently. There were hailstones bigger than a centimetre falling... Trees toppled over.” (music, outdoor festival, indie, major)

“Then during the second quarter, lightning prompted a full-scale evacuation.” (sports, American football, indoor, stadium, major)

“Police said that the grounds were muddy after day-long rain, and the victims, who were pressed up against barriers in front of the stage, slipped and fell.” (music, indie, outdoor, festival, major)

Occasionally, organiser error was cited as playing a part in some of these incidents, namely mismanagement of emergency and evacuation procedures. So too, on occasion, was its contribution to crowd crushes and structural collapses (mentioned at least twice for both crushes and collapses). Thematic analysis of such issues (connected to *slow emergency responses*) found that these were linked mainly to **sports** and **music events** (specific type and scale of event was not significant). Specifically, more detailed analysis found a number of events experiencing issues of this nature were documented. Of these, problems were linked to delayed, or no evacuation decision being made resulting in crowds still being 'in the wrong place at the wrong time' (identifiable details removed for anonymity):

“The fair's commission did not have adequate emergency planning in place, according to two investigative reports presented Thursday.... It was nearing 8:45 p.m., and [x] was telling [x] that the concert had to be delayed and the stands cleared. She seemed to agree...she would have local radio programmer [x] "make an announcement to have people leave the area." A few minutes later, [x], who later insisted he was following instructions, went on stage and told 11,000 fans that [the band] was coming out shortly but that threatening weather was approaching. [x] was surprised and perplexed. He thought [they] had concurred that the show should be moved back. An evacuation was never ordered. Three minutes later, the stage's truss roofing and scaffolding tumbled, killing seven people and injuring 58.” (music, outdoors, country, major)

“On the negative side, the evacuation was ordered only 10 minutes before the closest encounter of the tornado, and the vast majority of fans remained unsheltered outdoors.” (sports, American football, indoor, stadium, regional)

Whilst fire was acknowledged as an issue and contributing factor for three incidents, only one was cited to be a natural cause, of shrubland fires and high winds resulting in evacuation:

“British tourists in Croatia have spoken of the chaos that ensued when a fire broke out at the Fresh Island music festival on Tuesday. The venue, on the island of Pag in western Croatia, had to be evacuated after frightening footage showed a huge blaze taking hold on the outskirts of the festival.” (music, urban, outdoor, festival, major)

For two of these incidents, malpractice was recognised; rule avoidance (smoking in wooden stadium stands) and indoor pyrotechnics as well as poor safety procedures during evacuation:

“The blaze ripped through the wooden structure in just a few minutes as Bradford City played Lincoln City in an end-of-season match, leaving many fans unable to get out. Retired Detective Inspector Raymond Falconer has told the BBC documentary - Missed Warnings: the Bradford City Fire - that he interviewed Mr Bennett. Mr Bennett told

officers that he tried to extinguish the fire by pouring coffee onto it but, within minutes, smoke and then flames took hold. Mr Falconer said: "They (the two men) rushed to the back of the stand. Got hold of some policemen. He told them what was happening." (sports, football, grounds and stadia, regional)

"The fire, and the lack of safety precautions at the venue, have prompted widespread concern about Brazil's ability to host major sporting events in the next four years. Investigators also criticised the fact that the venue only had one exit. Attempts by the singer and a security guard to extinguish the fire failed when the extinguisher they used did not work, the witnesses said. Prosecutor Joel Dutra said the four men knew of the possible impact of their actions and failed to act. The fire extinguisher did not work. The nightclub had only one access to the street. The permit issued by the Firemen was over [outdated]" (music, nightclub, indoor, local)

Performer timing-related issues were also noted as triggers for several incidents within the database and were observed to trigger disruptive and dangerously reactive behaviours amongst crowds in attendance that were arguably beyond the control of the organisers themselves:

"The venue was in ruins after a riot that erupted after GNR ended their set early." (music, major, disorderly fan behaviour)

"The hearing was told revellers raced to leave the club after a DJ announced all coaches outside were about to leave. The court was told the club's DJ told students: 'Your coach, your coach, your coach is leaving'." (music, urban, indoor nightclub)

7.1.5 Structural failings and collapse

Structural collapse was mentioned as a significant issue in a range of separate crowd incidents within the database. It was primarily associated with weather factors (high winds) as discussed in 7.1.4 but was also found on other occasions to be linked to fan behaviour (dancing, moshing and excitement):

"Fire officials said the victims were standing on the grate to watch an outdoor performance by the band 4Minute, who are popular across Asia. A video recorded by someone at the concert, which later ran on YTN, showed the band continuing to dance for a while in front of a crowd that appeared unaware of the accident. Meanwhile, dozens of people were shown standing by the ventilation grate, looking into the hole where people had been standing to watch the performance." (music, pop, outdoor, regional)

"Fifteen minutes before the match, after the players have gone back to the dressing rooms, the stand has become increasingly unstable. The stadium speaker asks the spectators not to move too much so that no further metal parts come off." (sports, football, stadium, regional)

"A police investigation has been launched after the roof of a shelter protecting disabled fans collapsed at Rugby Park as Rangers fans celebrated their winner against Kilmarnock the roof collapsed as away supporters celebrated. One supporter was injured after the structure caved in." (sports, football, stadium, major)

Qualitative thematic analysis identified four key scenarios linked to the crowd incidents that occurred within the database: barrier / railing collapse, platform floor collapse, temporary structure collapse and permanent structure collapse. Of these, *barrier or railing collapses* and *temporary structure collapses* were most prevalent. With regard to barrier or railing collapses, neither the event type itself nor scale were particularly significant in relation to this issue. More pertinently, this problem was typically linked to incidents of *critical spatial density* pertaining to *crowd force and pressure*:

“The tragedy is reported to have occurred as people ran toward an exit that connects the venue to a car park via a footbridge, causing a balustrade to give way... ‘The barriers at the exit fell. People fell and were crushed by the crowd’ (music, indoor, nightclub, local)

“At the end of JLS's performance a safety fence was breached, allowing too many people on the square... a metal barrier penning the crowd in collapsed, leaving 60 people needing treatment, West Midlands Ambulance Service said.” (music, indoor, shopping centre, local)

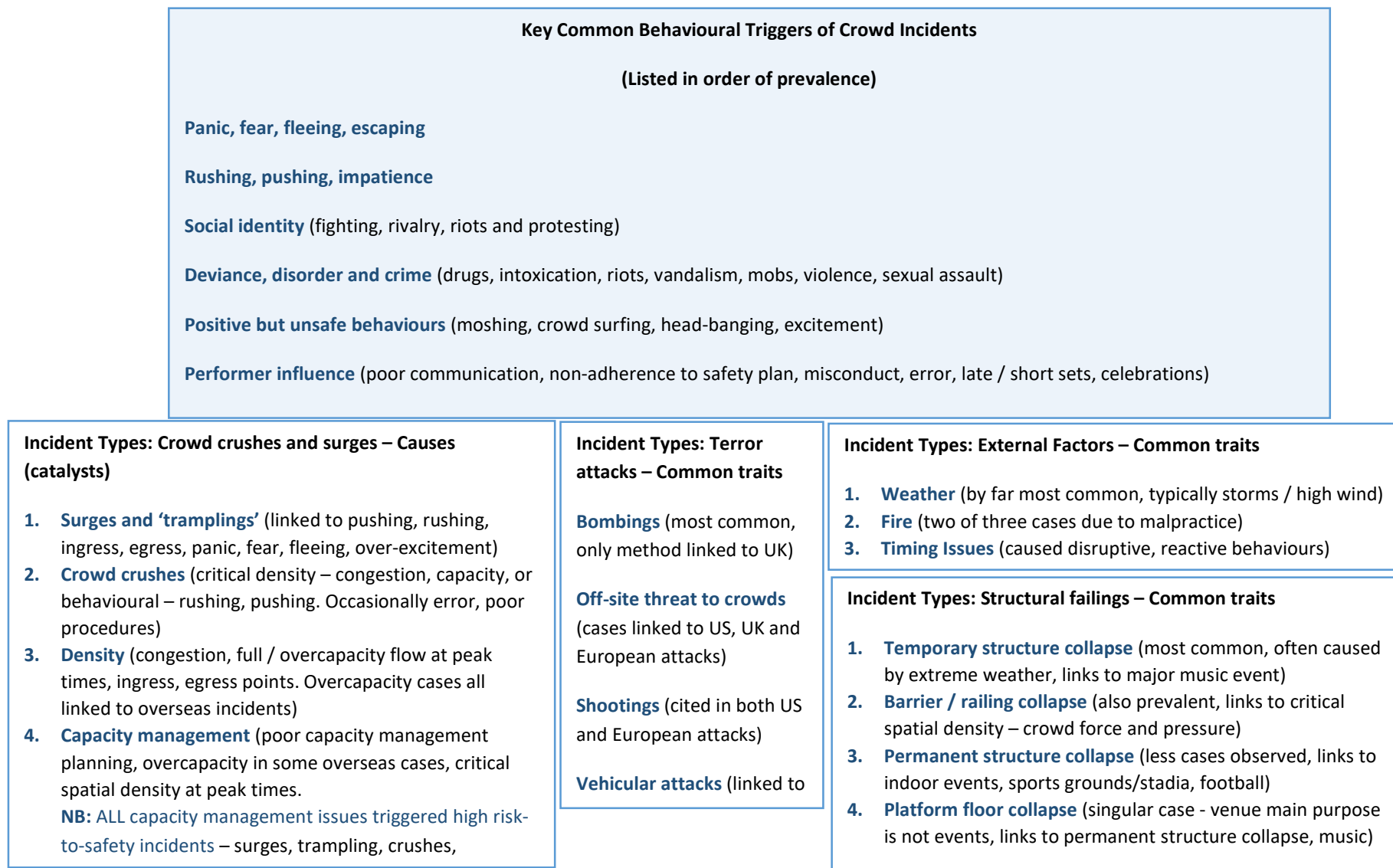
“...the disaster started when a pedestrian bridge railing was bent, causing seven people to fall off a bridge and onto people exiting the tunnel.” (cultural, religious, outdoor, mega)

“The push and pull force of this on the temporary barrier causes it to rock and buckle under the pressure. Security in the pit were seen to be bracing the barrier from the other side to keep it in place....” (music, EDM, outdoor, major)

In terms of *temporary structure collapses*, these were all linked to **music events** of a **major scale** in an **outdoors setting**. Extreme weather incidents contributed to triggering of these structural failures (marquees, staging, fixtures and fittings) in all cases observed, as discussed previously in 7.1.4. Less cases of *permanent structure collapse* were noted among cases observed in the database, but they tended to be connected to **indoor venues, typically sports grounds and stadiums (football)**, with the exception of the car park platform floor collapse recorded for a **music event in an outdoor setting**.

A visual summary of the significant behavioural triggers (catalysts) and incident types discussed above is presented hereafter in Figure 10.

Figure 10: Visual summary of significant behavioural triggers and incident types



7.2 Findings linked to incident management by event scale and event type

In addition to the five key themes related to incident triggers discussed throughout 7.1, two further themes emerged from this set of headline findings around incident identification that centred on incident management linked to the issue and its causes or triggers (Table 1, Appendix 6, p300). Further qualitative framework analysis of the case content documents contained within the incident database highlighted additional supporting detail linked to these themes in relation to event scale (also discussed further in section 7.3) and event type as well as country. All associated findings are presented and discussed hereafter.

7.2.1 Visible crowd management and crowd control strategies

Framework analysis of themes emerging from the crowd incident database identified a number of visible crowd management and control strategies employed to deal with the incidents as they unfolded. In total six sub-themes were prominent across a range of incidents, identified below in Table 14, in order of frequency:

Table 14: Visible crowd management and control strategies

Emerging sub-theme	No of cases identified
<i>Emergency and first response</i>	8
<i>Crowd control (police and security practice)</i>	7
<i>Onsite safety measures</i>	5
<i>Show-stop implementation</i>	5
<i>Communication</i>	3
<i>Crowd control (drugs policies)</i>	2

Emergency and first response strategies were primarily documented in relation to **major events** linked to **outdoor music** (music type was not significant here) or **sports festivals**, and **indoor sports stadiums**. The only regional event featured was linked to **EDM music** and drug usage. Such strategies were often linked to external threats such as terror or extreme weather or natural incidents but were also noted in cases of critical density and crowd surges or collapse. Approaches included on-site treatment / first aid centres, close working between security and emergency services, orderly evacuation of injured people or everyone onsite, communication (i.e., with audience and event staff to coordinate / facilitate response efforts, with loved ones to provide information and help to find missing attendees):

“The venue...had to be evacuated after frightening footage showed a huge blaze taking hold on the outskirts of the festival... we worked with the emergency services to contain the fire over the following hours, transporting festival goers off site when possible and safe.” (music, urban, outdoor, festival, major)

“I was able to establish a cordon around the scene and retrieve the bodies. Tony had managed to establish a line of security people that extended from the pit to us, and this enabled us to pass people back to St. John Ambulance staff, who were stationed at stage right... we discovered one person unconscious. This person was immediately passed to

the pit where he was resuscitated by Steve Johnson, a ShowSec pit team member.” (music, rock, outdoor, festival, major)

“A field hospital was quickly set up to deal with those less seriously injured... Rescuers had to cut through soaking branches to get to the trapped.” (music, folk / cultural, outdoor, festival, major)

“Police have set up an information point to help people find their loved ones and are now investigating what caused the panic.” (sports, football, stadiums, major)

“We noted the different evacuation locations for sheltering, the sheltering-in-place component... During its evacuation of a Gophers game in 2014, Dressler's team shared the radar map with spectators in anticipation of an evacuation. “People were watching the radar, and a lot of them self-evacuated,” (sports, American football, stadium, major)

Cases of crowd control (in terms of police and security practice) were identified to be connected predominantly to **football** and **music events** of a **major scale**, but also noteworthy for **events of all scales** drawing **crowds of black origin and culture** for purposes of either **hiphop/urban music** or **racial protesting**. Key strategies observed included dispersal techniques such as use of pepper spray or firecrackers, segregation techniques such as division / separation of **football home and away fans**, police barricades and kettling to prevent access or for purposes of containment:

“Officers have sealed off a two-mile area around the centre of Brixton and both Brixton and neighbouring Stockwell tube stations have been closed... About 50 police officers in riot gear have formed a line across Brixton's main road to stifle pockets of trouble” (protests, cultural, race-related, regional)

“Despite being a far larger club, Liverpool supporters were allocated the smaller end of the stadium, Leppings Lane, so that their route would not bring them into contact with Forest fans arriving from the south.” (sports, football, stadium, major)

“There were a number of police officers on horses backing towards us which was forcing people toward the walls around the turnstile. No organisation from the stewards who were also pushing people from all angles into a bottleneck.” (sports, football, stadium, major)

“Why'd they [security] have to spray Mace?...People were stacking up on top of each other, screaming and gagging, I guess from the pepper spray.” (music, nightclub in predominantly black neighbourhood, local)

“...the explosion sounds were firecrackers - which he believes may have been set off by undercover police to disperse the crowd.” (music, urban / hiphop, stadium, major)

Furthermore, an outlier finding for this theme noted the need for training police forces of threat posed by snipers or those who may attack from outside the event itself; this could arguably be pertinent in today's terrorism climate.

Also evident in relation to visible CM and CC strategies were the number of *on-site safety measures* that were identified among the case information held within the database. These were most often observed in cases of a **major scale** and extreme weather incidents or health issues

(drugs, coronavirus). Measures included *onsite safety testing and checks, batch processing of crowds (hold and release) and identification of evacuation points, provision of health-related facilities* such as medical centres and hygiene stations, *use of on-site staff to staff and staff to audience comms, and supporter segregation arrangements*. None were found to be more frequently mentioned than others on this occasion.

Show-stop implementation was found to be linked to **music events of a major or hallmark scale**, for reasons such as crowd surges and trappings, crowd disorder or illness. They were also predominantly connected with **rock, metal and indie** event crowds. Techniques used when implementing show-stops included *PA announcements and performer intervention / communication with the crowd to get them to act, or to provide information about the situation:*

“At the same time, I sent a message to the stage to ask the singer with Guns `n Roses to stop the show as we had a problem. The singer immediately stopped the show, and he then used the stage PA to calm the crowd and advise them of the problem.” (music, rock, outdoor, festival, major)

“...the Stones frontman Mick Jagger, trying to intervene on stage, halting the gig to plead ‘Why are we fighting?!’” (music, rock, indoors, major)

“Witnesses said that the band had repeatedly urged fans to pull back from the stage before the accident occurred.... Pearl Jam intervened (reportedly too late) to ask the crowd on count of three to take three steps back repeatedly but density at the front at that point prevented this from happening... Security officers asked the band to stop playing” (music, rock & indie, indoors, major)

“At a show in San Bernardino, California last month, frontman Corey Taylor went as far as to halt the show until the band’s fans calmed down.” (music, rock & metal, outdoors, major)

“‘Can we make a path?’ he asked. ‘There’s somebody who’s very ill out in the audience that we need to get out.’” (music, mixed, indie, outdoors, festival, hallmark)

Communication strategies were observed in relation to **music** and **sports** events of a **major scale**. Communication approaches recorded in incident management were two-fold: first, messages to the crowd / public to guide behaviour, using techniques such as messages and updates via big screens, PA announcements, in person (onsite staff), online press releases, and signage:

“The singer immediately stopped the show, and he then used the stage PA to calm the crowd and advise them of the problem....” (music, rock, outdoor, festival, major)

“We worked with the Vikings’ public relations personnel and our own to get information beforehand to prepare the crowd...We continued to message on the big screens and video boards on the concourse, showing maps and radar, and keeping people up to date on the weather.... We use signage throughout the stadium showing offsite shelter locations...” (sports, American football, stadium, major)

“The only way that we can know for sure what is circulating at festivals and whether dealers are mis-selling NPS to users is to conduct forensic testing on site and to match what users think they have bought with what they have actually bought. This is essential

for public safety, for emergency services to respond appropriately to incidents, and for targeted harm reduction messages to users.... This also allowed our messaging to be more honest, open and informative.” (music, EDM, outdoor, festivals, major)

Second, messages to staff / event team to facilitate swift action, primarily done via radio message, non-verbal gestures and signals, and control room updates:

“I sent a message to the stage to ask the singer with Guns `n Roses to stop the show as we had a problem. The singer immediately stopped the show, and he then used the stage PA to calm the crowd and advise them of the problem...The advance team reached the spot and attempted to send back a radio message... At this point the team leader signalled to me to go to the spot. I instructed Tony Ball to remain in charge of the pit and I advised the control room...” (music, rock, outdoor, festival, major)

Crowd control (drugs policies) were least frequently noted as a theme throughout the crowd incident database although incident cases linked to **EDM** events and **festivals**, and focussed on drug testing facilities and info dissemination at larger events of a higher risk of drug taking:

“The tragic events prompted renewed calls for drug testing, which is provided at a limited number of festivals but was not available at Mutiny, to be rolled out more widely... All UK festivals should provide drug-testing facilities, experts and campaigners have urged.” (music, EDM, outdoor, festival, regional)

“...the drugs outreach organisation set up a nondescript white tent at Secret Garden Party and invited festivalgoers to hand over samples of whatever illicit substances they had managed to smuggle through the gates. In return, they'd be told the true nature of whatever it was they were planning on taking ... we changed our drugs stance from 'Zero Tolerance' to the 'Four P's' - (Prevent, Protect, Prepare, Pursue) which is now becoming a festival industry-wide approach to harm reduction.... The only way that we can know for sure what is circulating at festivals and whether dealers are mis-selling NPS to users is to conduct forensic testing on site and to match what users think they have bought with what they have actually bought. This is essential for public safety, for emergency services to respond appropriately to incidents, and for targeted harm reduction messages to users.” (music, EDM, outdoor, festivals, major)

7.2.2 Organiser error

Finally in relation to the analysis of Table 1 (Appendix 6, p300) from the crowd incident database, findings showed that *organiser error* was cited in 7 incidents in overall. Themes included poor evacuation and emergency procedures (failure to act) or poor site planning and crowd management procedures in hazardous situations (i.e., in relation to weather, fire, structures). In one case (an air show crash), crowds too close to the flight zone was also mentioned.

Further and more detailed thematic analysis identified a series of six key documented organiser error scenarios, incorporating those from the headline analysis above, some of which were noted in several unrelated incidents. These sub themes and their key summarising characteristics are identified in Table 15 below and, following this, a visual summary of all incident management findings is presentation in Figure 11.

Table 15: Organiser error sub-themes and key summarising characteristics

Organiser Error Sub Themes	Key characteristics
Poor site safety	Scale of event was less significant for this issue, with cases in all scales of event. Instead, issues including poor site design creating bottlenecks or ingress / egress incidents, poor building safety tests, poor management of pedestrian flow / contraflow on-site, and poor crowd safety planning (health, risk of injury etc) were prevalent
Slow emergency response (failure to act)	Linked mainly to sports and music events (specific type and scale not significant). Delayed or no evacuation decision made resulting in crowds still being 'in the wrong place at the wrong time', reticence to send emergency services to high risk to safety sites were observed contributing factors to incidents recorded
Poor CM / CC procedures (i.e. heavy-handed police/security)	Observed only in relation to music events (type and scale not significant). Blocked nodes and ingress/egress points was the most commonly noted poor CM/CC procedure across several documented incidents. The overcrowding it caused was linked as a contributing factor of the incident that occurred. Other issues included absence of key tools useful in emergency situations (loudspeakers, fire extinguishers) and procedural issues such as lapsed fire permits, risk-averse decision to prevent emergency services from entering venue for safety reasons.
Mismanagement (negligence, poor decision-making)	Seemingly not significantly linked to one event type or scale. Most commonly seen to be connected to incidents of overcrowding, crowd crushes and critical density, suggesting a failure to notice the escalation in seriousness of a dense crowd situation. This aspect was also seemingly linked to non-adherence to public safety guidelines and practices (coronavirus policies and disregard for safe standing zones)
Lack of visible police / security	Only noted in two incidents from the database but seemingly connected to events of a major scale. Event type did not appear to be significant and no common themes.
Unhelpful police / security	Connected to sports and music events of a major scale, and to incidents of critical density and real or potential threat of crowd disorder. Accounts of these incidents suggest the approach was perceived in a very negative light amongst crowds at the events and those who reported on the incidents.

Figure 11: Visual summary of incident management findings

Observed (Visible) Crowd Management and Control Strategies (See also findings linked to crowd risk analysis factors and crowd incident analysis – 7.4 & 7.5)

- **Emergency and first response:** links to major outdoor music events, indoor sports stadiums, external threats (i.e., terrorism) or extreme weather, critical density or crowd surge / collapse incidents. Approaches included on-site treat centres, security / emergency services collaboration, orderly evacuation procedures, strong staff-to-crowd / staff-to-staff/ staff-to-loved ones communication
- **Crowd Control (police and security practice):** predominantly major sports and music events but also events drawing crowds of BAME profile for hiphop or racial protesting motives. Methods – dispersal techniques (i.e., pepper spray), segregation techniques (i.e., of home / away football crowds), police barricades or kettling to prevent access or for purposes of containment.
- **Onsite safety measures:** mainly links to major scale and extreme weather incidents or health issues (i.e. drugs). Methods – onsite safety testing (i.e., drugs, temporary structures), batch processing of crowds (hold and release), identification of evacuation points, provision of health-based facilities (i.e., medical tent, hygiene stations), staff-to-staff / staff-to-audience communication, supporter segregation arrangements.
- **Show-stop implementation:** observed in music events (predominantly rock, metal or indie crowds) of a major or hallmark scale for reasons such as crowd surges, trampling incidents, disorder or illness. Methods – PA announcements, performer communication (to inform or get crowd to act)
- **Communication:** links to major music and sports events. Approaches were two-fold. 1) **messages to the crowd to guide behaviour** (i.e., big screen messages / updates, PA announcements, front-facing staff to crowd in-person updates, online press releases and signage. 2) **messages to staff / event team to facilitate swift action** (i.e., radio message, non-verbal gestures / signals, control room updates)
- **Crowd control (drugs policy):** least frequently noted but cases linked to EDM events and festivals (regional and major scale). Approaches included drug testing facilities and info dissemination at larger events with a higher risk of attracting those associated with drug taking.

Observed Organiser Errors in Incident Management

- **Mismanagement (negligence / poor decision making):** links to overcrowding, crowd crushes, critical density. Suggests failure to notice the escalation in seriousness of a dense crowd situation. More occasionally linked to non-adherence to public safety guidelines and practices.
- **Poor site safety:** cases included poor site design (bottleneck, ingress/egress node incidents), poor building safety tests, poor management of pedestrian flow / contraflow on site, poor crowd safety planning (i.e., health or risk of injury issue identification).
- **Slow emergency response (failure to act):** Links to sports and music events. Delayed / no evacuation decision and crowds in ‘wrong place at wrong time’, or reticence to send emergency services to high risk-to-safety sites.
- **Poor CM / CC procedures:** link to music incidents. Blocked ingress points were most common - resulting overcrowding seen as incident trigger. Also noted – absence of resources useful in emergencies (i.e., fire extinguisher), procedural issues (i.e., lapsed fire permit), risk-averse decision making.
- **Unhelpful policy / security:** links to major sport and music events, critical density incidents, crowd disorder. Perceived in a negative light by crowds.
- **Lack of visible police / security:** least frequently observed but seemingly connected to events of a major scale. No common themes.

7.3 Findings linked to event scale and type by incident, fatalities and injured

The crowd incidents documented within the database illuminated key findings linked to events of different scales and types and their associated incidents as well as number of fatalities and injured (Table 2, Appendix 6, p300). Overall, in terms of death tolls, **indoor events** (and according to the framework data, predominantly **major scale football sports** and **local scale music nightclub** events to be explained further on) were most impacted by high density, poor evacuation and ingress/egress issues leading to crushes, surges, trampling's and asphyxiation as well as terror attacks:

"There was a 60,000-capacity crowd in the stadium, but reports suggest a further 30,000 more fans were trying to gain entry to the stadium. Reports also suggest that 120,000 fans were admitted into the stadium." (sports, football, stadium, major)

"The fans were crushed together in a section of terrace hemmed in by a concrete retaining wall, which eventually collapsed. Thirty-nine people died." (sports, football, stadium, major)

"Salvini concurred that it is "probably true that there were ... more people inside than was permissible." (music, mixed, indoor, nightclub, local)

Outdoor event fatalities were most impacted by poor capacity management leading to critical density, crushes and surges, or otherwise, they were commonly linked to terror attacks:

"...21 people died due to being crushed whilst using the over-crowded (poorly managed) tunnel entrance to the site.... The moment I got there, I knew it was going to be a nightmare because there were too many people, and the area was way too small." (music, EDM, outdoors, major)

"The bombs exploded 12 seconds apart near the marathon's finish line on Boylston Street. According to Richard DesLauriers, the special agent in charge of the FBI's Boston office, the bombs contained BB-like pellets and nails.... The bombs were contained in pressure cookers, hidden inside backpacks, according to the FBI." (sports, outdoors, street event, major)

Examining the numbers of injured per incident, *crowd crushes and surges* featured heavily at both **outdoor** and **indoor events of all scales**; for outdoor events this involved ingress or egress through a node however (i.e., tunnel or gate) or weather triggering crowds to run for cover. Structural collapses and terror attacks were also linked to high no's of injured in events of more than one scale. Finally, behavioural triggers also featured in incidents across **events of all scales** as discussed previously throughout 7.1; this predominantly links to sports and music events, though it should also be noted these event types occurred most frequently within the crowd incident database. The observed most high-risk incident types and triggers overall were:

- **Indoors events:** High density, poor evacuation and egress procedures leading to *crushes, surges, trampling's and asphyxiation*.
- **Outdoors events:** poor capacity management leading to *critical density, crushes and surges, as well as terror attacks*.

- *Crowd crushes and surges* featured heavily in number of injured attendees **at both indoor and outdoor events for events of all scales**. Most frequently, this was linked to *ingress/egress through a node or weather triggering crowds to run for cover*. **Structural collapse and terror attacks** were also linked to higher number of injuries for events across more than one scale.

Some behavioural causes (specifically, deviant and expressive but unsafe behaviours such as moshing, pushing) were featured heavily in documented incidents across all scales. These were seemingly most prevalent in certain types of **music & sports events**, though it should be noted that the database contained higher numbers of music & sports incidents than other genres. Exploring these content analysis findings from the crowd incident database by scale of event revealed further insights. To categorise event incidents by their scale, Bowdin et al's (2011) typology of events by size was adapted to include an additional 'regional' category as it was noted that arguably there were a number of events within the database that were too large and too much of a draw to fit into the 'local' events category but equally without enough of the defining characteristics to include them as a major event; Bladen et al (2012) provide specific typologies useful in categorising music and sports events, which include a 'regional' category in terms of event scale. The adapted typology is therefore outlined below in Table 16 and applied to the crowd incidents contained within the database hereafter and in 7.4.

Table 16: Adapted typology of events by scale

Local	Regional	Major	Hallmark	Mega
Community-based. Targeted mainly at local audiences. Staged for their social, fun and entertainment value	Wider draw than a local event. Sometimes part of a wider tour, competition or derby. Targeted at regional audiences and lacking key traits of a major event.	Events that by their scale and interest are capable of attracting significant visitor numbers, media coverage and economic benefits.	Events that become so identified with the spirit or ethos of a town, city or region that they become synonymous with the name of the place and gain widespread recognition and awareness	Affect economies and reverberate in the global media. Yield extraordinarily high levels of tourism, media coverage, prestige, or economic impact for the host community (Getz 2005: 6)
✓	✓	✓	✓	✓

(Adapted from Bladen et al 2012; Bowdin et al 2011)

7.3.1 Local events level

First, at the local level, **nightclubs** were the most common location for music incidents, typically linked to crushes, surges and trampling on egress. **Sports events** centred on hostility at derby-based **football** matches. Terror attacks were observed twice at this level, at **political and cultural events**. There were slightly more **indoor** than outdoor incidents recorded too:

“Over 200 injured and 100 killed (including the band’s guitarist) in the rush and panic that ensued to get out of the venue.” (music, live band, indoor, nightclub, local)

“The hearing was told revellers raced to leave the club after a DJ announced all coaches outside were about to leave.” (music, urban, indoor, nightclub, local)

“The catalyst for the use of Pava Spray came very soon into half time. On CCTV around 25 to 30 men were seen kicking and stamping ‘at something’ by an exit door. Simultaneously two stewards who’d seconds before radioed for help, disappeared off the screen and were uncontactable on their radios. It therefore followed that there was an immediate concern that the two stewards could be under genuine attack... the belief was [they] were in danger”. (sports, football, indoors, local)

Local sports incidents recorded no severe injuries or fatalities, whilst all other types generated significant numbers of injuries and fatalities; these mainly linked to evacuating or escaping **indoor venues (nightclubs)** via capacity and egress issues, terror attacks & other event-specific triggers such as fire, structure collapse, and weather incidents. The highest death toll was seen at a **music event (indoor nightclub fire and trampling)** whilst the highest injury tolls were seen in relation to an air show crash, nightclub fire & structure collapse respectively.

7.3.2 Regional events level

At the regional level, behavioural causes were responsible for the majority of incidents across types of events. Specifically, deviance (drugs, sexual attacks, violence and criminal damage as well as rule avoidance were prominent in incidents of this scale):

“Overnight, looting took place in Tottenham Hale retail park and nearby Wood Green. The following days saw similar scenes in other parts of London, with the worst rioting taking place in Hackney, Brixton, Walthamstow, Peckham, Enfield, Battersea, Croydon, Ealing, Barking, Woolwich, Lewisham and East Ham.... The violence continued for five hours and 22 people were arrested and charged with public order offences, theft and criminal damage and three police officers were hurt.” (protest, cultural, regional)

“deaths of two young people believed to have taken high-strength ecstasy at a festival over the bank holiday weekend. Five people have been arrested for drug-related offences after Georgia Jones, 18, and Tommy Cowan, 20, died at Mutiny Festival in Hampshire. Thirteen other people were taken to hospital, with one remaining critically ill.” (music, EDM, outdoor, festival, regional)

“We’ve been angered and saddened to hear reports of sexual assault and harassment in the audience at our shows”, the band wrote.... “It’s clear that this disturbing trend is on the rise in our industry, and that ignoring or dismissing the problem sends a very clear message to perpetrators that they can get away with their behaviour.” (music, live, indoor, regional)

Music and political protest incidents noted the most behavioural triggers. Also noteworthy is that all drug / riot issues were noted at **outdoor events**, but for sports, all incidents were recorded in **stadiums**. Political events saw the least fatalities and injuries at the regional level. Whereas crowd surges, crushes and the weather were most attributed to high numbers of casualties. At this level, the number of injured was considerably higher than the number of fatalities in all cases across all genres; the three incidents with the highest injury tolls were linked

to a fire inside stands at a football match, a crowd surge / trampling after a music event, and a crowd crush at a cultural celebration respectively.

7.3.3 Major events level

At the major and international event level, this scale of event was most heavily documented in the database, arguably suggesting that as scale increases, so too does event risk. The majority of incidents at this level occurred at **outdoor events** (for **music and cultural events**; for **sports**, the majority took place in **stadiums**). Specific incident and trigger types were observed to potentially be linked to certain types of events, namely:

- Moshing / headbanging behaviour at rock & outdoor festivals.
- Drugs usage was associated with EDM events.
- Crowd surges & crushes were observed at rock, EDM, football, and cultural events.
- Terror attacks were mainly linked to outdoor events (6 outdoor vs 3 indoor) at pop (in), country, horse racing, marathons, political (1 in), & cultural events (1 in).
- Weather & fire triggers were mainly linked to music events (pop, hip-hop, mixed, country) and US football.
- Deviant behaviours (drugs use, rioting, sexual assault, pitch invasions, hostility and violence) were noted at EDM, mixed, hip-hop, football & horse racing events.
- Structural failings were observed at mixed genre & country music events as well as football events.

Also at this major event level, approximately half of the **music and sports** incidents cited within the database recorded fatalities and injuries:

“...500 concert goers injured and 21 people died due to being crushed whilst using the over-crowded (poorly managed) tunnel entrance to the site...The moment I got there, I knew it was going to be a nightmare because there were too many people, and the area was way too small.” (music, EDM, outdoor, festival major)

“About 400 meters from the Stade de France, a third blast occurs on Rue de la Cokerie. A total of four people are killed: three suicide bombers and a man who had been walking by... Three attackers armed with assault weapons arrive at the Bataclan concert hall. The gunmen enter the small concert hall and open fire as a performance is underway by the US band Eagles of Death Metal. Ninety people are killed....” (music and Sports, indoor and outdoor, major)

“...at least 83 people were killed and more than 140 injured as an excessive number of fans attempted to enter the General Sur section... It is believed that near 50,000 people were trying to attend the stadium that day, which days before the event had been determined to be capable of 37,500 people and of a maximum "congested" seating of 47,500.” (sports, football, stadium, major)

“Thirty-nine people died and 600 were injured when fans were crushed against a wall that then collapsed during the European Cup final between Liverpool and Juventus,... the fans were crushed together in a section of terrace hemmed in by a concrete retaining wall, which eventually collapsed.” (sports, football, stadium, major)

“Scaffolding that collapsed during a storm and killed seven people during the Indiana State Fair last year was not up to standard...” (music, country, outdoor, major)

Of these, **sports** events recorded higher death tolls (terror attack, crowd surge, & crush respectively), whilst both **music and sports** incidents recorded high numbers of injured; for music events these were due to terror attacks and a crowd crush incident respectively) and for **sports**, these were due to a structural collapse, crowd surge/trampling and terror attack respectively. Extremely high numbers of injured (c.500 or more) were seen at several **major music events** (crowd crush, 1, and terror attacks, 2) and **sports events** too (structural collapse, crowd surge/trampling and terror attack respectively).

7.3.4 Hallmark events level

For hallmark events, three appeared in the database however, likely due to their scale, all were **outdoor events** and triggered by behavioural causes. Two incidents (both **sports horse-racing** events) exhibited negative behaviours (rule / public safety guidance avoidance, fighting):

“Doctor Bharat Pankhania, an expert in infectious disease and public health, said events like Cheltenham Festival “without a doubt create a source for spreading infection”... crowds across four days this week expected to top 250,000, flocking to the Cotswolds from Britain, Ireland and France... There are now calls for an investigation into whether the decision to allow the festival to go ahead led to a rise in coronavirus cases in the county.” (sports, horse racing, festival, outdoor, hallmark)

Whenever you have an exceptionally large gathering of people, many of whom will have been drinking for long periods the pragmatist may say that a degree of trouble is sadly inevitable... a group of 10 men appeared to be responsible for the fighting. They were fighting amongst themselves; they weren’t fighting with our security staff.” (sports, horse racing, festival, outdoor, hallmark)

The third hallmark scale incident was a music event and exhibited positive behaviours in the way of empathy for others and compliance), with framework analysis uncovering key statements within its case content such as *“Can we make a path?... There's somebody who's very ill out in the audience that we need to get out.”* Almost no injuries or fatalities were recorded at incidents of this scale.

7.3.5 Mega events level

Two incidents documented within the crowd incident database fit the profile of a mega event but they by far recorded the highest number of fatalities, with over 1000 in each case. These were the crowd crush and trampling incidents in Mecca during the Hajj annual **religious** pilgrimage in 1990 and 2015 respectively. Both were connected to extremely high-density crowds in attendance and a trigger for the incident that occurred, namely, a structural failing and contraflow /bottleneck issue respectively:

“...the disaster started when a pedestrian bridge railing was bent, causing seven people to fall off a bridge and onto people exiting the tunnel.” (cultural, religious, outdoor, festival, mega)

“The Saudi Interior Ministry stated that the stampede was triggered when two large groups of pilgrims intersected from different directions onto the same street. The area was not previously identified as a dangerous bottleneck. The junction lay between two pilgrim camp sites.” (cultural, religious, outdoor, festival, mega)

7.4 Event scale, type, location and incident against incident analysis models

The crowd incident analysis undertaken (Table 3, Appendix 6, p300) adopted the principles and concepts put forward by Fruin (1993) and Endsley (1995) regarding safety factors linked to understanding dynamic, changing operational environments, in this case, applied to the event setting. Overall, incidents linked to event **space** were most common across event scales and types. According to Fruin’s Force, Information, Space, Time model (FIST) developed in 1993, the configuration, capacity, and traffic processing capabilities of assembly facilities (spaces) determine degrees of crowding, and this includes standing and seating areas, projected occupancies, and the practical working capacities of corridors, ramps, stairs, doors, escalators, and elevators. The three-level model of Situational Awareness was developed by Endsley in 1995 to understand aviation tasks in a dynamically changing environment, and follows a chain of information processing, from perception of the elements in the environment (level 1), to comprehension of the current situation (level 2) and prediction of future status (level 3). The emerging findings indicate that the extent to which these levels of awareness are present is often linked to fail points in event safety strategies. Incidents where situational awareness (Endsley 1995) was not observed primarily involved issues linked to **crowd force** and **profile**, resonating with Fruin’s (1993) force of the crowd or the crowd pressure (including dynamic aspects such as pushing, rushing and other negative behaviours as documented in 7.1.1). These overall findings also correlate with the most high-risk incident types and triggers previously identified in 7.3, (Table 2, Appendix 6, p300) including:

- 1) **Indoors:** High density, poor evacuation and egress procedures leading to crushes, surges, trampling’s and asphyxiation
- 2) **Outdoors:** poor capacity management leading to critical density, crushes and surges, as well as terror attacks
- 3) Crowd crushes and surges featured heavily in number of injured attendees at both **indoor and outdoor** events for events of all scales
- 4) Most frequently, this was linked to **ingress/egress through a node** or **weather** triggering crowds to run for cover. **Structural collapse** and **terror attacks** were also linked to higher number of injuries for events across more than one scale

As mentioned previously in 7.1 and 7.3, behavioural causes (deviant and expressive-but-unsafe behaviours such as moshing, pushing) were featured heavily in documented incidents across all scales of event. These were most prevalent in certain types of **music & sports events**, though the database contained higher numbers of music & sports incidents than other genres.

7.4.1 Local level incident analysis

At the local level, nightclubs were the most common location for music incidents, typically linked to crushes, surges and ‘tramplings’ on egress. Sports events centred on hostility at derby-based football matches. Terror attacks were observed twice at this level, at political and cultural events.

Issues linked to **event space** were most prevalent at this level, followed by **time**, and then **force and information** jointly. Moreover, evidence of **situation awareness was lacking** at this scale of event compared with all others, which showed more awareness, planning and positive action was required to deal with the incidents recorded as they arose. **Music, cultural and political events** in particular arguable showed a lack of situational awareness at this level.

7.4.2 Regional level incident analysis

At regional level, behavioural causes were responsible for the majority of incidents across types of events. Specifically, deviance (drugs, sexual attacks, violence and criminal damage as well as rule avoidance were prominent in incidents of this scale). **Music and political incidents** noted the most behavioural triggers. Also noteworthy when consulting the database, was that all drug / riot issues were noted at **outdoor events**, but for **sports**, all incidents were recorded in **stadiums**.

Incidents linked to **space and time** were jointly prevalent at the **regional level**. Only the **cultural event** at this level (bridge crowd crush) showed a lack of situational awareness as the incident took hold, with *all other event types showing at least partial awareness in some of the documented incidents* and attempts to mitigate incident impact.

7.4.3 Hallmark level incident analysis

For hallmark events, only three appeared in the database however, likely due to their scale, all were outdoor events and triggered by behavioural causes; two incidents (both **sports events**) exhibited negative crowd behaviours (rule / public safety guidance avoidance, fighting) and one exhibited positive behaviour, in the way of empathy for others and compliance).

Incidents documented at the hallmark scale were linked equally to **information and space**. The **music event** cited in the database showed **full situational awareness** and positive crowd management strategies (show-stop to remove an ill audience member from near front of stage during the headline act at an outdoor event with over 100,000 capacity). The **sport events** (continuation of the four-day Cheltenham horse racing festival near to the start of the COVID-19 pandemic in the UK in mid-March 2020 and a fighting incident at Goodwood Festival) demonstrated only **partial awareness**; for the fighting incident, arrests were made on-site and the injured were treated as well as informing police for further investigation. However, for Cheltenham Festival, whilst sanitation stations were provided as well as temperature checks, reports linked to the incident documented *poor social distancing efforts amongst the high volume of crowds at the event and a lack of action from organisers to police social distancing better or call the event off as it was happening*.

7.4.4 Major / Mega level incident analysis

As noted previously in 7.3 at the major event level, this scale of event was most heavily documented in the database, arguably suggesting that as scale increases, so too does event risk. The majority of incidents at this level occurred at outdoor events (for music and cultural events; for sports, the majority took place in stadiums). As noted in 7.3, specific incident and trigger types were observed to potentially be linked to certain types of events, namely:

- Moshing / head-banging behaviour at rock & outdoor festivals.
- Drugs usage was associated with EDM events.
- Crowd surges & crushes were observed at rock, EDM, football, and cultural events.
- Terror attacks were mainly linked to outdoor events (6 out vs 3 in at pop (in), country, horse racing, marathons, political (1 in), & cultural events (1 in).
- Weather & fire triggers were mainly linked to music events (pop, hiphop, mixed, country) and US football.
- Deviant behaviours (drugs use, rioting, sexual assault, pitch invasions, hostility, violence) were noted at EDM, mixed, hiphop, football & horse racing events.
- Structural failings were observed at mixed genre & country music events as well as football events.

At this major level of event, incidents were predominantly linked to event **space**, although **information and force** were also common. Only **partial situational awareness** was evident at **music events** of this scale; incidents where situational awareness was not observed primarily involved issues linked to **crowd force and profile**. This was similar for sports events of this scale, though **football events showed awareness** and management of crowd profile issues more strongly (i.e., control of hostility and fighting). Terror attacks linked to the two **political events** at this scale **showed greater awareness** by comparison.

Only two incidents documented within the crowd incident database fit the profile of a mega event. Both were linked to **Force, Space and Time**. These were the crowd crush and trampling incidents in Mecca during the Hajj annual pilgrimage in 1990 and 2015 respectively. **Situational awareness was also lacking** at these **cultural mega events** as areas filled to extreme critical density with worshipping crowds (in 1990, through a tunnel at egress) and where, in the 2015 incident, it was reported that the area had not been identified previously as a potential bottleneck despite being a key route to site at a point where two arterial ingress routes to the Jamarat bridge combined. These incidents recorded by far the highest death tolls of incidents recorded in the database.

A visual summary of the combined crowd incident findings linked to event scale presented in sections 7.3 and 7.4 above is displayed in Figure 12 below. This summary identifies the key incident findings by event scale in relation to location and event type, injuries and fatalities, key issues and triggers (catalysts) as well as incident analysis evidence.

Figure 12: Visual summary of crowd incident findings by event scale (findings from 7.3 and 7.4)

Overall Findings

Location and event type: High density, poor evacuation / egress procedures leading to crushes, surges, asphyxiation (**Indoors**). Poor capacity management (leading to critical density, crushes, surges), and terror attacks (**Outdoors**). Prevalent in certain types of music & sports events (explored below).

Injuries and fatalities: Crowd crushes / surges featured heavily at events of all scales often linked to ingress or egress through a node (i.e. entrance tunnel or gate), and structural collapses and terror attacks were also linked to high no's of injured in events of more than one scale (**Indoors & outdoors**). **Indoor event fatalities** (primarily major scale football sports and local scale music nightclub events) were most impacted by high density, poor evacuation and ingress/egress issues leading to crushes, surges, trampling and asphyxiation, as well as terror attacks. For outdoor events specifically, as well as ingress / egress issues, weather was also often linked to triggering temporary structure failing or crowd surges as they rushed for cover. **Outdoor event fatalities** were most impacted by poor capacity management leading to critical density, crushes and surges, or otherwise, they were commonly linked to terror attacks.

Key issues and triggers: Crowd crushes, surges featured heavily in no. of injured attendees (**indoor & outdoor events, all scales**). Most often linked to ingress/egress through a node, weather triggering crowds to run for cover. Structural collapse and terror attacks also linked to higher no. of injuries for events across more than one scale. Behavioural causes (**deviant plus expressive-but-unsafe behaviours such as moshing, pushing**) featured heavily too in observed incidents across all event scales.

Incident analysis evidence: Incidents linked to event space were most common across event scales and types. Incidents where situational awareness was not observed primarily involved issues linked to **crowd force** and **profile**, resonating with Fruin's force of the crowd or the crowd pressure (**including dynamic aspects such as pushing, rushing and other negative behaviours as documented in 7.1.1**). These findings correlate with the **most high risk incident types and triggers identified in 7.3**.



Local Event Scale Findings

Location / type: Nightclubs most common for music. Football grounds mainly for sports. Terror attacks were observed twice, at political and cultural events.

Injuries & fatalities: no severe injuries or fatalities (sports). Highest death toll – indoor nightclub fire and trampling (music). Highest injury tolls – air show crash, nightclub fire & structure collapse respectively (cultural, music, business)

Key issues & triggers: capacity issues, crushes, surges, trampling on egress evacuating / escaping indoor venues (music) and hostility at derby-based football matches. Terror attacks on political / cultural targets and other event-specific triggers such as fire, structure collapse, and weather incidents.

Incident analysis evidence: Issues linked to event space were most prevalent, followed by time, then force and information jointly. No situation awareness evident - more awareness, planning and positive action was required to deal with incidents as they arose. Music, cultural and political events in particular arguably showed a lack of situational awareness at this level.

Regional Event Scale Findings

Location / type: Music & political protest events most prominent – mainly behavioural triggers. All drug / riot issues seen at outdoor events. All sports issues in stadia.

Injuries & fatalities: Least fatalities and injuries – political events. Crushes and the weather were most attributed to high no's of casualties. No. of injured was considerably higher than the no. of fatalities in all cases across all genres. Highest injury tolls – fire inside the stands (sports, football), egress crowd surge / trampling (music), and a crowd crush at a cultural celebration on a bridge.

Key issues & triggers: Behavioural causes were responsible for the majority of incidents across types of events at this scale. Deviance issues (drugs, sexual attacks, violence, criminal damage, and rule avoidance) were prominent.

Incident analysis evidence: Incidents linked to space and time were jointly prevalent. Only the cultural event (crowd crush) at this level showed a lack of situational awareness as the incident took hold, with all other event types linked to incidents showing partial awareness and attempts to mitigate impact (i.e. drugs policies).

Major Event Scale Findings

Location / type: Majority of issues occurred at outdoor events (music, cultural events) or in stadiums (sport events). **Unique traits (Music):** Moshing / headbanging behaviour (rock & outdoor festivals), drugs usage (EDM events). Crowd surges & crushes were observed at rock, EDM, football, and cultural events. Terror attacks were mainly linked to outdoor events (6 outdoor vs 3 indoor). Weather & fire triggers linked to music events (pop, hiphop, mixed, country) and US football. Deviant behaviours (drugs use, rioting, sexual assault, pitch invasions, hostility and violence) were noted at EDM, mixed, hiphop, football & horse racing events. Structural failings were observed at mixed genre & country music events as well as football events.

Injuries & fatalities: Approximately half of the music and sports incidents cited recorded fatalities and injuries. **Sports** events recorded higher death tolls (terror attack, crowd surge, & crush respectively), whilst both **music and sports** incidents recorded high no's of injured.

- for music events these were due to terror attacks and a crowd crushes respectively) and
- for sports, these were due to a structural collapse, crowd surge /trampling and terror attack respectively.

Extremely high numbers of injured (c.500 or more) were seen at several major music events (crowd crush,1 and terror attacks, 2) and sports events too (structural collapse, crowd surge, and terror attack respectively).

Key issues & triggers: Major events most heavily documented; possible that as scale increases, so too does event risk. Behavioural issues perceived as 'deviant' or 'thrill-seeking' (drugs, hostility, pitch invasions, physical expressiveness, rioting, sexual assault, violence) – EDM, rock, mixed genre, outdoor and hiphop events (**music**) plus football & horse racing (**sports**). Density issues (crowd surges and crushes, structural failings) – rock, EDM, mixed genre and country (**music**), **football** and **cultural** events of this scale. External factors (extreme weather, fire and terror attack incidents) – link to **music** events (pop, hiphop, mixed, country) and **US football** either of an outdoor or stadium-based nature.

Incident analysis evidence: Predominantly linked to event space, although information and force were also common. Only partial situational awareness was evident at music events of this scale; incidents where situational awareness was not observed primarily involved issues linked to crowd force and profile. Similar for sports events of this scale, though football events showed awareness and management of crowd profile issues more strongly (i.e. control of hostility and fighting). Terror attacks linked to the two political events at this scale showed greater awareness by comparison.

Hallmark Event Scale Findings

Location / type: All were outdoor events; two horse racing and one music event (mixed genre).

Injuries & fatalities: No recorded fatalities. Relatively low no. of injuries as linked to isolated incidents (fighting, and illness). Threat of public health issue linked to one sports event (potential coronavirus spreading event).

Key issues & triggers: All triggered by behavioural causes. Two cases (sports horse-racing events) – negative behaviours (rule/public safety guidance avoidance, fighting). Third (music) – positive behaviours (empathy, compliance).

Incident analysis evidence: All linked equally to information and space. Full situational awareness and positive crowd management strategies (music). Partial awareness (sports) i.e. arrests made, the injured, police informed at

Mega Event Scale Findings

Location / type: Both were outdoor religious, cultural events; linked to crowd surge, crush, critical density issues and trampling.

Injuries & fatalities: By far the highest number of documented fatalities observed in relation to these two events, with more than 1000 in each case.

Key issues & triggers: Extremely high density crowds and an incident trigger (namely, a structural failing and contraflow /bottleneck issue).

Incident analysis evidence: Both incidents of this scale were linked to Force, Space and Time. Situational awareness was lacking; areas filled to extreme critical density with worshipping crowds and non-identification of potential bottleneck on site despite being a key node for two arterial ingress routes. By far the highest number of documented fatalities observed, with more than 1000 in each case.

7.5 Incident association with crowd risk analysis factors

Key findings linked to incident association with crowd risk analysis factors demonstrated some important themes for further scrutiny (Table 4, Appendix 6, p300). The crowd risk models applied to the database were the RAMP and DIMICE tools developed by Still (2013; 2022) and are useful in the determination of risk factors by event component to enable safer event planning in future (Figure 13).

7.5.1 RAMP: routes, areas, movement, profile

RAMP analysis of the crowd incident database identified the following key findings:

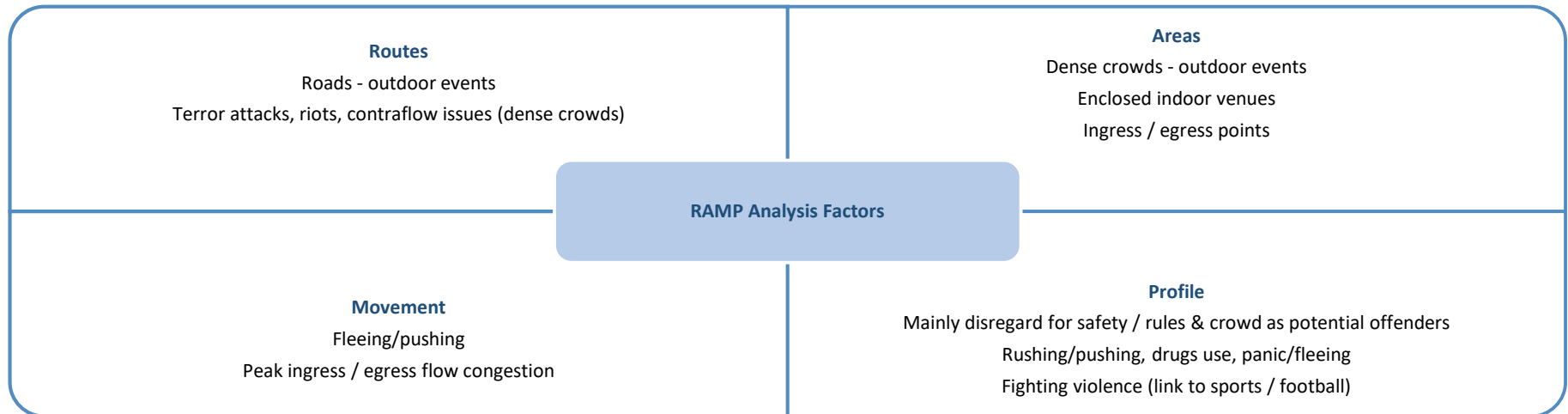
- a) Routes. This aspect most commonly affected roads around **outdoor events**. Especially in terror attacks but also linked to riots and contraflow issues (due to dense crowds).
- b) Areas. Incidents were noted in dense crowds at **outdoor events, enclosed indoor venues** and at *ingress/egress points*.
- c) Movement. Issues were primarily linked to *fleeing /pushing* of fellow audience members and during *peak ingress and egress* flow congestion.
- d) Profile. Primary profile characteristics seen to contribute to crowd incidents included *disregard for safety/rules*, and *crowd as potential offenders* (i.e., terror attacks). Also *rushing/pushing, drugs use, panic/ fleeing, fighting/ violence* (incidents of this nature were all linked to **sports**, and predominantly **football**)

7.5.2 DIMICE: design, information, management, ingress, circulation, egress

DIM-ICE analysis of the incidents documented identified the following key factors:

- a) Design. Poor security measures (ingress, site safety, and capacity) were most prevalent. Exposure to attack risks at open outdoor events, structural collapses were also common.
- b) Information. Poor decision making (mostly delayed evacuation calls) was most prominent. Also evident was poor event to emergency services & inter-staff communications. Positively, good drugs education strategies were mentioned twice.
- c) Management. Positive management related factors included cancellations and show stops made, onsite treatment for intoxication / illness (good first response) and audience arrests / bans. Most frequently noted negative issues linked to this factor were over-capacity events, criticism for failure to cancel, poor emergency responses, questioned event safety, and heavy-handed police control. Also documented for several incidents each were unsafe ingress and egress processes and a failure to protect guests.
- d) Ingress. High density congestion through entrance node was most prevalent. Also noteworthy is observation of good drugs education strategies at the ingress point.
- e) Circulation. Equally most prevalent were incidents occurring inside a venue (indoors events) and in dense crowds at outdoor events. Incidents that occurred during the event schedule on-site (in terms of timing) were also frequently observed.
- f) Egress. Evacuations were the most prevalent egress incident noted (mainly for weather and fire causes). Also noteworthy are incidents linked to fleeing in panic / fear to escape, and dense crowds exiting venue at the same time (peak egress flow congestion).

Figure 13: Visual summary of incident findings by crowd risk factor



DIM-ICE Analysis Factors

Design	Information	Management	Ingress	Circulation	Egress
<ul style="list-style-type: none"> • Poor security measures (ingress, site safety, capacity) • Risk of attack exposure (open, unsecured outdoor venues) • Structural collapse 	<ul style="list-style-type: none"> • Poor decision making (delayed evacuation calls) • Poor event to emergency services / inter-staff comms • Good drugs education strategies 	<ul style="list-style-type: none"> • Pos: Cancellations / show stops, onsite medical treatment (good first response), audience arrests / bans • Neg: Over-capacity, failure to cancel, poor emergency responses, questioned safety, heavy-handed police control. • Also (less common) unsafe ingress and egress processes and failure to protect guests. 	<ul style="list-style-type: none"> • High density congestion through entrance node. • Good drugs education strategies - ingress point 	<p>Equally prevalent:</p> <ul style="list-style-type: none"> • Incidents occurring inside indoor venue • Incidents in dense crowds - outdoor events • Incidents linked to event schedule timings also common (but less so than those above) 	<ul style="list-style-type: none"> • Evacuations most prevalent (weather and fire causes). • Also, fleeing in panic / fear to escape, and dense crowds exiting venue (peak egress flow congestion)

7.6 Findings by event type: music, sport, cultural and religious event profiles

Secondary analysis of the crowd incident database headline and framework analysis summary findings presented the opportunity to explore findings by event type in order to begin to build a profile of the key characteristics linked to the different groups of event types documented (with the intention of contributing to the satisfaction of A3, '*To develop matrix of event type by crowd dynamics and safety strategies*'). From the summary tables presented within (Appendix 6, p300), the grouped event types observed within the crowd incident database were as follows:

1. Music events
2. Sports events
3. Cultural / religious events
4. Business events (insufficient cases and incident data connected to this event type for deeper analysis)

For analysis purposes, protests and political events were included within the cultural and religious events category for analysis due to the underpinning cultural motives connected to them. However, it should be noted that there was an insufficient number of cases documented and thus a lack of incident data linked to the business events category to enable more in-depth thematic analysis of this grouped event type. Therefore, only music events, sports events and cultural and religious events have been explored in greater detail. Moreover, in relation to cultural and religious event incidents, whilst there was sufficient data documented in relation to this type of event to explore trends in associated characteristics, they were not as frequently documented in relation to crowd incidents experienced as the music and sports event types. Furthermore, for analysis purposes, protests and political events were included within the cultural and religious events category due to the underpinning cultural motives connected to them. The findings linked to common incident characteristics by grouped event type profile are presented in Figures 14-16 hereafter, and Appendix 7, p313 contains a detailed description of these findings.

Figure 14: Music event incident profile

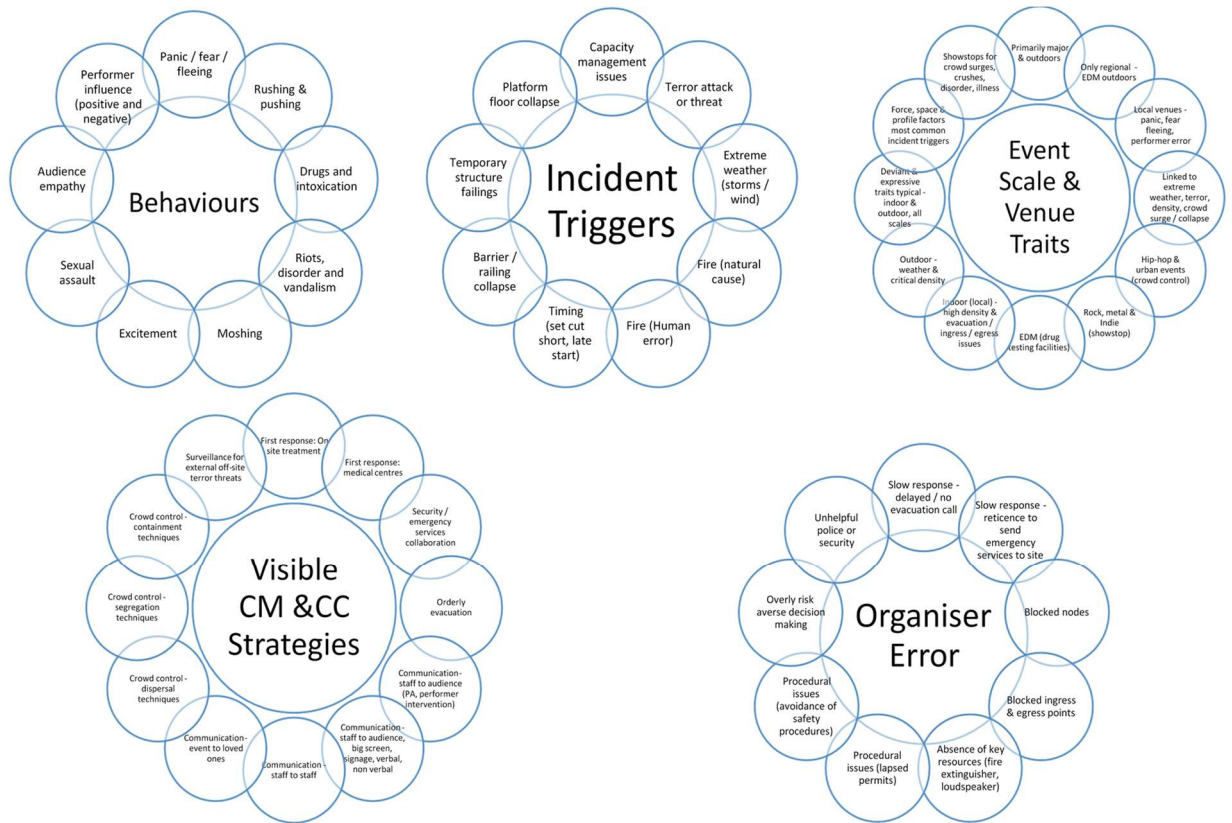


Figure 15: Sports event incident profile

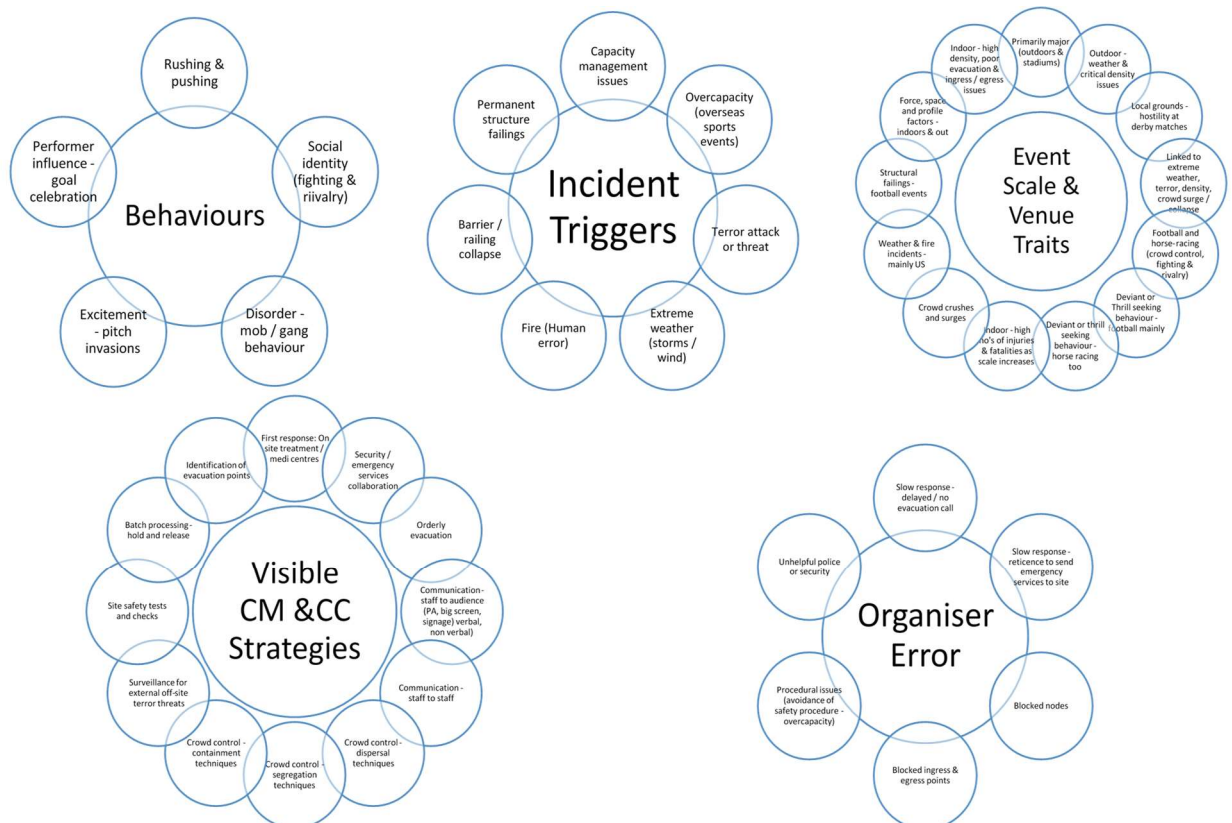
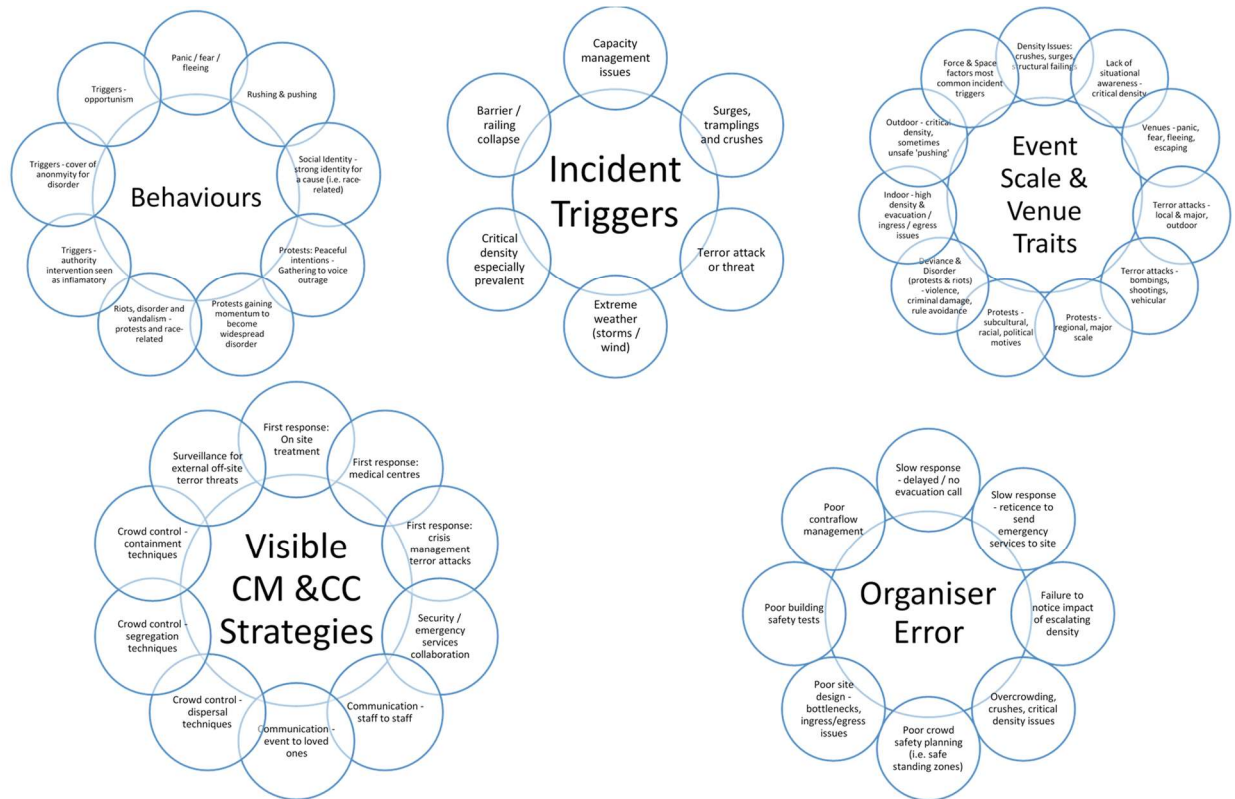


Figure 16: Cultural and religious event incident profile



7.7 Summary of Phase 1 findings: global crowd incident data

This chapter sought to analyse and discuss the information obtained from phase one of the research study through the development of the global crowd incident database. The data were analysed in two ways. First, headline findings were identified through a content analysis of the database. This explored specific aspects, characteristics and incident features linked to the cases contained within the database, to establish an overview of the key findings and topic areas. To reiterate, the tables linked to this content analysis can be found in Appendix 6, p300.

Second, qualitative framework analysis was implemented to explore the thematic patterns underpinning the textual, image and video-based information contained in the range of documents collated for each crowd incident case within the database. The full crowd incident excel database and the framework analysis excel database have been stored for future review and this chapter has interpreted the findings of both databases as well as including the key thematic summary charts and supporting quotes throughout, thus contributing to the satisfaction of the final step (Step 5) of the qualitative thematic framework analytical process.

Table 17 below displays all significant findings from Research Phase 1 linked to the crowd incident database, in accordance with the objective it aids in satisfying.

Table 17: Significant findings from Research Phase 1: Crowd incident database

Objective	Significant Findings
<p>01 To create a database of historical crowd incidents at events to document their defining characteristics and outcomes for further analysis</p>	<ul style="list-style-type: none"> • Satisfied. • Crowd incident excel database and thematic framework analysis database of the crowd incident data available to view in a one drive folder. • Crowd incident excel database headline findings in Appendices x-y. • Thematic framework analysis findings integrated throughout chapter 7 above.
<p>02 To analyse audience behaviour at events and the influencing factors involved</p>	<p>The most common behaviours noted within the crowd incidents documented were as follows (in descending order of prevalence):</p> <ul style="list-style-type: none"> • Panic, fear, fleeing and / or escaping • Rushing, pushing, impatience • Social identity (fighting, rivalry, riots and protesting) • Deviance, disorder and crime (drugs, intoxication, riots, vandalism, mobs, violence, sexual assault) • Positive but unsafe behaviours (moshing, crowd surfing, head-banging, excitement) • Performer influence (poor communication, non-adherence to safety plan, misconduct, error, late / short sets, celebrations)
<p>03 To identify the audience perspective in relation to CM and control at events</p>	<p>Not addressed through the crowd incident database. See findings in Ch. 8.</p>
<p>04 To determine common types of crowd safety incidents at events and explore patterns in the catalysts (triggers) for their occurrence</p>	<p>Incident Types: Crowd crushes and surges – Causes (catalysts)</p> <ol style="list-style-type: none"> 1. Surges and ‘tramlings’ (linked to pushing, rushing, ingress, egress, panic, fear, fleeing, over-excitement) 2. Crowd crushes (critical density – congestion, capacity, or behavioural – rushing, pushing. Occasionally error, poor procedures) 3. Density (congestion, full / overcapacity flow at peak times, ingress, egress points. Overcapacity cases all linked to overseas incidents) 4. Capacity management (poor capacity management planning, overcapacity in some overseas cases, critical spatial density at peak times. <p>NB: ALL capacity management issues triggered high risk-to-safety incidents – surges, trampling, crushes, structural collapses, crowd fighting or disorder)</p>

		<p>Incident Types: Terror attacks – Common traits</p> <ol style="list-style-type: none"> 1. Bombings (most common, only method linked to UK) 2. Off-site threat to crowds (cases linked to US, UK and European attacks) 3. Shootings (cited in both US and European attacks) 4. Vehicular attacks (linked to European attacks) <p>Incident Types: External Factors – Common traits</p> <ol style="list-style-type: none"> 1. Weather (by far most common, typically storms / high wind) 2. Fire (causes - two of three cases due to malpractice) 3. Timing Issues (catalyst for disruptive, reactive behaviours) <p>Incident Types: Structural failings – Common traits and catalysts</p> <ol style="list-style-type: none"> 1. Temporary structure collapse (most common, often caused by extreme weather, links to major music event) 2. Barrier / railing collapse (also prevalent, links to critical spatial density – crowd force and pressure) 3. Permanent structure collapse (less cases observed, links to indoor events, sports grounds/stadia, football) 4. Platform floor collapse (singular case - venue main purpose is not events, links to permanent structure collapse, music)
05	To identify common components in CM and event safety planning across a range of events	<p>Visible crowd management strategies implemented</p> <ul style="list-style-type: none"> • Emergency and first response: links to major outdoor music events, indoor sports stadiums, external threats (i.e., terrorism) or extreme weather, critical density or crowd surge / collapse incidents. Approaches included on-site treat centres, security / emergency services collaboration, orderly evacuation procedures, strong staff-to-crowd / staff-to-staff/ staff-to-loved ones communication • Crowd Control (police and security practice): predominantly major sports and music events but also events drawing crowds of BAME profile for hip-hop or racial protesting motives. Methods – dispersal techniques (i.e., pepper spray), segregation techniques (i.e., of home / away football crowds), police barricades or kettling to prevent access or for purposes of containment. • Onsite safety measures: mainly links to major scale and extreme weather incidents or health issues (i.e. drugs). Methods – onsite safety testing (i.e., drugs, temporary structures), batch processing of crowds (hold and release), identification of evacuation points, provision of health-based facilities (i.e., medical tent, hygiene stations), staff-to-staff / staff-to-audience communication, supporter segregation arrangements. • Show-stop implementation: observed in music events (predominantly rock, metal or indie crowds) of a major or hallmark scale for reasons such as crowd surges, trampling incidents, disorder or illness. Methods – PA announcements, performer communication (to inform or get crowd to act) • Communication: links to major music and sports events. Approaches were two-fold. 1) messages to the crowd to guide behaviour (i.e., big screen messages / updates, PA announcements, front-facing staff to crowd in-person updates, online

		<p>press releases and signage. 2) messages to staff / event team to facilitate swift action (i.e. radio message, non-verbal gestures / signals, control room updates)</p> <ul style="list-style-type: none"> • Crowd control (drugs policy): least frequently noted but cases linked to EDM events and festivals (regional and major scale). Approaches included drug testing facilities and info dissemination at larger events with a higher risk of attracting those associated with drug taking. <p>Observed Organiser Errors in Incident Management</p> <ul style="list-style-type: none"> • Mismanagement (negligence / poor decision making): links to overcrowding, crowd crushes, critical density. Suggests failure to notice the escalation in seriousness of a dense crowd situation. More occasionally linked to non-adherence to public safety guidelines and practices. • Poor site safety: cases included poor site design (bottleneck, ingress/egress node incidents), poor building safety tests, poor management of pedestrian flow / contraflow on site, poor crowd safety planning (i.e., health or risk of injury issue identification). • Slow emergency response (failure to act): Links to sports and music events. Delayed / no evacuation decision and crowds in ‘wrong place at wrong time’, or reticence to send emergency services to high risk-to-safety sites. • Poor CM / CC procedures: link to music incidents. Blocked ingress points were most common - resulting overcrowding seen as incident trigger. Also noted – absence of resources useful in emergencies (i.e., fire extinguisher), procedural issues (i.e., lapsed fire permit), risk-averse decision making. • Unhelpful policy / security: links to major sport and music events, critical density incidents, crowd disorder. Perceived in a negative light by crowds. • Lack of visible police / security: least frequently observed but seemingly connected to events of a major scale. No common themes.
06	To explore links between audience behaviour, event crises and efficacy of CM strategies	<p>RAMP analysis findings:</p> <ul style="list-style-type: none"> • Routes. This aspect most commonly affected roads around outdoor events. Especially in terror attacks but also linked to riots and contraflow issues (due to dense crowds). • Areas. Incidents were noted in dense crowds at outdoor events, enclosed indoor venues and at ingress/egress points. • Movement. Issues were primarily linked to fleeing /pushing of fellow audience members and during peak ingress/egress flow congestion. • Profile. Primary profile characteristics seen to contribute to crowd incidents included disregard for safety/rules, and crowd as potential offenders (i.e., terror attacks). Also rushing/pushing, drugs use, panic/ fleeing, fighting/ violence (incidents of this nature were all linked to sports, and predominantly football). <p>DIM-ICE analysis findings:</p>

		<ul style="list-style-type: none"> • Design. Poor security measures (mainly ingress, site safety, and capacity) were most prevalent. Exposure to risk of attack at open unsecured outdoor events were also common as were structural collapse issues. • Information. Poor decision making (mostly delayed evacuation calls) was most prominent. Also evident was poor event to emergency services & inter-staff communications. On a positive note, however, good drugs education strategies were mentioned twice. • Management. Positive management related factors included cancellations and show stops made, onsite treatment for intoxication / illness (good first response) and audience arrests / bans. Most frequently noted negative issues linked to this factor were over-capacity events, criticism for failure to cancel, poor emergency responses, questioned event safety, and heavy-handed police control. Also documented for several incidents each were unsafe ingress and egress processes and a failure to protect guests. • Ingress. High density congestion through entrance node was most prevalent. Also noteworthy is observation of good drugs education strategies at the ingress point. • Circulation. Equally most prevalent were incidents occurring inside a venue (indoors events) and in dense crowds at outdoor events. Incidents that occurred during the event schedule on-site (in terms of timing) were also frequently observed. • Egress. Evacuations were the most prevalent type of egress incident noted (mainly for weather and fire causes). Also noteworthy are incidents linked to fleeing in panic / fear to escape, and dense crowds exiting venue at the same time (peak egress flow congestion).
07	To classify event risk based on crowd dynamics, as well as internal and external environmental factors	<p>Overall Findings by Event Type (sufficient incidents were recorded for music, sports and cultural events to profile these event types)</p> <ul style="list-style-type: none"> • Music events: <ul style="list-style-type: none"> • Behaviours: heightened emotions (panic/fear/fleeing, excitement, empathy), physical/ energetic actions (rushing, pushing, moshing), deviance and criminality (drugs and intoxication, riots and disorder, vandalism, sexual assaults), performer influence (at times positive but also found to negatively influence crowd emotions, actions or behaviours to become unsafe and trigger incidents). Strong links for music event profile to expressive and / or deviant behaviours (common across all events scales). • Triggers / catalysts (mainly crowd force, space or profile): predominantly temporary structural failings due to weather primarily or critical density (staging, barriers, platforms, etc), poor capacity management (leading to critical density, crowd crushes, trampling), and external factors such as entertainment timing issues (leading to disorder). • Venue scales and traits: most commonly linked to major outdoor music events (triggered by weather or critical density). Numerous regional (solely linked to EDM events and drugs usage) and local scale incidents too (all nightclub incidents linked to high density, egress/evacuation issues, panic/fear/fleeing or performer error). • Sub-profile observations: hip-hop and urban events (heavy crowd control strategies), rock, metal and indie events (show-stop incidents due to crowd crushes), EDM events (drugs usage, intoxication, fatalities and drug testing facilities) • Incident management: communication, crowd control and emergency/first response strategies were most common. Most common errors were blocked thoroughfares, slow response and overly risk-averse decision-making. To a lesser

extent, procedural issues and absence of key resources (i.e., loudspeakers, fire extinguishers – though these were not UK-based incidents) were noted too on several occasions each.

- **Sports events:**

- **Behaviours:** primarily linked to football incidents. Physical behavioural actions (rushing, pushing, and excitement) were common. Players were influential on crowds (leading to pitch invasions, crowd surges, crowd collapse). Strong social identity manifesting as fighting and rivalry among attendees and gang/mob disorder (this identity was also noted for horse-racing events).
- **Triggers / catalysts (mainly crowd force, space or profile):** incidents linked to critical density (crushes, surges) and venues being overcapacity (solely linked to overseas sports events) were most common. Permanent structural failings, barrier/railing collapses were closely linked to critical density incidents.
- **Venue scales and traits:** predominantly linked to outdoor sports events (due to extreme weather and critical density) or major events in stadiums (due to high density, poor evacuation procedures or ingress/egress issues). Very high numbers of injuries and fatalities were observed as the scale of indoor sports event increased.
- **Sub-profile observations:** local sports grounds (hostility between supporters, mainly football), football and horse-racing events (heavy crowd control tactics, fighting and rivalry, deviant and disorderly thrill-seeking behaviour), structural failings almost exclusive to football (event scale was irrelevant).
- **Incident management:** crowd control, evacuation, communication, batch processing at ingress, and first response strategies were most commonly observed for sports events. Predominant organiser errors observed were linked to poor management of critical crowd density (blocked thoroughfares, ingress/egress routes, slow response and risk-averse decision making, procedural issues plus unhelpful police or security).

- **Cultural events (including protests and political events):**

- **Behaviours:** strong social identity / association with a cause – religious (pilgrimage and ceremony attendance) and protest events (to voice concerns i.e., race-related). Initially peaceful and well-intentioned. Religious events affected by critical density (exacerbated by pushing and panic). Protests gathered momentum and media interest to move from peaceful protest to widespread disorder incidents (linked behaviours - riots, emotion, vandalism, cover of anonymity for disorder, opportunism and inflammatory authority intervention)
- **Triggers / catalysts (mainly crowd force, space or profile):** primarily linked to critical density among the crowds in attendance. These capacity management issues were linked to barrier and railing collapses, surges, crushes and trampling. Terror attacks were also noted
- **Venue scales and traits:** issues related to critical density were most commonly observed, for both indoor and outdoor events (i.e., crushes, surges, structural failings, lacking situational awareness, unsafe pushing, and evacuation, ingress/egress issues). Terror attacks were most frequently associated with cultural events (all outdoor).
- **Sub-profile observations:** Protests (regional and major scale) were most often linked to racial subcultural or political motives resulting in deviance and disorder (riots, violence, criminal damage, and rule avoidance). Mega-scale religious events lacked situational awareness of the severity of risk associated with the density, flow and pushing issues experienced (organiser and crowd perspectives).
- **Incident management:** most commonly observed were first response and crisis management strategies (terror attacks), and strategies for managing crowds in disorder (protests). For the cultural incidents linked to critical density,

an absence of effective capacity and crowd management strategies was observed suggesting poor situational awareness and a failure to notice the impact of escalating density (severe congestion, escalating density, crushes, poor site design in terms of bottlenecks, contraflow and ingress/egress issues).

Overall Findings by Scale

- **Location and event type:** High density, poor evacuation / egress procedures leading to crushes, surges, asphyxiation (Indoors). Poor capacity management (leading to critical density, crushes, surges), and terror attacks (Outdoors). Incidents prevalent in certain types of music & sports events especially.
- **Unique traits (all scales):** Moshing / headbanging behaviour (rock & outdoor music festivals), drugs usage (EDM events), crowd surges & crushes (local scale nightclubs, plus rock, EDM, football, at the local, regional and major scales and cultural events at the regional, major and mega scale). Weather & fire triggers (pop, hiphop, rock, mixed, and country music events, plus football). Deviant behaviours including drugs use, rioting, sexual assault, pitch invasions, hostility and violence (EDM, mixed, hip-hop, football & horse racing events). Structural failings (mixed genre & country music events as well as football events).
- **Injuries and fatalities:** Crowd crushes / surges featured heavily at events of all scales often linked to ingress or egress through a node (i.e., entrance tunnel or gate), and structural collapses and terror attacks were also linked to high no's of injured in events of more than one scale (Indoors & outdoors). **Indoor event fatalities** (primarily major scale football sports and local scale music nightclub events) were most impacted by high density, poor evacuation and ingress/egress issues leading to crushes, surges, trampling and asphyxiation, as well as terror attacks. For outdoor events specifically, as well as ingress / egress issues, weather was also often linked to triggering temporary structure failing or crowd surges as they rushed for cover. **Outdoor event fatalities** were most impacted by poor capacity management leading to critical density, crushes and surges, or otherwise, they were commonly linked to terror attacks. **Extremely high no of injuries and fatalities** were noted at the two cultural mega events (poor capacity management), plus certain types of major scale music and sports events. Moreover, approximately half of the music and sports incidents cited recorded fatalities and injuries. **Sports events recorded higher death tolls** (terror attack, crowd surge, & crush respectively), whilst both **music and sports incidents recorded high no's of injured**.
 - for music events these were due to terror attacks and a crowd crush incidents respectively) and
 - for sports, these were due to a structural collapse, crowd surge /trampling and terror attack respectively.**Extremely high numbers of injured (c.500 or more)** were seen at several major music events (crowd crush,1 and terror attacks, 2) and sports events too (structural collapse, crowd surge, and terror attack respectively).
- **Key issues and triggers:** Crowd crushes, surges featured heavily in no. of injured attendees (**indoor & outdoor events, all scales**). Most often linked to ingress/egress through a node, weather triggering crowds to run for cover. Structural collapse and terror attacks also linked to higher no. of injuries for events across more than one scale. Behavioural causes (**deviant plus expressive-but-unsafe behaviours such as moshing, pushing**) featured heavily too in observed incidents across all event scales.
- **Incident analysis evidence:** Incidents linked to event space were most common across event scales and types. Incidents where situational awareness was not observed primarily involved issues linked to **crowd force** and **profile**, resonating with Fruin's force of the crowd or the crowd pressure (**including dynamic aspects such as pushing, rushing and other negative**

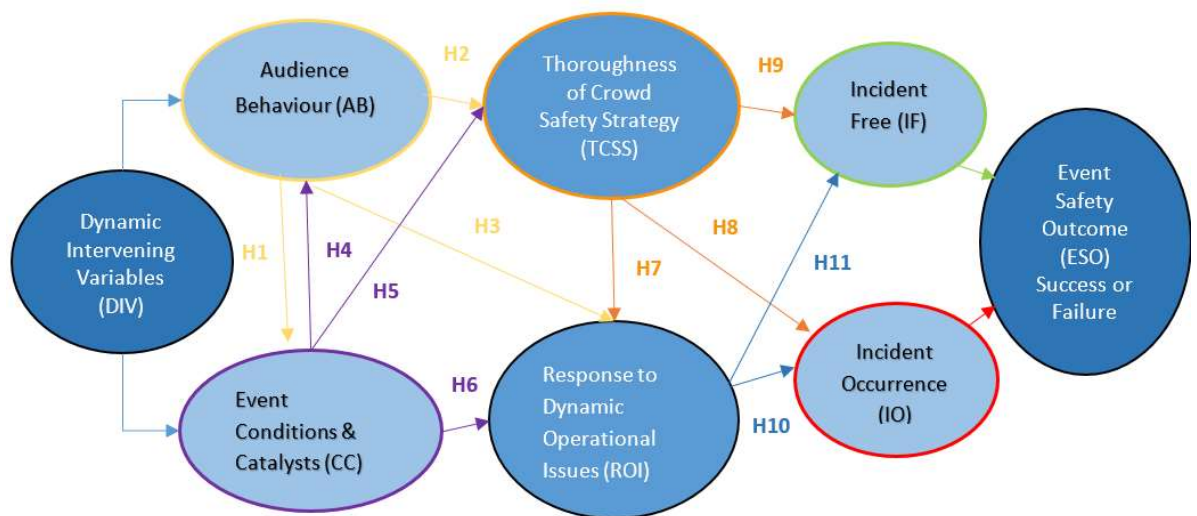
behaviours as documented in 7.1.1). These findings correlate with the most high-risk incident types and triggers identified in 7.3, as follows:

- **Indoors events:** High density, poor evacuation and egress procedures leading to crushes, surges, trampling's and asphyxiation
- **Outdoors events:** poor capacity management leading to critical density, crushes and surges, as well as terror attacks
- **Crowd crushes and surges** featured heavily in number of injured attendees at both indoor and outdoor events for events of all scales
- Most frequently, this was linked to ingress/egress through a node or weather triggering crowds to run for cover. **Structural collapse and terror attacks** were also linked to higher number of injuries for events across more than one scale

Finally with regards to the findings from the crowd incident database presented above (Table 17), when considering them against the conceptual framework (Figure 6, p71), there is a considerable amount of data relevant to the audience profile, contextual background and the event environment, site planning and crowd management and control components of the crowd safety strategy (pre-event and during the operational phase). Moreover, findings have emerged linked to the dynamic intervening variables (associated with the event conditions, catalysts and audience profile), again demonstrating applicability of the conceptual framework. However, emerging qualitative findings from the crowd incident database also note the close interlinking relationships between these variables at all stages of event planning and delivery, and that factors within the thoroughness of the crowd safety strategy and response to dynamic operation issues (i.e., emergency plans) are often connected directly to incident occurrence.

Therefore, to investigate audience perceptions of crowd safety at events in the UK (to be presented and discussed in Chapter 8), and considering the preliminary qualitative incident database findings from phase one of the research study discussed above, whilst aligning with the thesis aims and objectives (Figure 7, p73), a synthesised conceptual hypotheses map was developed to be tested via the quantitative research design and analysis (Figure 17 below). This hypotheses map identifies the constructs for further quantitative testing as well as the relationships to be analysed between them.

Figure 17: Synthesised conceptual hypothesis map for quantitative bivariate data analysis



8. Discussion of event audience crowd safety perceptions survey data findings

This chapter discusses the quantitative analysis and findings obtained from phase two of the research study to explore UK event audience perceptions of crowd behaviour and safety at events attended (see Appendix 2, p247, for a copy of the questionnaire). From the distribution to 18 event special interest groups via the Facebook social media platform (Table 11, p86), in total 512 completed responses were received utilising the online survey platform Jisc Online Surveys. Upon closure of the survey, responses were exported to SPSS for coding and analysis. An *all-available* approach was adopted, ignoring selectivity of respondents or missing data and computing values based on the valid observations that were available. Thus, the corresponding value for *n* has been provided for each analysis performed. Using graphs, frequency and descriptive tables, a detailed early insight into respondent profile characteristics and findings linked to crowd behaviour, perceptions of crowd management and safety at events is provided to develop an understanding of the data from which more rigorous analysis is conducted in the latter part of the chapter. The descriptive findings (Appendix 8, p317) provided some early indications of relationships and prevalent incident characteristics to be explored hereafter.

8.1 Respondent demographic characteristics

Survey data was received from a slightly higher number of females (58%) than males (Table 18). This is unsurprising given that the vast majority of respondents (*n*= 434 of 512, 85%) discussed attending music events and of music festival visitors in 2016, 60% were female (Statista 2021). Respondents ranged in age from 15 to 79, representing a spread of 64 years, and the age range of 23 to 49 years fell within one standard deviation of the mean (36 years). A visual comparison (Figure 18) to the normal distribution showed a moderate positive skewness of 0.674 from the mean average age, with most ages clustered around the left tail of the distribution, likely due to the fact that cumulatively, 38% of respondents were aged between 20 and 29 years.

Table 18: Age and gender characteristics

Characteristic	Frequencies	(%)
Gender (N=510)		
⇒ Female	296	58
⇒ Male	214	42
Age (years) (N=504)		
<i>Grouped interquartile ranges:</i>		
⇒ 24 and under	121	23.6
⇒ 25-32	133	26
⇒ 33-45	120	23.8
⇒ 46 and over	130	25.8
Descriptive data - Age (scale):		
Mean: 36		
Range: 64		
Minimum : 15 / Maximum: 79		
Std deviation: 13		
Range (1 s.d.): 23-49 years		
Skewness: 0.674		

Figure 18: Age distribution of event attendees

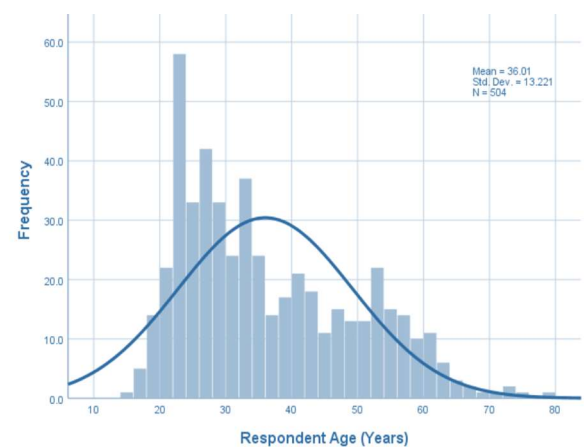


Table 19 depicts demographic findings linked to place of residence and occupation. Data for the place of residence showed that location concentrated primarily on regions within England (89%), with some representation from the four countries of the United Kingdom (predominantly Scotland and Wales with 6.4% and 4% respectively) as well as the Republic of Ireland. Cumulatively, the largest number of respondents were found to reside in the south of England (39.8%) with the north of England and the Midlands regions also well represented (22.8% and 21.2%). These findings broadly reflect UK population estimates except for the Southwest where responses received were disproportionately higher at 14.9% compared with the 8.4% UK average, and the East of England, which was comparatively underrepresented, with a 5.2% respondent share compared with the 9.3% UK average (ONS 2020b).

Regarding occupation, over three quarters of respondents were employed or self-employed (75.9%), closely mirroring the UK average of 75.6% (ONS 2020b). The number of unemployed or redundant respondents also shared close similarities with the UK average, with 4.9% share of the dataset compared with the 4.5% UK average (ONS 2020a). Discrepancies were identified around the percentages of respondents in full time education and retired; a disproportionately larger number of respondents were found to be in full time education (15%) compared to the 3.7% UK average of 2.53m (Clark 2022; ONS 2021; Plecher 2021), whilst a lower number of retired had responded (4.3%) compared with the UK population average of 18% (ONS 2019; 2020b). This correlates with the positive skewness from the mean age of 36 and over one third of respondents (38%) falling within the age range of 20-29 (Figure 18). Moreover, the proportionately higher number of younger respondents is in line with typical university attendance ages, which focus predominantly on the 18-25 group and where acceptance rates among the 21-25 (70.9%) and 26 and over (66.7%) groups saw record increases in 2017 (UCAS 2017). Whilst there may be some marginal skew within the dataset on the regional England data due to the Southwest and East of England issues reported, and in the number of respondents identified in full time education and retired, base numbers are reasonably small and so residence and occupation-based findings arguably remain representative of the wider UK population.

Table 19: Place of residence and occupation characteristics

Characteristic	Frequencies	Valid (%)	UK Average (ONS 2020)
Place of Residence (N=502)			
⇒ East of England	26	5.2	9.3
⇒ East Midlands	49	9.8	7.2
⇒ Greater London / London	58	11.6	13.4
⇒ North East	25	5.0	4.0
⇒ North West	49	9.8	11.0
⇒ South East	67	13.3	13.7
⇒ South West	75	14.9	8.4
⇒ West Midlands	57	11.4	8.9
⇒ Yorkshire and Humber	40	8.0	8.2
⇒ Northern Ireland	3	0.6	2.8
⇒ Republic of Ireland	1	0.2	-
⇒ Scotland	22	6.4	8.2
⇒ Wales	20	4.0	4.7
Occupation (N=507)			
⇒ At home with children	14	2.8	-
⇒ Employed / self employed	374	75.9	75.6
⇒ In full time education	74	15.0	3.6 (2.38 of 66.8m, 2019)
⇒ Retired	21	4.3	18.0
⇒ Unemployed / redundant	24	4.9	4.5

8.2 Attendee profile characteristics

Cumulatively, 93.1% of respondents recorded that they attend events at least three to six times per year, with over one third each (36.5% and 33.6% respectively) selecting that they attend either very frequently (once per month or more) or occasionally (3-6 times per year). Regarding the type of event most visited, over eight in ten respondents (84.6%) visit music events, which was by far the most prevalent, followed by sports events (41.6%) and arts and cultural events (34.2%). To explore visitation further, genre of music and sports events visited were also requested. For music events, rock music events were frequently attended by three quarters of respondents (74.6%) which was much higher than the other common genres of indie (29.5%), pop (25.6%) and EDM (19.9%) respectively; it is clear from responses received within the 'other' category too that *metal* specifically, is identifiable as a perceived standalone sub-genre of rock with 50 of 90 responses (55.6%) in this category attributed to the sub-genre, and equating to around 10% of all respondent answers for music visitation overall. For sports events, almost one third of respondents frequently attended football matches (29.9%), which was the predominant sports event genre. Following this, rugby (11.1%), cricket (7.6%), horse racing and equestrian (6.8%), motorsports and tennis (4.9% each) were also more prevalent than others.

In terms of venue size, small and intimate venues, either indoor or outdoor were most frequented by almost one third of respondents (29.3%). Following this with around one fifth of respondents each were large city-based indoor venues (22.6%), arenas and stadiums (20.8%) and outdoor festivals (20.2%) respectively. Respondents were asked for details about the event they had most recently visited (prior to the COVID-19 impact of event cancellations) and of 512 responses, the most prevalent recorded themes with ten or more recorded responses each are highlighted in Table 20.

Table 20: Most recently visited (prevalent themes)

Local, small-scale events	Regional events in large city-based venues such as:	Major events in arenas and stadiums including:
<ul style="list-style-type: none"> - local live gigs in bars, stores or nightclubs (46, 9.0%) - local football matches (45, 8.8%) 	<ul style="list-style-type: none"> - football matches (40, 7.8%) - rock and metal concerts (64, 12.5% and 16, 3.1% respectively) - EDM club nights (28, 5.5%) - music festivals, mainly family-friendly (14, 2.7%) - conferences & exhibitions (11, 2.1%) - indie concerts (11, 2.1%) - pop concerts (10, 2.0%) 	<ul style="list-style-type: none"> - metal shows (29, 5.7%) - rock shows (27, 5.3%) - outdoor rock festivals (27, 5.3%) - premier league / international football matches (11, 2.1%)

When exploring these findings in depth, regional rock and metal concerts were most frequently mentioned with 12.5% of the respondent share. Local live music gigs (9%), local football matches (8.8%) and larger regional league football matches with a regional draw (7.8%) were also commonly attended. Of the specific music genres recorded, rock and metal events were far more commonly cited including regional scale concerts (15.6% cumulatively), and major indoor

shows or outdoor festivals (11% cumulatively and 5.3% respectively). EDM nights at the regional scale were also recorded more times than any other genre except rock (5.5%).

Data indicated that the entertainment appeal of artists was most important to respondents as a motivator for attending events with almost two thirds of respondents highlighting it as one of their three most important motivators (63.7%). Analysis highlighted four other statistically significant motivators, namely socialising with friends (45.1%), festive / fun atmosphere (44.1%), supporting a team / act / individual (32.4%) and camaraderie (29.1%). Of these, three exhibited traits connected to socialisation (socialising with friends, fun atmosphere and camaraderie), whilst the other two were both linked to the entertainment and line up itself (appeal of artists and supporting a team, act, individual). Finally in relation to key attendee profile characteristics, three quarters of respondents were a member of (at least one) fan club, event / club forum or event / club social media group (75.2%).

8.3 The event environment and site

Survey data showed that happy and excited crowds were by far the behaviour most associated with events attended (84.8%) along with camaraderie (64.3%). Physically expressive behaviours such as dancing, moshing, and crowd surfing were also commonly noted, with 43.6% of the respondent share. Emotionally charged atmospheres (41.0%), tightly packed and dense crowds (40.6%) and intoxication (40.4%) were also prevalent behaviours cited. Of these predominant behaviours, five (excitement, emotionally charged atmosphere, intoxication, physically expressive behaviour and tightly packed, dense crowds) have been found through the crowd incident phase 1 findings to hold the potential to trigger crowd incidents. Perhaps unsurprisingly, the activity type was considered by over half of all respondents (52%) to contribute most to crowd incidents, involving acts such as drinking or drug use, queuing and waiting. This was closely followed by audience behaviour including traits such as (but not restricted to) boredom, dancing and aggression (42%). Also pertinent was that over one third of respondents (33.4%) highlighted lack of space including congestion, crushes and surges as a factor in crowd incidents, and almost one quarter (24%) cited environmental factors outside of the event's control such as weather and heat as contributors to crowd incidents. Perhaps interestingly, real or fear of threats to personal safety scored the lowest, only cited by 4.7% of respondents.

Frequency analysis indicated that event surroundings and handling of emergency situations and procedures scored most highly in terms of importance for attendance (48.4% and 40.7% respectively), however, when considering higher end scores of 1 and 2 combined in Figure 19, event surroundings and socialising are shown to be of the greatest importance for attendance overall. This correlates with the descriptive comparative analysis conducted on all importance factors (Table 21); the event and surroundings scored most highly with a mean of 1.86, followed by socialising with like-minded people (2.02). Both factors displayed similarly low standard deviations compared to other factors, of 1.063 and 1.059 respectively. Handling of emergency situations and procedures also scored highly with a mean of 2.08, though responses weren't centred quite so strongly around the mean (std. dev of 1.138). Conversely, the weather was identified as the least important factor when considering event attendance, with a mean of 3.08. Whilst some factors had missing data, the response to this question across all factors of

importance was high, the lowest response rates to this question experienced were 508 of 512 for the event and its surroundings, and the weather.

Figure 19: Important factors in event attendance

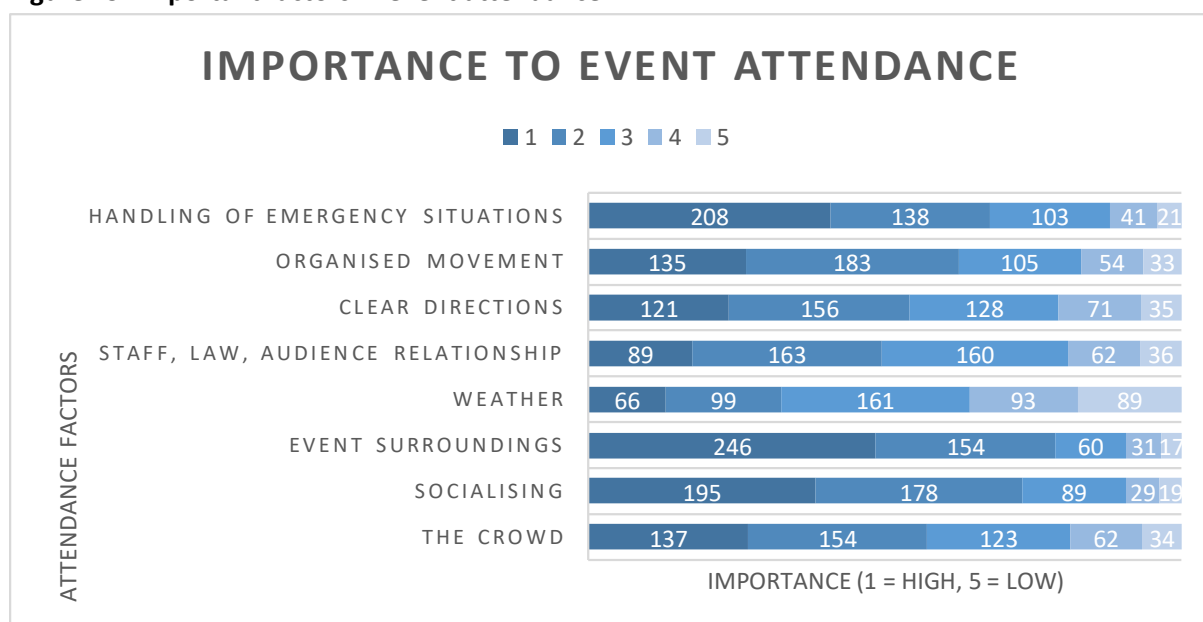


Table 21: Comparative descriptive, important factors in attendance

Factors in event attendance	N	Range	Min.	Max.	Mean	Std. Deviation
The crowd (i.e. size / atmosphere)	510	4	1	5	2.42	1.194
Socialising with like-minded people	510	4	1	5	2.02	1.059
The event and surroundings (i.e. line up, look and feel, timings, unrestricted viewing, lighting, sound)	508	4	1	5	1.86	1.063
The weather	508	4	1	5	3.08	1.263
Relationship between event staff, law enforcement and the audience	510	4	1	5	2.59	1.122
Clear directions and signage around the site (i.e. for information and to inform about unsafe, no-go areas)	511	4	1	5	2.50	1.190
Organised movement of crowds and queuing zones (i.e. effective use of barriers, roped areas, entry systems, disability access)	510	4	1	5	2.35	1.166
Space to move freely	509	4	1	5	2.22	1.132
Handling of emergency situations and procedures (i.e. access to first aid, evacuation)	511	4	1	5	2.08	1.138

Respondents were then asked which common organisational and design features were most likely to influence their behaviour at the events they attend. Almost half of all respondents (47.1%) stated that their behaviour was not influenced by any of the features listed. However, of those who were influenced in some way, barriers, gates, queuing and waiting systems were found to be most influential according to over one third of respondents (36.9%), followed by signage, furnishing and facilities (22.1%) and staff to audience communication (20.3%). A further open question was then asked to determine if this influence was positive or negative by exploring *how* their behaviour has been changed. Behavioural influence was found to be more

negative than positive (79 of 146, 54%) compared with 41% for positive behavioural changes recorded. Table 22 shows the common supporting themes arising from this open question.

Table 22: Nature of behavioural changes and influence due to site design and crowd strategies

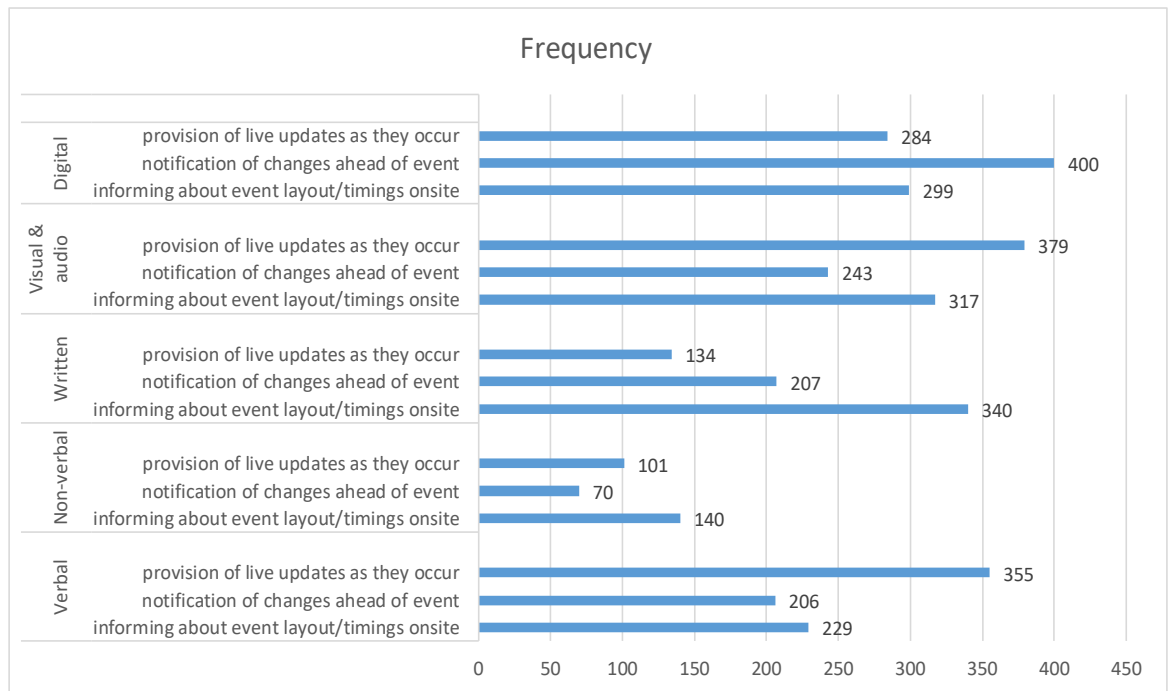
Negative Themes*	Key Supporting Quotes
Long queues & wait times triggering frustration, anger, disorder, rule avoidance	<p>"I have felt frustrated by poor systems for queueing [they] have led to frustration."</p> <p>"Did not like queueing for mobile toilets when stadium ones were non-operational, so I snuck into the stadium ones."</p> <p>"Someone queue jumping is a no-no and can cause issues."</p> <p>"When there are queueing areas I get bored and irritable."</p> <p>"...queueing for hours in hot sun. I was quite verbal but not aggressive."</p> <p>"... delays in the queueing caused me to miss a key band that I specifically wanted to watch. I don't normally complain but I wasn't happy with the experience"</p>
Aggressive, rude, heavy crowd control (law enforcement, security, stewards) enflaming crowd trouble	<p>"Aggressive security on power trip, caused negative atmosphere & more disobedience."</p> <p>"I've been at gigs where the staff were aggressive to the crowd it made the atmosphere toxic and created the trouble that inevitably followed."</p> <p>"... the way you are spoken to by event staff can cause you to be hostile or frustrated."</p> <p>"Stewards at football have been overly officious, thereby making me aggressive"</p> <p>"police/ground staff totally not a clue, ...I had a ticket so fought my way in regardless"</p>
Confusion (due to poor signage, layout, communication) affecting crowd movement and emotions	<p>"confusion between information given by stewards and that given by police"</p> <p>"confusing signage at festivals makes me hesitant to travel through events because I don't want to appear stupid"</p> <p>"No correct signage for direction and getting confused with where to go"</p> <p>"Poor communication leads to unnecessary stress and therefore a rise in panic- Which means people tend to act erratically."</p> <p>"Poor staff communication and signage ... caused a stampede to the smoking area."</p>
Timings (i.e. late starts) influencing decision to leave, anger / frustration	<p>"The headline act was late at a music festival causing the crowd to become agitated"</p> <p>"Had to leave early because I was worried I would miss the last train home if I got caught up in a crowd"</p> <p>"Bands not turning up or coming on late cause anger issues"</p>
Avoidance of events or certain areas (for H&S reasons or satisfaction)	<p>"As an epileptic, as soon as strobe lights appear, I do the best I can to try to avoid them"</p> <p>"Avoiding areas with large unorganised queues."</p> <p>"Not going in to area which did not look properly stewarded"</p>
Positive Themes*	Key Supporting Quotes
Recognition of value of crowd management procedures and compliance	<p>"Barriers and orderly queues influence people to be more relaxed and patient"</p> <p>"Following signage instructions, creating space in crowds to help first aider's..."</p> <p>"...the rules they are there for a reason, for safety of others and yourselves."</p> <p>"If event is well organised with courteous staff, more likely to observe instructions"</p> <p>"Queueing systems made me behave more sensibly"</p> <p>"Tannoy told us about congestion and to back up so we did"</p>
Timings encouraging early attendance, better planned movement around site.	<p>"Arrived at a certain time to ensure we saw specific acts"</p> <p>"Extra information about timing enabled me to plan my day better so I was more relaxed on the day and not panicking about missing things."</p> <p>"Organising timing to leave or attend to not miss a certain musical act, and to factor in queueing times, security searches etc."</p>
*Recorded as common theme if mentioned by 8 or more respondents.	

Data regarding common event hazards experienced at events showed that only 5.1% of respondents had never experienced a hazardous situation at an event attended. Of the hazards listed, bottlenecks and congestion were most prevalent, cited by over two thirds of the respondent base (68.0%). Also predominant were the weather (58.6 %), overcrowding and density (52.7%) and temperature issues (48.2%). Two aspects that do not correlate particularly well with the phase one findings or the existing literature is the lack of appropriate or visible exits (13.5%) and the lower prominence of temporary structure issues, only cited by 10.5% of respondents. Interestingly, in phase one of the research, both of these hazards were identified as secondary contributing hazards to crowd incidents historically and linked to the escalation of crowd incidents, injuries and fatalities. What is clear from the phase one findings is that these failings were normally triggered as a direct result of another hazard taking place (i.e., extreme weather or crowd incident / force) and so perhaps this indicates that audiences are less aware of potential hazards that can arise in a secondary manner and thus, are less prepared for them.

8.4 Crowd management strategies

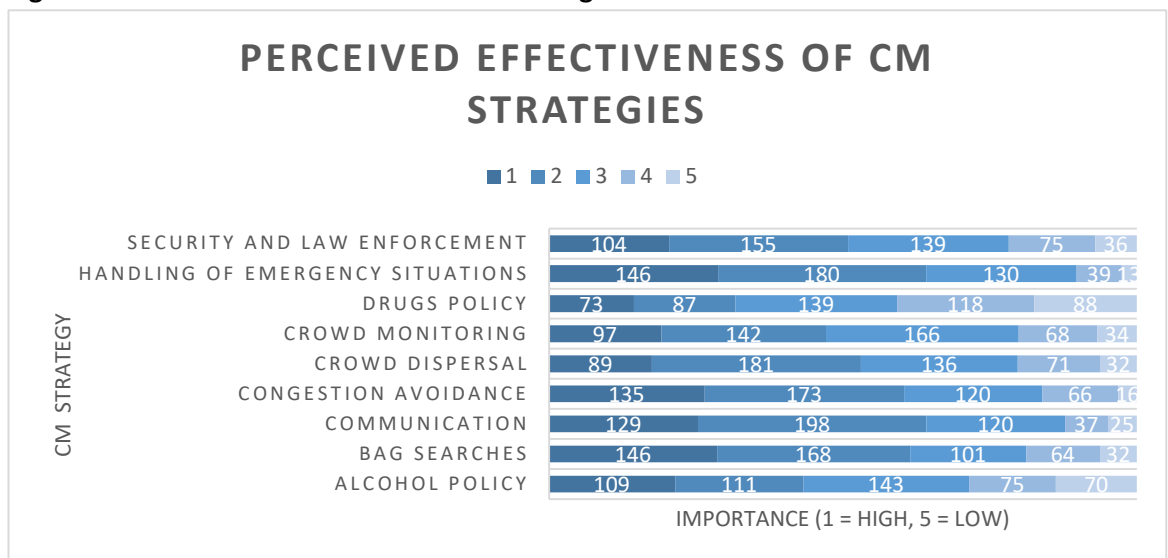
Data showed visually (Figure 20) that electronic forms of communication were cumulatively most favoured by attendees (specifically 'digital' and 'visual and audio' techniques) followed by 'verbal' methods of communication. Examining the statistics, over one half of the respondent base (512) for each situation preferred the use of digital communication methods at events and of these 'for notification of changes ahead of event' was most prevalent (78.1%). Furthermore, visual and audio methods also scored particularly high for their appropriateness regarding 'provision of live updates as they occur' (74%) and 'informing about event layout and timings onsite' (61.9%). Of the rest, verbal communication was perceived most appropriate for provision of live updates (69.3%) and written communication for information about event layout and timings onsite (66.4%). Non-verbal communication was perceived a far less appropriate method comparatively, though most felt it was useful when informing about event layout and timings on site (27.3%).

Figure 20: Perceived appropriateness of communication techniques in specific situations



Frequency analysis indicated that handling of emergency situations and procedures, search policies, congestion avoidance measures and communication scored most highly in terms of effectiveness of crowd management strategies (28.7%, 28.6%, 26.5% and 25.3% respectively). However, when considering higher end scores of 1 and 2 combined in Figure 21, handling of emergency situations and communication are shown to be perceived as most effective overall, followed closely by search policies and congestion avoidance.

Figure 21: Perceived effectiveness of CM strategies



This correlates with the descriptive comparative analysis conducted on all crowd management techniques (Table 23); handling of emergency situations scored most highly with a mean of 2.20, followed by communication (2.28). Both factors displayed similarly low standard deviations compared to other factors of 1.021 and 1.072 respectively. Congestion avoidance measures and

search policies also scored highly with means of 2.32 and 2.35 respectively, though responses weren't centred quite so strongly around the mean for search policies in particular (std. dev of 1.195). Conversely, it was drug policies and alcohol policies respectively that were identified as the least effective CM strategies at events, with means of 3.12 and 2.78. Whilst some factors had missing data, the response to this question across all factors of importance was high, the lowest response rates to this question experienced were 505 of 512 for the effectiveness of drug policies at events.

Table 23: Comparative descriptive, effectiveness of CM strategies

	N	Range	Min.	Max.	Mean	Std. Dev
Alcohol policies i.e. Challenge 25, refusal to serve	508	4	1	5	2.78	1.315
Bag searches and metal detectors i.e. for weapons, contraband	511	4	1	5	2.35	1.195
Communication i.e. stewards and ushers, tannoy, social media, email, website, big screens, signage	509	4	1	5	2.28	1.072
Congestion avoidance i.e. multiple entrances/entry times, barriers, gates, seating/standing zones, buffer zones, spacing of facilities (bar, toilets, stages)	510	4	1	5	2.32	1.094
Crowd dispersal i.e. movement away from congested areas, end of event	509	4	1	5	2.56	1.120
Crowd monitoring i.e. of queues/dense areas, hotspots, CCTV surveillance, security lighting	507	4	1	5	2.61	1.138
Drug policies i.e. drug testing, stop and search, police dogs	505	4	1	5	3.12	1.292
Handling of emergency situations and procedures i.e. access to first aid, temporary show stops, evacuations, deployment of emergency services	508	4	1	5	2.20	1.021
Security and law enforcement i.e. ejection policies, patrols, crowd control, uniformed/plain clothed police presence, arrests	509	4	1	5	2.58	1.172

Analysis of the factors most commonly linked to crowd safety incidents experienced by participants at events, uncovered some interesting findings. Approximately two thirds of respondents in total had experienced some type of safety incident at events they had attended. Specifically, findings showed that over one third of respondents (35.5%) had experienced incidents that occurred inside the event itself whilst it was taking place and closely following this, almost one third indicated that they had experienced overcrowding and congestion incidents (31.6%). The venue egress (exit) and ingress (entry) processes were also experienced by around one quarter of respondents each (25.7% and 23.8% respectively). These findings were also reflected in the follow-up question posed to explore locations inside the venue where the crowd incidents experienced had occurred (Table 24).

Table 24: Locations inside the venue where recorded incidents had occurred

<i>Locations inside venue where the incident occurred (N=181) (Adjusted N = 177)</i>		Adjusted (<i>other</i>)	% (including <i>adjusted %</i>)
⇒ All parts of the venue	-	5	2.8
⇒ Bar area	12	-	6.8
⇒ Campsite	-	7	6.8
⇒ Main event area / stage(s)	103	109	61.6
⇒ Queues (i.e. facilities, ingress / egress)	22	27	15.3
⇒ The foyer (i.e. turnstiles and gates)	5	8	4.5
⇒ Within the stands / seating area	-	9	5.1
⇒ Other	39		21.5
○ <i>All parts of the venue</i>	5		
○ <i>Campsite</i>	7		
○ <i>Main event area / stage</i>	6		
○ <i>Queuing</i>	5		
○ <i>Turnstiles / gates (ingress or egress)</i>	3		
○ <i>Within the stands / seating area</i>	9		
○ <i>Responses linked to offsite were removed</i>	4		

Whilst a range of locations were identified by respondents, by far the most prevalent location inside a venue for incident occurrence was in the main event area or near the stage, cited by almost two thirds of respondents (61.6%) to answer this question. Moreover, when asked how the incident was dealt with, over half suggested only adequately (52.9%) and of the rest, 'extremely poorly' was most prominent (27.1%).

8.5 Feeling safe at events

Examining the findings linked to behaviours associated with events attended pointed to a range of prominent positive and negative behavioural traits noted by respondents. The highest frequencies were recorded for positive behavioural traits, with cheering, chanting and singing recorded by almost all respondents (95.3%) and friendly crowd moods almost mentioned by almost nine in ten participants (87.9%). Moreover, three quarters of respondents (75%) cited experiencing helpful crowd members too. Regarding the negative behavioural traits most commonly experienced at events attended, intoxication due to alcohol was cited by over eight in ten respondents (84.7%), followed by rowdiness and boisterousness (70.3%), group 'herd' behaviour (67.8%), pushing and impatience (63.3%), intoxication due to drugs usage (55.7%), with each trait cited by over half of all respondents. Furthermore, the group of traits mentioned by almost half of all respondents were all negative too; of these, rushing or running (48.4%) and fighting and / or physical violence (46.7%) scored most highly, with verbal aggression / abuse and avoidance of following the rules of the event / venue, and avoidance of following instructions when needed also mentioned by a significant number of respondents each (42.8%, 41% and 31.4% respectively).

Cumulatively, respondents associated most frequently with the personal safety statements linked to being uncomfortable in overcrowded conditions at events (42.8%), with the majority

of these feeling uncomfortable but accepting it as a consequence of the events they choose to attend (29.7%), which scored the highest out of all five personal safety statements. Conversely, over one third of respondents stated that they feel comfortable in overcrowded conditions at events (36.7%) with the majority of those displaying positive affiliation with viewing it as part of the event's atmosphere (27.5%). Regarding those at the extremities, around one in ten respondents would either seek to find less crowded areas (13.1%) or actively seek overcrowded spaces out as an integral part of the event experience (9.2%); whilst not the majority views, these findings are still a point of interest in the psychological and behavioural profiling of event audiences and predicting likely behavioural patterns. Further descriptive comparative analysis of this variable corroborates these findings; with a mean of 2.90 (where 1 = neg and 5 = pos), respondent affiliation with the five personal safety statements provided was skewed slightly towards the more negative statements linked to feelings of discomfort in overcrowded conditions (range of 1.69 to 4.11), when calculating the range within one standard deviation either side of the mean. When exploring skewness of the data in relation to this variable, there was only a very small positive skew of 0.058 suggesting that the data was approximately symmetric and normally distributed (Hair et al, 2014).

Respondents were also asked a series of questions related to determining the likely impact of COVID-19 on behavioural patterns and attitudes. First, respondents were asked to state whether or not COVID-19 would influence their attitudes towards being in crowded spaces; whilst answers to this question were fairly evenly split, the largest single majority answered 'yes', their attitudes towards being in crowded spaces would be affected (39.5%). Moreover cumulatively, over two thirds (69.6%) replied either 'yes' or 'unsure', linked to the influence of COVID-19 on their attitudes towards being in crowded spaces. Building on this, when asked the extent to which COVID-19 may influence their perceived event safety overall, all respondents answered this question (512) and cumulatively almost two thirds of participants (60.7%) answered that COVID-19 would have a relatively strong influence (with scores in the range of 6 to 10). A descriptive test on the variable indicates a mean score of 6.02 overall and a standard deviation of 2.875, with a calculated range of between 3.33 and 8.90 within one standard deviation of the mean. With a negative skewness of -0.326, descriptive analysis indicates a negative skew within the data towards COVID-19 having a strong influence on perceived personal safety at events. Together, these findings arguably suggest a potentially significant attitudinal shift linked to perceived safety at events post-COVID that could arguably affect overall event attendance and feelings of personal safety in relation to crowded spaces.

Connected to this, respondents were asked to state the type of influence certain factors would have on their attitudes and decisions to attend events in future. Of these factors, several can be connected to being in crowded spaces and overall perceptions of safety at events as a result of COVID-19. Data for these connected factors showed the following:

- **COVID-19 related social distancing measures**
 - Almost one quarter (24%) would be influenced to attend if these were in place
 - Over one third (34%) would not attend if these were not evident or were done poorly
- **Crowds (i.e., congestion, queues and lack of space)**
 - Almost one quarter of respondents (23.6%) would not attend if crowding was likely
- **Updated health and safety information on website**

- 46.6% would be encouraged to attend with updated H&S info on an events' website

With this in mind, it is arguable that strategies linked to enhancing space per attendee and communication between an event and its audience about measures in place, would be key factors in ensuring positive perceptions of personal safety at events in a post-COVID environment. Linked to this, the question posed to determine influences on attitudes and decisions to attend events in future also highlighted several other key findings. In terms of the aspects that would positively influence attitudes about an event and decisions to attend, factors linked to visible emergency services and procedures (49.9%) as well as word of mouth or online reviews (47.8%), heightened security measures (46.6%), updated health and safety information on websites (46.1%) and press releases and public communication via social media (44.7%) scored most highly. These findings indicate that it is the visibility of crowd management strategies and emergencies protocols as well as strong communication with event audiences that can have the most positive influence on decision to attend. Anticipated crowd mood or behaviour and good COVID-19 and social distancing measures were also cited as positive influencers by just under one third (31.7%) and one quarter of respondents (24%) respectively. Examining the key deterrents found to negatively influence attitudes and attendance decisions, poor COVID-19 and social distancing measures was most significant (34%), followed by coverage of recent terror attacks (29.1%), lack of information or visible security / police presence (28.4%) and crowding such as congestion, queuing and a lack of space (23.6%). Coverage of recent crimes and the media portrayal of past events were not found to be significant influences either way.

This correlates with the descriptive comparative analysis conducted on all factors influencing attitudes and decisions to attend events in future (Table 25). Visible emergency services and procedures scored most highly with a mean of 1.53, demonstrating the strongest positive influence, followed by word of mouth or online reviews (1.55) and updated health and safety information on websites (1.56). Interestingly, press releases and public communication (i.e., via social media) scored fourth highest with a mean of 1.58, superseding heightened security measures (1.62) unlike in the frequency results, which had a comparatively larger standard deviation of 0.639 suggesting answers for this influence were less tightly centred around the mean. Conversely, it was coverage of recent terror attacks and lack of information (visibility) about likely security / police presence, with means of 2.21 and 2.22 respectively that were identified as the strongest negative influencing factors on attitudes and decision to attend future events. The negative influence of covid factors such as social distancing measures and overcrowding were the two next most negative influences on attitudes and attendance decisions but not to such an extent when considering mean scores. The response to this question across all factors of influence was high, and the lowest response rates experienced were 508 of 512, arguably suggesting greater variability in responses related to these COVID-19 factors.

Table 25: Comparative descriptive, influences on attitudes and decision to attend events in future

Influencing Factor	N	Range	Min.	Max.	Mean	Std. Dev
Coronavirus (Covid-19) and social distancing measures	512	2	1	3	2.10	.756
Coverage of recent crimes	509	2	1	3	2.08	.500
Coverage of recent terror attacks	509	2	1	3	<u>2.21</u>	.577
Crowds (i.e. likely congestion, queues, lack of space)	509	2	1	3	2.11	.595
Fellow audience members (i.e. likely behaviour, mood, etc)	508	2	1	3	1.78	.609
Heightened security measures (i.e. rigorous entry checks, venue and surrounding area safety enhancements)	511	2	1	3	1.62	.639
Lack of information (visibility) about likely security / police presence	511	2	1	3	<u>2.22</u>	.549
Media portrayal (of past events / area)	508	2	1	3	1.92	.514
More visible security / police presence	508	2	1	3	1.67	.644
More visible emergency services / emergency procedures	509	2	1	3	<u>1.53</u>	.562
Press releases and public communication (i.e. via social media)	510	2	1	3	1.58	.550
Updated health and safety information on website	510	2	1	3	<u>1.56</u>	.535
Word of mouth / online reviews (for event / area)	508	2	1	3	<u>1.55</u>	.554
1 = positive 2 = no influence 3= negative						

Finally, an open question was posed to respondents to explore their perceptions about prioritised measures that would encourage post-COVID event attendance. Respondents were able to note any measures that would affect their future attendance and in total, seventeen themes were identified (Table 26). Further analysis identified ensuring social distancing at events as most frequently cited, by one quarter of respondents (25.2%), followed by capacity management strategies including for seating and standing areas, queue systems and limited or reduced numbers of visitors for increased space per person, and enhanced cleaning and hygiene measures cited by almost one quarter of respondents each (23.2%). Also prominent were testing measures, including temperature checks and track and trace (12.2%), careful reopening of events with clear communication of measures (12.2%), and wearing of masks and management of overcrowding / congestion, prioritised by almost 10% of respondents each (9.8% and 9.3% respectively). Interestingly, over one in ten respondents (11%) wanted events to return as before and as soon as possible, either because they did not believe that COVID-19 was a worry for them or because they felt that crowds at events make the atmosphere and do not want to compromise on this atmosphere at the events they attend.

Table 26: Prioritised measures to encourage post-covid event attendance

<i>Prioritised measures to encourage post-covid event attendance (N=409)</i>	Frequency	Valid (%)
⇒ Banning alcohol / drugs	1	0.2
⇒ Capacity management / reduced no.s for space	95	23.2
⇒ Careful opening with communication of measures	50	12.2
⇒ Enhanced cleaning / hygiene measures	95	23.2
⇒ Events as before:	45	11.0
○ (covid not a personal worry)	(38)	
○ (crowds make the atmosphere)	(7)	
⇒ Low infection rates	31	7.6
⇒ Management of overcrowding / congestion	38	9.3
⇒ Masks / PPE	40	9.8
⇒ Postponement	27	6.6
⇒ Social distancing	103	25.2
⇒ Testing, temperature checks, track and trace	50	12.2
⇒ Vaccine	31	7.6
⇒ Venues – focus on use of:	14	3.4
○ (Larger venues)	(3)	
○ (Open air events)	(7)	
○ (Smaller venues)	(4)	
⇒ Unsure	1	0.2

8.6 Summary of descriptive findings

Analysis uncovered a number of significant findings within the dataset. These are displayed through the descriptive summary observations presented in Tables 27-29 below, and linked to attendee profile findings, the findings likely to be beneficial to crowd safety and the findings likely to be detrimental to crowd safety.

Table 27: Summary of findings linked to prevalent attendee profiles

Descriptive Findings Summary – Prevalent attendee profile			
Variable Type	Significant Finding(s)	Notes / Comments / Questions	Links to Theory / Statistics
Demographics	Slightly more females (58%) Predominantly 23-49 (68%) Over one third – 20-29 (38%) 75% employed 15% in FT education 40% Southern England	Females more cautious Younger profile & views Majority have a stable income Potential skew in outlook	Risk averse Sensation-seeking, deviance, risk-takers Events for leisure Dense population?
Visit frequency	90% at least attend moderately 37% very frequent attenders	Confidence in attendance likely related to frequency	Conceptual f/w – risk profile
Event type	85% attend music events 42% attend sports events 34% attend art / cultural events	Likely to exhibit different behavioural patterns / views – affects management	Central behaviours, crowd emotion, social identity
Music events	75% attend rock events Indie (30%), pop (26%), EDM (20%) also common Metal seen as separate to rock	Specific attitudes / behaviours How these are best managed is likely to differ	Links to qualitative case studies
Sports events	30% attend football matches Of the rest rugby, cricket, horse-racing, equestrian, motor-sports, tennis notable	Very specific profile Similarities / differences between these profiles?	Identity, emotion Links to qualitative case studies
Venue types	30% - small / intimate venues 23% - large city-based, indoor 21% - arenas / stadiums 20% - outdoor festivals	Likely to exhibit different behavioural patterns / views around safety / CM – diverse management required	Links to qualitative case studies
Fan clubs	75% fan club / group members	Likely strong social identity	Impacts motivation, emotion, behaviours
Motivations	1/3 or more each - Entertainment / artist appeal, socialising with friends, festive / fun atmosphere, supporting a team / act / individual, camaraderie	4 of these top 5 link to strong social identity	Impacts motivation, emotion, behaviours

Table 28: Summary of findings likely to be beneficial to crowd safety

Descriptive Findings Summary – Findings beneficial to safety management			
Variable	Significant Finding(s)	Notes / Comments	Links to Theory / Statistics
Associated behaviours	Happy crowds, camaraderie	Strong social identity / good mood aid compliance	Social identity theory (SIT), collective identity theory,
Crowd incident triggers	Reaction to safety threats scored low	Potentially due to lack of awareness though	Reaction to fear / threats is a key trigger in literature and Ch. 7
Importance for attendance	Event surroundings, handling of emergencies, and socialising were key	Strong social identity / good surroundings and confidence in emergency procedures aid attendance	Social identity theory (SIT), collective identity theory, Situational awareness (SA) / monitoring & comms
Common hazards	Low prevalence of lack of exits, temporary structures as hazards	Both are secondary contributing hazards in Ch. 7 findings but lack of audience awareness?	Goes against literature and qualitative Ch. 7 findings. Strong need to manage these aspects.
Site design influences	- good site planning - good scheduling	value of / compliance with procedures encourages early and staggered attendance / better flow around site	Lynch (1960), Getz (2005) site legibility / planning, capacity management Yeoman et al (2004), RAMP analysis (Still 2013)
Communication method	Electronic comms favoured overall (digital, visual / audio). Also (to supplement): - verbal, mid-event - written, layout/timing	Use of apps for wayfinding / updates, e-boards, tannoys, website and social media comms strategies crucial	OSC strategies - O’Toole (2011); HSE 2000 Martella et al (2017) – crowd analytics and support
Effectiveness of CM	Handling emergencies, communication and search policies felt to be most effective	Handling emergencies was important to attendance motivation	To be explored through chi square test analysis I.e. attitudinal differences according to profiles?
Safety incidents	Most linked to inside (main area or queuing), overcrowding, or ingress / egress	Density, congestion, crowd mood, behaviour must be monitored carefully in these areas	SA, OODA Loop, Swiss Cheese model, density analysis, DIM ICE – On-site CM strategies
How incident dealt with	Very few positive responses	Handling of emergencies was found to be effective above. Contradictory finding.	To be explored through chi square test analysis I.e. attitudinal differences according to profiles?
Behaviours experienced	Positive traits recorded highest frequencies: Cheering, chanting, singing Friendly crowd moods, Helpful crowd members	linked to expressive and revellous crowds, resonate with positive social identity and audience empathy	Strong links to literature review Ch 3. Motivations of fun and entertainment SIT, collective identity, Positive crowding, etc
Comfortable in crowd	37% feel comfortable; most of these (28%)	Links to concept of functional density and	Functional density theory

	crowds as part of the atmosphere but 9% actively seek out crowded spaces to enhance experience	potential links to specific crowd profiles as well.	Allocentric personality (Plog 1991) Subcultural differences
C-19 attitudinal impact	Space per attendee (social distancing) and communication of H&S measures are key for positive perceptions of personal safety (24% & 47% respectively)	These strategies appeared to provide reassurance that would encourage attendance	Covid-19 regulations (2021-22). Canetti's (1973) rational perspective on crowd theory – personal space E-communication – (i.e., O'Toole 2011)
Attendance stimuli	Predominantly linked to visibility of CM strategies (emergency procedures, heightened security, social distancing) and strong communication (WOM /online reviews, updated H&S info on website, PR and social media comms)	The range of findings linked to these strategies appeared to provide reassurance that would be most beneficial for encouraging attendance	DIM ICE analysis (Still 2013) and CM planning Reducing perceived fear Covid-19 regulations (2021-22) Canetti's (1973) rational perspective on crowd theory – personal space Importance of e-communication – (i.e., O'Toole 2011)

Table 29: Summary of findings likely to be detrimental to crowd safety

Descriptive Findings Summary – Findings detrimental to safety			
Variable	Significant Finding(s)	Notes / Comments / Questions	Links to Theory / Statistics
Associated behaviours	Emotionally charged, dense crowds, intoxication	Two (emotions, intoxication) are crowd behavioural triggers Density is a key contributor to safety incidents	Evidenced in the qualitative case studies
Crowd incident triggers	Activity, crowd behaviour, lack of space	Activities / behaviours defined as drinking, waiting, boredom, dancing, aggression – this can lead to manifestation of other negative behaviours. Density noted again too	Sensation seeking – boredom / waiting, impatience Intoxication / aggression
Common hazards	Bottlenecks, the weather, overcrowding, temperature issues	Most share links with high density and congestion – key contributor to safety incidents	Evidenced in the qualitative case studies
Site design influences	Barriers / gates / queuing Audience comms Signage	Long waits trigger frustration, rule avoidance Heavy, rude, aggressive CC triggers crowd trouble Poor layout creates confusion	Evidenced in the qualitative case studies
Communication method	Non-verbal perceived least useful except for layout / timing updates	Crowds must be able to ‘see’ the instruction provided via stewards, etc	
Effectiveness of CM	Drugs and alcohol policies least effective overall	Indicates these factors are a key issue for CM at events. Perhaps this suggests that more must be done to enhance effectiveness of strategies used to manage drugs and alcohol issues onsite at events.	Drug deaths / issues, behaviour due to intoxication evidenced in Ch. 7 / literature to be significant trigger for escalating crowd incidents
Safety incidents	Experienced by over two thirds of respondents: 36% inside – main area (common) or queuing 32% - overcrowding 26% - egress 24% - ingress	Potential differences between event types as to where incidents are experienced	Evidenced in the qualitative case studies To be explored through chi square test analysis
How incident dealt with	53% - adequately 27% - extremely poorly	Potential differences between profiles and perceptions of incident resolution	To be explored through chi square test analysis
Importance for attendance	Handling of safety incidents was important to attendance	Important to attendance yet vast majority of respondents to have experienced incidents felt they were not handled well	Implications for crowd perceptions of organisers / police / security and attendance
Behaviours experienced	Intoxication (alcohol), rowdiness /	Some are outcomes resulting from factors noted	Many of these are documented as

	boisterousness, group 'herd' behaviour, pushing / impatience, Intoxication (Drugs), rushing / running, fighting / physical violence, verbal aggression / abuse, rule / instruction avoidance	above linked to incident triggers, hazards, site influences Others are linked to crowd in attendance (profiles) Some are both	contributing factors in Ch. 7 to qualitative crowd incident case studies
Uncomfortable in crowd	43% felt some level of unease but only 13% would actively seek to avoid crowded spaces	Crowding is not a significant deterrent for the majority	Profile / event type differences be explored through chi square analysis
C-19 attitudinal impact	Negative attitudinal shift that could affect future attendance: 34% - would not attend if social distancing poor 24% - would not attend if crowding is likely	Implied nervousness among respondents about attending when events open back up again – predominantly linked to crowding issues	Strategies to reduce crowding (capacity management, spatial planning, site design) could be crucial
Attendance deterrents	Mainly linked to C-19 impact and hesitance about safety / security: - poor social distancing - terror attack coverage - lack of visible security - overcrowding	Clear communication strategies to alleviate fear also important in addition to crowd spatial planning	Measures to alleviate perceived fear important alongside crowd spatial planning

8.7 Analysis of quantitative data: associations and relationships

Following on from the emergence of the study’s descriptive quantitative findings, the discussion hereafter considers whether relationships exist within the quantitative data, and how any associations might help to define profile groups and explain variations in their behaviour as well as the way in which they are managed for safety. To assist in the management of the analysis, the synthesised hypotheses map (Figure 17, p140) developed from the conceptual framework and emergence of the qualitative crowd incident database findings (phase 1 of the research process, Table 17, p133) were utilised to aid in the grouping of variables (Table 30).

Table 30: Synthesised conceptual hypotheses mapped against grouped variables for analysis

Hypotheses Groups	Grouped Variables for Analysis	Variables linked to the group
Audience Behaviour	Behavioural Profile (H1, H2, H3)	Attendance motivations, being a fan club member, crowd incident triggers (three behavioural ones only), important factors for attendance, associated and experienced behaviours, perceptions of safety in crowds, attendance influencers and deterrents, and impact of covid-19 on attitudinal change towards crowd spaces, and linked to perceived safety for future attendance
Event Conditions & Catalysts	Environment, Site and Crowd Management Factors (H4, H5, H6, H7, H8, H9, H10, H11)	Crowd incident triggers (those specific to the event environment, site or crowd management), hazards, site planning and design influences, preferred communication strategies, effectiveness of CM techniques, safety incidents experienced, incident locations, how well incidents were dealt with, prioritised CM measures to encourage future attendance.
Thoroughness of Crowd Safety Strategy		
Response to Dynamic Operational Issues		
	Demographic & Visitation Profile (Independent Variables)	Age, gender, occupation, residence (location), visit frequency, venue types (scale), event type, music events, sports events,
Associations between these two groups of variables and a series of nine independent <i>demographic</i> and <i>visitation profile</i> variables were tested to better understand the attendee behaviours and experiences linked to event safety.		

Given that the data were predominantly categorical in nature where the response belongs to either one category or another (Fox et al 2014), Pearson’s chi-square tests were used to determine whether associations between these two groups of variables and a series of nine independent *demographic* and *visitation profile* variables exist. These results have been drawn upon to assist further analysis and aid the construction of a risk by attendee profile matrix in order to better understand the attendee experiences and behaviours (Chapter 9).

The chi square test of independence is typically used to examine the relationship between two discrete variables (Tabachnick and Fidell 2007). For Chi-square to maintain integrity Field (2005: 686) explains that no more than twenty percent of response groups should be unrepresented, with expected counts of less than five. In cases where there were too many empty cells, resulting in more than 20% of cells with an expected count less than 5, then an attempt to recode these variables to collapse the data into less categories was made and the analysis re-run, as suggested by Fox et al (2014: 194). Similarly, the continuous cardinal data for *age* was also reduced and arranged into groups which were similar in number, based on quartile ranges obtained via the cumulative frequency statistic for the original cardinal variable. This enabled the variable to be used as one of the identified independent demographic variables for chi-square testing.

In chi-square analysis, the null-hypothesis generates expected frequencies against which observed frequencies are tested; if the observed and expected frequency counts are similar then the null-hypothesis is accepted but if they are sufficiently different, then the null-hypothesis is rejected (Tabachnick and Fidell 2007: 59). The Pearson chi-square was therefore used to analyse if the two variables were independent of one-another and where the asymptotic value (asympt.sig.) was smaller than 0.05, then the null-hypothesis was rejected that the two variables were independent of one-another and were in fact somehow related (Fox et al, 2014: 193). It should also be noted that the larger the test statistic is, the stronger the evidence of association will be, so rejecting the null at 1% is more conclusive than at the 5% level (Buglear and Castell 2019: 224). Variables were considered to have a significant association provided no more than twenty percent of expected counts were less than five. In cases where the null hypothesis was accepted *and* the test criteria had not been met (i.e., for invalid tests or those which were close to indicating a significant finding), categories were recoded where possible into fewer groups for greater representation, and the test repeated as discussed above. Where 2 x 2 tables presented as a result of tests between two dichotomous variables, the value of the Fisher exact test was taken into account, and the null rejected providing the Fisher's exact value was less than 0.05 and that the test was indeed valid (Fox et al 2014).

For each rejected null-hypothesis, a cross tabulation of results was produced for comparison with predicted counts to assist with interpretation. Chi-square tests were conducted for the two categories of data whereby each category of data was run in turn against the nine identified demographic and visitation profile variables, and a summary of the associations discovered is shown in Appendix 9, p327 onwards, Tables A9.1 to A9.8. The full comparative table of results for every test run is stored in a separate file for review if required.

In total, 988 associations within the dataset were identified at either the 0.05 or 0.01 level, and the nature of these associations are presented and described hereafter. The term *association* is typically used to describe connections found between the two variables tested in a chi-square test and this is deliberate as according to Brotherton (2008: 193) a correlational association is not the same as a cause-effect relationship, so whilst there may be a statistical association between two variables, it does not prove that a change in one is the cause of a change in another. Careful interpretation of the associations which have been established through this phase of the research process is therefore required.

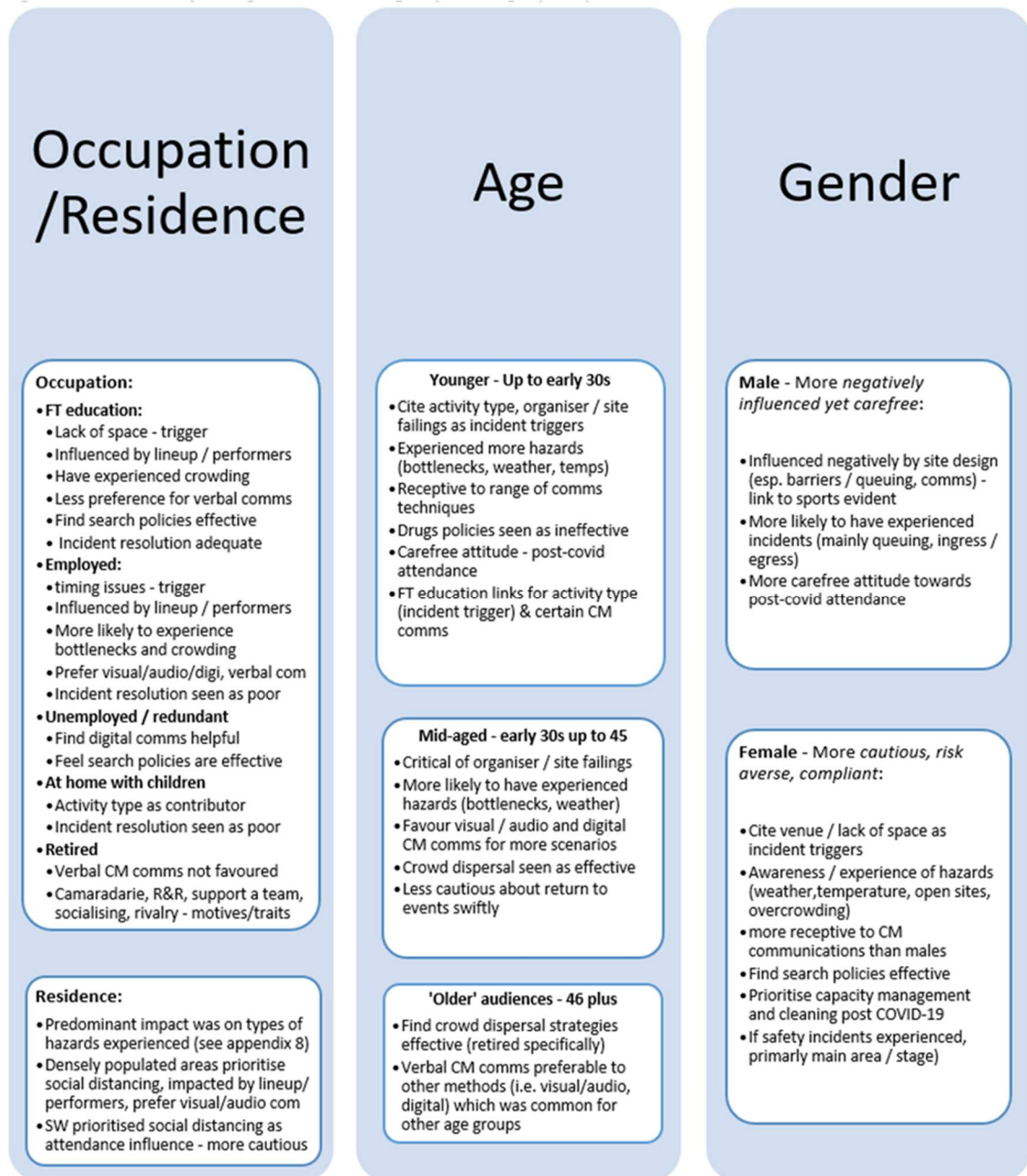
8.7.1 Demographic analysis: attitudes by age, occupation, residence, and gender

Cumulative frequencies and interquartile ranges were primarily used to determine recoded *age* groups for bi-variate analysis, though in some cases where findings were either borderline or invalid at the 4-group level, the age variable was recoded into 3 equal groups and re-tested, providing additional significant findings in some cases. The findings presented in Figure 22 are therefore representative of these nuances and present all findings for age at both the 4-group and recoded 3 group levels.

Regarding *occupation*, three broad categories were identified for the majority of findings: in full-time education, Employed or self-employed, and unemployed or redundant (to include those who are retired or who stay at home to look after children, which were collapsed as so few significant findings were associated with them as standalone groups). That said, the retired and at-home-with-children sub-groups were reported on and included in the study prior to recoding and collapsing the variable as they did present some unique attitudinal findings. Similarly, place of residence did not generate a great deal of insights but was found to impact on the hazards experienced mainly and also influences likely to have an impact on attendance, thus these findings were included below in Figure 22.

Significant findings indicated some distinct attitudinal differences in relation to *gender* (Figure 22). To summarise, the gender-based analysis showed connections to sports-related findings outlined further on in 8.7.2, which could indicate that those specific sports are dominated by male attendees. Males also showed a more carefree attitude towards the impact of COVID-19 linked to the return to live events, through their prioritisation of a swift return to events as they were before. Conversely, female event attendees were significantly linked to the more cautious, risk-averse and compliant variables explored in relation to the event environment, site planning and crowd management strategies.

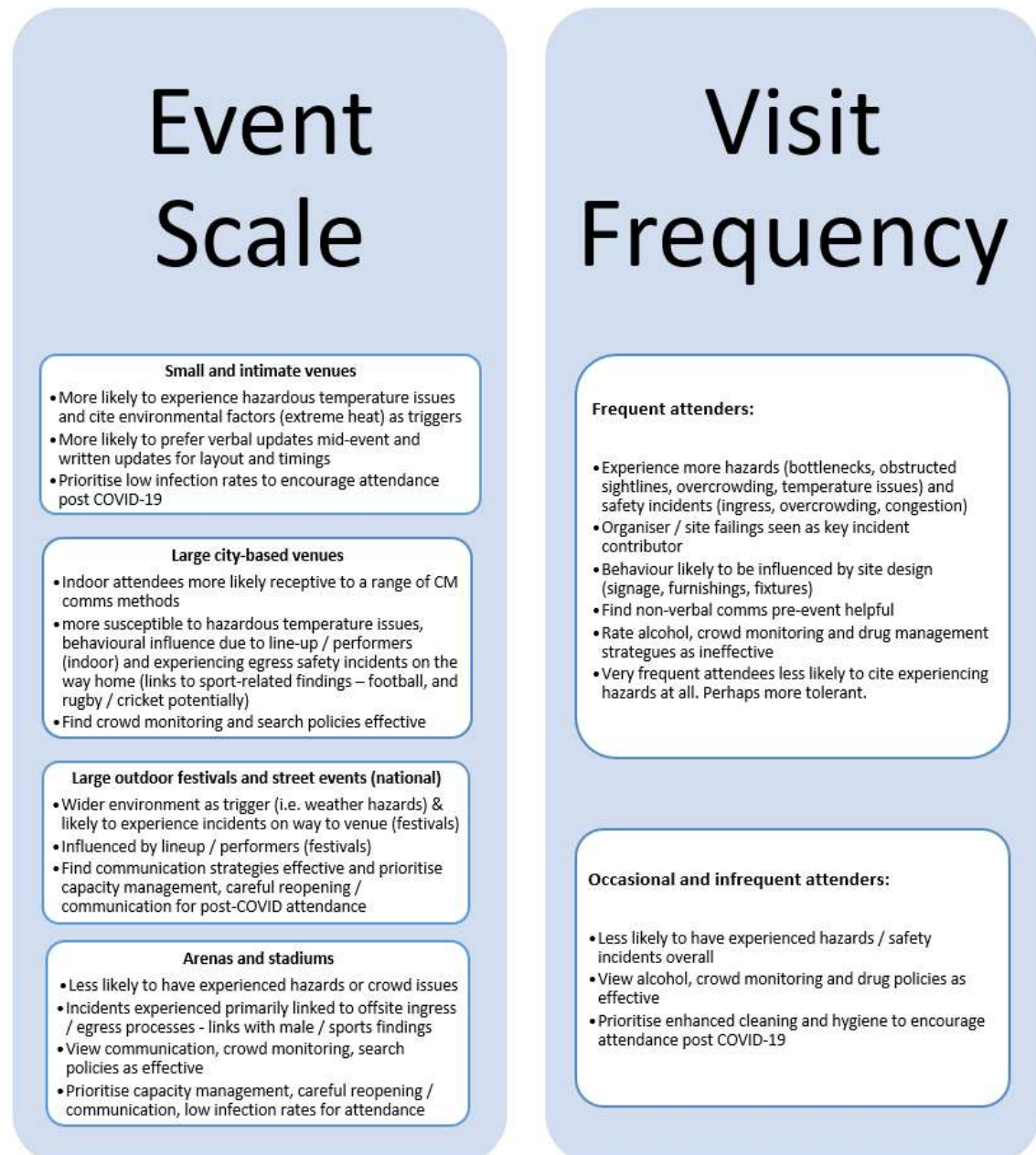
Figure 22: Summary of significant findings by demographic profile



8.7.2 Visitation profile

Significant findings linked to *visit frequency* fell into two broad groups: those who attend frequently versus those who attend occasionally or infrequently. In some tests, more detailed findings were uncovered prior to a variable recode at the very frequently level. Moreover, significant findings linked to *event scale* predominantly fell within four scales: small/intimate, large city-based venues (indoor or outdoor), large outdoor festivals/events with a national draw, and arenas/stadiums. In some tests, more detailed findings were uncovered prior to a variable recode at large city-based indoor venues and outdoor national festivals. All visitation profile findings are presented in Figure 23.

Figure 23: Summary of significant findings by visitation profile



8.7.3 Event type, plus further investigation of the music and sport sub-profiles

Findings were then explored in relation to *event type*, and by *music* and *sport* event sub-profiles (each of which achieved sufficient responses to enable bivariate analysis). In summary, the independent variable *event type* contained six separate categories in total: arts and cultural, business, family-friendly, food festivals, music and sports. The independent variable *music event type* contained eight separate categories in total that contained sufficient data for bivariate analysis: classical, EDM, folk, hip-hop, indie, metal, pop and rock. The independent variable *sports event type* contained nine separate categories in total that held sufficient data for bivariate analysis: athletics, boxing, cricket, football, golf, horse racing/equestrian, motorsports, rugby and tennis.

Chi-square test analysis was conducted for *event type, music event* and *sport event type* against each variable in the two groups (*environmental, site and crowd management* group and *behavioural profile* group). Significant findings across the six *event types*, eight *music event sub-profile types*, and nine *sports event sub-profile types* investigated for the two groups of variables tested are presented in detail in Figures 24 to 26 hereafter. Furthermore, reference to the specific detail of these associations can be found in Appendix 9, p327 onwards.

Figure 24: Summary of significant findings by event type

<p>Arts and Cultural</p> <ul style="list-style-type: none"> • Less likely to view <i>crowd behaviour</i> as a contributor to safety incidents • Most strongly associated with behavioural change via site design (all 5 factors) • Strong links with Food events regarding hazards experienced • Written changes pre/during event, digi-comms for layout & timings, pre-event favoured • Prioritised <i>social distancing</i> to encourage future event attendance but less likely to prioritise <i>careful reopening and comms measures</i> • Motivated to attend by <i>entertainment offered, networking, novelty/uniqueness</i> • Associated behaviours: <i>calm atmospheres</i> • Less likely to feel comfortable in crowded spaces, and more likely that attitude towards crowded spaces will change as a result of Covid-19 going forwards • Covid-19 more likely to influence future attendance at events (more cautious) • Need for greater reassurance and stringent mitigating measures in place post-covid to alleviate the concerns and encourage them back to events • Positive attendance influencers: <i>updated H&S website info, WOM reviews</i> • Negative attendance influencers: <i>crowding, lack of/too much security presence</i> 	<p>Business</p> <ul style="list-style-type: none"> • Venue factors seen as contributor • Influenced by signage/furnishing, ambience, communication • Less experience of hazards except bottlenecks & lack of suitable exits • Written changes pre event favoured • Polarised views regarding <i>congestion avoidance strategies</i> • Handling of emergency strategies deemed effective • Safety incidents experienced all linked to incidents inside the venue, or leaving venue at egress • No positive attendance motivators identified but <i>camaraderie and escape from pressures</i> not deemed important • Associated behaviours: <i>calm atmospheres</i> • Importance for attendance: <i>Organised movement of crowds, weather, clear directions and signage</i> • Negative attendance influencers: <i>lack of visible security/police presence</i> 	<p>Family-Friendly</p> <ul style="list-style-type: none"> • Not behaviourally influenced by any site design factors • Unique in views of hazards - car parks and expansive open sites • Handling of emergency strategies deemed effective • Safety incidents experienced - inside the venue, or leaving venue at egress • Most cautious regarding post covid-19 future attendance • Prioritised <i>management of overcrowding, postponement</i> for future attendance • Motived to attend by <i>fun atmospheres and socialising with family</i> • Associated behaviours: <i>calm atmospheres</i> • Importance for attendance: <i>Organised movement of crowds, weather, clear directions and signage, space to move freely, handling of emergency situations</i> • Covid-19 more likely to influence future attendance at events (more cautious) • More likely to attend with covid-19 / social distancing measures in place • Need for greater reassurance and stringent mitigating measures in place post-covid to alleviate the concerns and encourage them back to events • Positive attendance influencers: Heightened security, visible security/police presence/emergency procedures • Negative attendance influencers: <i>lack of visible security/police presence</i>
<p>Food Festivals</p> <ul style="list-style-type: none"> • Venue factors seen as contributor • Strong links with Arts events regarding hazards experienced • Written changes during event, visual /audio for layout/timings favoured • Polarised views regarding <i>effectiveness of alcohol strategies</i> • Motived to attend by <i>entertainment offered and escape from pressures</i> • Associated behaviours: <i>calm atmospheres, pushing and impatience</i> • Importance for attendance: <i>Organised movement of crowds, weather, clear directions and signage</i> • Behaviours experienced: <i>pushing and impatience</i> • Less likely to feel comfortable in crowded situations and more likely to say that their attitude towards crowded spaces will change due to C-19 • Covid-19 more likely to influence future attendance (more cautious) • Need for greater reassurance and stringent mitigating measures post-covid to alleviate the concerns and encourage them back to events • Positive attendance influencers: <i>Crowd behaviour/mood, heightened security, media portrayal, more visible security/police presence, press releases/comms, updated H&S info on website, WOM reviews</i> • Negative attendance influencers: <i>lack of visible security/police presence</i> 	<p>Music</p> <ul style="list-style-type: none"> • Influenced by ambience, barriers / queueing, lineup / performers • Receptive to widest range of update comms; mainly methods that could easily be seen, read or heard when required (see 8.7.4) • Polarised views regarding <i>effectiveness of alcohol and search strategies</i> • Safety incidents experienced: overcrowding, congestion, issues in venue • Experienced incidents <i>in the front of stage and main event area</i> • Prioritised enhanced cleaning & hygiene for future event attendance • Motivated to attend by <i>entertainment offered and fun atmospheres</i> • More likely to be <i>members of fan clubs or interest groups</i> • Associated behaviours - common theme, excitement. <i>Happy/excited crowd, intoxication, physically expressive, pushing/impatience, crowds</i> • Importance for attendance: <i>Organised movement, socialising, event & surroundings, event staff/law/crowd relationship. Weather unimportant</i> • Behaviours experienced - linked to themes such as social identity, excitement, heightened emotions & sensation seeking. Most positive associations identified. <i>Rivalry less likely</i> • Positive attendance influencers: <i>likely audience behaviour / crowd mood, press releases/comms, WOM reviews</i> • Negative attendance influencers: <i>coverage of recent crimes</i> 	<p>Sports</p> <ul style="list-style-type: none"> • Less experience of hazards except bottlenecks & lack of suitable exits • Handling of emergency strategies deemed ineffective • Safety incidents experienced all ingress/egress factors (<i>on-site & off-site</i>) • More likely to feel safety incidents experienced were handled poorly or inadequately. Arguably linked to police / security strategies at sports (<i>mainly football</i>) events • Less likely to prioritise <i>testing measures</i> to encourage attendance • Motivated to attend by <i>supporting a team only. Entertainment offered, escape from pressures, fun atmospheres</i> were not important • Associated behaviours - common theme of invested emotion. <i>Aggression / violence, camaraderie, disorderly behaviour, emotional / tense atmosphere</i> • Placed lower importance on <i>event and surroundings, clear directions/signage, organised crowd movement, space to move freely and the weather</i> • Behaviours experienced - Most factors linked to a volatile & difficult to manage crowd. requiring <i>monitoring, strong security, law enforcement, and crowd comms. Intoxication (drugs), organised theft, sale of drugs, sexual assault or sexual promiscuity less likely</i> • Positive attendance influencers: <i>WOM reviews only</i> • No influence on attendance: <i>heightened security, updated H&S website info</i>

Figure 25: Summary of significant findings by music event type



Figure 26: Summary of significant findings by sports event type

Athletics

- **Less likely** to have experienced *physically expressive* behaviours
- **Positive** attendance influencer: *more security / police presence*

Boxing / Ringside Sports

- Favoured *visual/audio changes pre-event*

Golf

- Experienced behaviours: **more likely** to have experienced *fighting and physical violence*
- **Positive** attendance influencer: *updated H&S info on website*

Horse Racing / Equestrian

- Found *search and drug policies* to be **effective**
- Attendance influencers: **no influence** association for *more security / police presence*

Cricket

- Influenced **most** behaviourally by *site design aspects (with football and motorsports)*. Influenced by *barriers, gates, queues & staff-audience comms*
- Experienced hazards: *obstructed sightlines only (link with football)*. Also in terms of the hazards *less likely to have been experienced*.
- **More likely** to have experienced safety incidents related to *ingress and egress* and to feel these were *poorly dealt with (Links with football)*
- **Less likely** than expected to prioritise *enhanced cleaning and hygiene measures*, in line with football attendee findings
- Attendance motivators: *supporting a team* (common across 4 sports event types), and *camaraderie*
- **More likely** to associate with *emotional atmospheres*
- **Low importance** to attendance: *the weather*
- Behaviours experienced: *rivalry*
- Attendance influencers: **no influence** association for *lack of security / police presence*

Motorsports

- Influenced **most** behaviourally by *site design aspects (with football and cricket)*. Influenced by *barriers, gates, queues & signage / furnishings*
- Found *handling of emergency situations* to be **effective**
- **More likely** to have experienced *overcrowding and congestion, ingress-to-site-related incidents*

Rugby

- Influenced by *barriers, gates, queues (key influencer for sports attendees)*
- Favoured *visual/audio changes pre-event, verbal updates during events*
- **More likely** to have experienced *overcrowding and congestion* incidents
- Attendance motivators: *solely supporting a team* (common across 4 sports event types)
- **Ambivalence** for attendance regarding *space to move freely*
- Experienced behaviours: high no of **negative** associations (7 in total), many shared with **football** attendees, **similarities between behaviours of these two groups** - *fighting / violence, group behaviour, organised violence, rivalry, rowdiness / boisterousness, verbal aggression / abuse*.

Football

- **Less likely** to view *environmental issues, lack of space, timing issues* as incident contributor
- Influenced **most** behaviourally by *site design aspects (with cricket and motorsports)*. Influenced by *barriers, gates, queues & staff-audience comms*
- Experienced hazards: *obstructed sightlines only (link with cricket)*. Also in terms of the hazards *less likely to have been experienced*.
- **Less likely** to find crowd communication methods helpful; negative associations for *written layout / pre / mid event, visual & audio layout / mid event, digital layout / pre / mid event*
- Deemed *handling of emergency situations* as **ineffective**
- **More likely** to have experienced safety incidents solely in relation to *ingress and egress (Links with cricket attendees)*
- **More likely** to have experienced incidents *whilst queuing* and to feel incidents they had experienced were *poorly dealt with (Links with cricket attendees)*
- **Less likely** to prioritise *capacity management, enhanced cleaning, testing measures* to encourage attendance but **more likely** to prioritise *return to events as they were before* and *low infection rates*
- Attendance motivators: *solely supporting a team* (common across 4 sports event types)
- **More likely** to be *members of fan clubs or interest groups* than expected
- Associated with several negative crowd behaviours, indicating a strong social identity: *aggression/violence, camaraderie, disorderly behaviour, emotional/tense atmospheres*
- **More likely** to cite *crowd behaviour* as a contributing factor to safety incidents
- **Low importance or ambivalent views** to attendance for all factors with the exception of *importance of the crowd to attendance (see 8.9.13)*
- By far largest range of behaviours experienced (16 - **predominantly negative behaviours** - i.e. *rules/instruction avoidance, fighting/violence, group behaviour, intoxication, abuse*. See 8.9.14)
- **More likely** to feel *comfortable in crowded spaces* and **less likely** to be impacted in *attitudes to crowded spaces as a result of covid-19 or perceived safety at future events post covid-19*.
- Attendance influence factors bore no influence (see 8.9.16) A **less cautious, carefree** crowd.

Tennis

- **More likely** to prioritise *social distancing* to encourage attendance
- Attendance motivators: *solely supporting a team* (common across 4 sports event types)

8.8 Profiling of significant associated relationships and influences

For the reasons explained in Appendix 4, p296, cluster and factor analysis were not considered to be appropriate for the purpose of this study and the exercise of *attendee profiling of behaviour, impact and risk to safety* in line with the study objectives was therefore instead based on the high volume of significant chi-square test associations uncovered within the dataset (988) as well as the descriptive quantitative findings, and also those which emerged from the qualitative data analysis (Chapter 7) as well. When exploring the vast range of significant associations identified through the chi-square analysis process, patterns and connections between certain demographic and event user groups became apparent, demonstrating relationships and commonality of interest, behaviour and / or influence. The detailed summarised profiles taken from the analysis presented in 8.7.1 to 8.7.3 above, considering the crowd incident database findings (Table 17, p133) and in the summary of associations tables in Appendix 9 (p327 onwards) are presented below in Table 31 and will be explored further in the context of the literature within Chapter 9.

Table 31: Significant associated relationships and connections between user groups

Profile Group	Summary profile	Links: other user groups
FT Education	Experience crowding, lack of space. Line up influence links to music events. Generally content.	Younger, music, larger venues
Employed	Line up / timings influence links to music events. Experience crowding, lack of space. Happy with e-comms. Unhappy with incident resolution.	Younger / mid aged, music, larger events, sport - cricket, football, music - Indie, rock
Unemployed	Happy with e-comms. Generally content.	Young / mid aged.
Home (kids)	More cautious. Unhappy with incident resolution. No issues or rivalry experienced.	Female, family-friendly, arts & cultural, food festivals, sports – partial – cricket, football, music – indie, rock
Retired	Do not favour verbal comms. Motivated by camaraderie, team support, fan club member. Experienced rivalry.	Male, sports (football, cricket, rugby, tennis)
Residence	Densely populated areas linked to line-up influence, V&A comms, confusing layouts and car park hazards. South linked to temperature issues. Dense & less dense areas linked to caution regarding social distancing	Younger / mid-aged, music, larger events
Younger	Experienced more hazards, triggers. Receptive to range of comms. Carefree attitude to post-covid attendance. FT education links - activity type (incident trigger) & CM comms	FT education, males, music - EDM, hip-hop, metal, indie (carefree, drugs stance), sports – football, smaller venues (temp), frequent attenders
Mid-aged	Experienced more hazards, triggers. Receptive to range of comms. Carefree attitude to post-covid attendance. Generally content with CM	Frequent attenders, males, larger events
Older	Generally content with CM (crowd dispersal) and verbal comms preferred over others	Mid-aged, larger venues
Male	More negatively influenced / triggered by CM issues, more likely to have experienced incidents yet carefree.	Younger, frequent attenders, sports – cricket, football, motorsports, rugby (site design influence, incidents on queuing / ingress etc)
Female	More cautious, risk averse, compliant. Value space at events (inc. post-covid). Have experienced a range of hazards. More receptive to CM strategies.	Family-friendly, arts & cultural, food festivals, music (rock), large events, frequent attender
Frequent Attenders	Either cited range of hazards experienced or none at all. Perhaps none at all suggests more tolerance. Rate several CM strategies as ineffective (inc. alcohol, drugs, monitoring)	Younger, range of venue types (large, small), sports – cricket, football (sightlines), music - rock

Infrequent Attenders	Less experience of hazards, more content with CM strategies and prioritise cleaning/hygiene post-covid to encourage attendance	Female, food festivals, arts & cultural, family-friendly, pop music – receptive to CM strategies, more cautious post-covid
Small venues	Susceptible to temp hazards and environmental factors such as extreme heat, prefer more informal methods of comms updates, seek low infection rates for post-covid attendance	-
Large city venues	Indoor attendees more receptive to range of CM comms, susceptible to temp hazards and line-up/performer influence, safety incidents linked to egress on way home, and more content with CM strategies	Female, family-friendly, business, music (indie, rock), sports (cricket, football), mid-aged / older
Large outdoor events	Wider environment (weather) as a trigger for incidents and likely to experience incidents on the way to the venue. Influenced by line-up performers (festivals specifically). Find communication strategies effective and cautious reopening post covid.	Music – EDM, hip-hop / urban, indie, rock, national scale events, females
Arenas / stadiums	Less likely to cite experience of hazards / crowd incidents (possibly greater tolerance or genuinely less issues at this scale). Incidents primarily linked to offsite ingress/egress. Generally happy with CM strategies and seek adoption of several key safety measures to attend post-covid.	Frequent attenders, males, sports (cricket, football), females (more content yet cautious attitude towards CM strategies)
Arts and Cultural	Wide range of hazards experienced, affected by site design and open to CM strategies and comms. Calm atmospheres but cautious regarding attendance	Frequent attenders, food festivals, female, mid-aged, older, larger venues
Business	Associations that correspond with the activity type (business event) and enabling the event to flow better: ambiguity around effectiveness of congestion strategies and experience of bottlenecks, safety issues inside the venue as well as on egress, calm atmospheres, organised movement, clear signage, weather important for attendance, whilst lack of visible security is a negative attendance influencer.	Food festivals
Family Friendly	One of the most cautious and risk averse user groups both in terms of the aspects they prioritise on site for attendance and what might encourage (socialising with family, fun / calm atmospheres, organised movement, space) or dissuade them from future attendance (i.e., lack of visible security, management of overcrowding, social distancing measures)	Arts and cultural events, food festivals, female, music (pop) – attendance motivators, factors to encourage/dissuade from attendance.
Food Festivals	Wide range of hazards experienced and open to CM strategies and comms. Calm atmospheres and entertainment motives but also pushing/impatience and cautious regarding attendance	Frequent attenders, food festivals, female, mid-aged, older, larger venues.
Music	Generally, positive moods, strong social identity and excitement underpin many of the associations identified. Influenced by site design and receptive to CM comms and strategies, safety issues linked to this group seem likely to be triggered by density or excitement over spilling than mal intent.	Female, younger (up to early 30s), in FT education or employed, large city-based venues, national outdoor festivals/street events, frequent attenders (i.e., less concern about hazards)

Classical	Only a few associations identified. Insufficient for commenting on profile. Favoured V/A changes pre-event and likely to have experienced ingress incidents.	-
EDM	More likely to have experienced a range of hazards (mainly linked to site legibility, dark spots, density, temporary structures) and crowd safety incidents (on way to venue or at point of entry). Sensation seeking crowd (motives of fun, entertainment associated behaviours of intoxication, drugs usage / sale, sexual promiscuity, organised violence). Most carefree music attendees, preferring informal comms, least likely to be put off attending by external factors and most high-risk crowd, with experienced behaviours linking to deviance, sensation-seeking.	Male (more likely to have experienced incidents yet carefree), younger, frequent attenders, Hip-hop, small venues (informal comms), large outdoor events
Folk	Only a few associations identified but some connections with other user groups evident. Influenced by barriers/queuing, motivated by camaraderie, experienced fear and panic, avoidance of following instructions.	Male (influenced by queuing, camaraderie, instruction avoidance), sport: cricket, football, motorsport, rugby
Hip-hop / Urban	Influenced by some site design elements (ambience and line-up) and likely to have experienced overcrowding. Find crowd monitoring and security strategies effective. A sensation seeking (motives of fun, entertainment) and high-risk crowd, with experienced behaviours linking to deviance, sensation-seeking (sales of drugs, sexual promiscuity). Less likely to attend for security or WOM reasons.	Male (more likely to have experienced incidents yet carefree), younger, frequent attenders, EDM, employed, FT Education, residence, large city / outdoor venues
Indie	Lack of space, overcrowding, temperature issues, incidents inside the event or at point of egress and a higher likelihood of experiencing safety incidents over other event types suggest these users attend larger more densely crowded events. Only music attendees to feel incidents tend to be poorly dealt with too. They have experienced a high no of hazards and behaviours (some deviant traits, links to camaraderie, excited / energetic moods triggering more negative behaviours (intoxication, rowdiness, sale of drugs, etc).	Music: rock, metal, EDM, hip-hop – dark areas, lack of visible exits, overcrowding, poor signage, temporary structure issues (EDM) and drugs issues (both), Sports: football (incidents poorly dealt with, obstructed sightlines, egress incidents, camaraderie) and cricket, rugby (lesser extent), large city-based venues, arenas and stadiums, Male, Younger
Metal	Less likely to be influenced behaviourally by site design factors. Strong social identity – motivated by socialising with friends, more likely to be fan club members associated / experienced behaviours point to a lively, energetic crowd (intoxication, rowdiness, physically expressive, dense crowds) but generally compliant, nonetheless. Deem drugs strategies ineffective.	Music: rock (especially), indie, sports: rugby, small city-based venues or outdoor national events, younger and mid-aged, frequent attenders, males, females
Pop	More likely to have experienced poor signage, value organised movement, receptive to a wide range of comms and CM strategies. A positive crowd motivated by socialising with family and fun. Associated behaviours centre on excitement (happy, intoxicated, physically expressive, pushing/impatience, dense crowds). More cautious (experienced fear / panic) and likely to be influenced to attend by visibility of security / emergency efforts and strong comms.	Large outdoor events, arenas / stadiums, female, moderate / infrequent attenders, employed / in FT education, younger

Rock	More sensible / cautious than expected – receptive to widest range of CM comms, influenced not to attend by a range of factors, uncomfortable but accepting of crowds, hesitant about post-covid attendance). Experience high no of hazards, plus safety incidents experienced tend to be in main stage area, motivated by fun, entertainment, with behavioural themes linked to positive moods, energetic close contact crowds with strong social identity yet compliant.	Music: metal (especially), indie, sports: rugby, small and city-based venues or outdoor national events, younger and mid-aged, frequent attenders, males, females
Sports	Less mention of hazards, ingress/egress incidents, handled poorly. Behavioural themes – invested emotion, volatility. Low regard for / positive influence of CM.	Male, employed, FT education, all ages, frequent attender, large city venues, arenas/stadiums
Athletics	Only a few associations identified. Insufficient for commenting on profile. Positively influenced by more security / police presence, and less likely to have experienced physically expressive behaviour.	-
Boxing / Ring Sports	Only one association identified. Insufficient for commenting on profile. Favoured V/A changes pre-event.	-
Cricket	Influenced by site design (qual findings suggest in a negative, antagonised manner). Obstructed sightlines only hazard mentioned but experienced safety incidents linked to ingress / egress. Less likely to be supportive of, influenced by or favour CM / comms strategies, security presence. Strong social identity (team support, camaraderie, emotional atmospheres, rivalry).	Sports: football, rugby, tennis, golf, Music: Indie, folk (camaraderie), EDM (organised violence), male, younger, mid aged, older, retired, large city-based venues, arenas / stadiums, frequent attenders
Football	Influenced by site design (qual findings suggest in a negative, antagonised manner). Obstructed sightlines only hazard mentioned but experienced safety incidents linked to queuing, ingress / egress. Less likely to be supportive of, influenced by or favour CM / comms strategies, security presence. Less cautious, more carefree. Strong social identity (team support, fan club members, camaraderie, emotional atmospheres, rivalry). Wide range of negative behavioural traits – points to volatile crowd	Sports: cricket, rugby, tennis, golf, Music: Indie, folk (camaraderie), EDM (organised violence), male, younger, mid aged, older, retired, large city-based venues, arenas / stadiums, frequent attenders
Golf	A few significant associations identified. Insufficient for full profiling. Experienced fighting / violence, influenced to attend by updated H&S website info	Male, football, rugby (fighting / violence)
Horseracing / Equestrian	A few associations identified. Insufficient for full profiling. Found search/drugs policies effective, more security/police presence has no attendance influence.	-
Motorsports	Influenced by site design (barriers/queuing, signage), found handling of emergencies effective and experienced overcrowding / ingress-to-site incidents	Sports: football, cricket, rugby, frequent attenders, males, business, family
Rugby	Influenced by queuing (qual findings suggest negatively). Experienced overcrowding, motivated by team support, high no of negative behaviour traits	Sports: football, cricket, tennis, young/mid aged Music: rock, males, city venues, frequent attenders
Tennis	Only a few associations identified. Insufficient for commenting fully on profile. Cautious in prioritising social distancing to encourage attendance, solely motivated to attend for supporting a team / act / individual.	Female (more cautious attitude), sports (cricket, football, rugby, tennis).

8.9 Summary of Phase 2 findings: audience safety perceptions survey

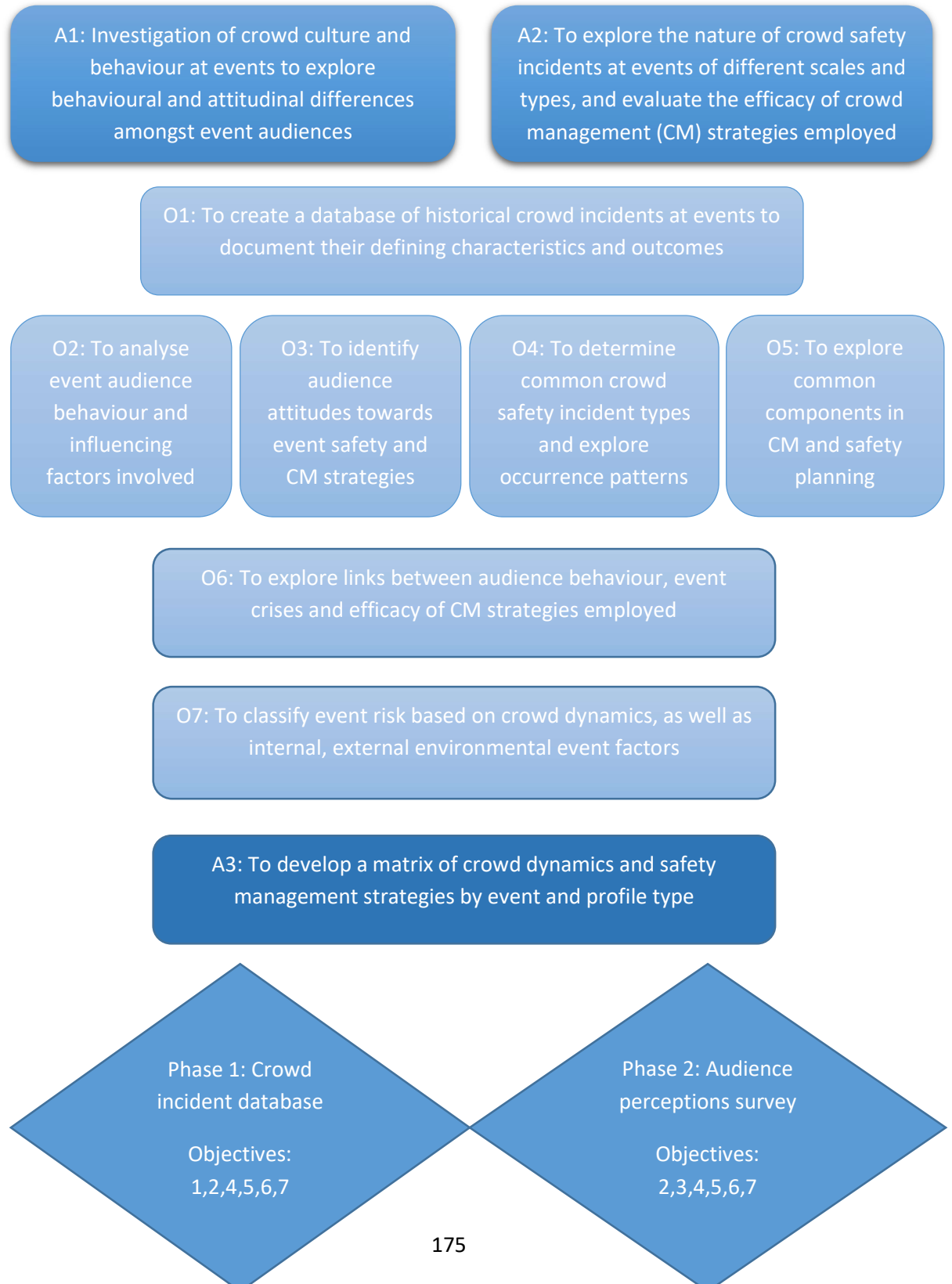
This chapter sought to present the information obtained from phase two of the research study through the analysis of the event audience safety perceptions survey (See Appendix 2: Copy of the final questionnaire, following pilot, p247). The data was analysed in two ways: first headline descriptive findings were identified in relation to the survey data (Appendix 8, p317 onwards). This established an overview of the prevalent topics and issues linked to demographics, attendee profile, event environment and site, crowd management strategies and feeling safe at events. Second, an in-depth analysis of the data was undertaken through bi-variate chi-square testing (Appendix 9, p327 onwards). In total, 988 associations within the dataset were identified at either the 0.05 or 0.01 level. From this, the significant associated relationships and connections between different emerging audience profiles and user groups were identified as well as, where possible and appropriate, the initial consideration of risk levels by profile group (based on known incident risk factors from the literature review, conceptual framework and qualitative research findings).

From this, the significant quantitative and preliminary indicative profile-by-safety-risk Phase 2 findings of the research linked to the event audience safety perceptions survey were taken forward and considered alongside the qualitative crowd incident database Phase 1 findings against the study aims and objectives and key literature. The discussion of these amalgamated significant findings is presented in Chapter 9 hereafter, with the concluding emergent contribution to existing knowledge, methodology and limitations in Chapter 10.

9. Discussion of significant research outcomes

This thesis has endeavoured to explore and consequently give explanation for the dynamics of crowds and audience behaviour alongside its influencing factors in order to find ways to manage crowds effectively for events. The aims for the study were three-fold, underpinned by seven research objectives and two research methods, detailed initially in Chapter 5 (Figure 7, p73) and presented again below:

Figure 7: Aims, objectives and research method map



Through the crowd incident database (Research Phase 1) and the audience safety perceptions survey (Research Phase 2) a series of findings significant to the thesis research outcomes have emerged. A table of the synthesised findings related to these two research phases (Appendix 10, p352 onwards) has informed the discussion of findings against the thesis research outcomes discussed hereafter.

9.1 Database of global historical crowd incidents at events (RO1)

Phase 1 of the research process centred on the development of a global crowd incident database including incidents dating from the 60s right up to present day. According to Still (2013; 2022) the documentation of crowd incidents is crucial to the understanding of event and crowd safety for a number of reasons: investigation of past incidents can provide insights into common causes and patterns linked to crowd incidents, builds an overview of key fail points and types of failures (i.e., crowd, environmental or planning-specific), and can also provide detail linked to the efficacy of CM strategies implemented. Still also notes that near miss incidents and effective crowd safety strategies are rarely documented (2013) and thus gathering data linked to a range of incidents with varying event safety outcomes and for varying event scales and types was deemed necessary in order to more fully understand the range of factors that underpin event safety and crowd safety incidents. The full incident database has been stored for future reference and contains data linked to the event scale, type, incident type and trigger (catalyst), as well as details of the incident itself (including the number of injured and fatalities). Further information was provided too about the type of safety management issues involved according to key theory such as the DIM-ICE and RAMP analysis (Still 2013) and FIST (Fruin 1993) and Situation Awareness (Endsley 1995) models. The compiled incident data generated a set of headline findings (Appendix 6, p300 onwards) as well as the other qualitative research findings taken forward (Table 17, p133) to inform the research outcomes linked to most of the thesis objectives discussed below, with the exception of 9.3 (the audience perspective).

9.2 Audience behaviour at events and influencing factors (RO2)

Many authors have emphasised the importance of studying crowd behaviour to make sense of its impact on crowds, and thus, event safety (Abbott and Geddie 2001; Berlonghi 1995; Bladen et al 2018; Canetti 1973; O'Toole et al 2020; Tarlow 2002). To fully understand audience behaviour at events it is first helpful to build a common attendee profile. The phase 1 and 2 research findings generated some interesting outcomes related to event attendance.

First, females were found to be more cautious, risk averse and compliant than males who attend events, who conversely were found to be more reactive, non-conformist and negatively influenced (triggered) by visible crowd management strategies (CMS), though they were also found to be more carefree. These findings are consistent with the literature around gender differences. Blackman (2008) explored studies on the concept of Social Unity Theory, and found it links gender to the propensity to lead (males) or follow (females). The identification of more

cautious and risk-averse behaviour among females than men was highlighted in a study by Eckel and Grossman (2002) linked to attitudinal differences regarding financial risk. In support of this, Booth and Nolan (2012) explored gender differences in risk attitudes and behaviours and found that women and men may differ in their propensity to choose a risky outcome because of innate preferences, pressure to conform to gender-stereotypes that encourages modification of innate preferences or depending on the gender of individuals with whom they are interacting. It may be argued that fear and panic which were common behaviours observed within the crowd incident database could therefore more likely be linked to the female profile. With this in mind, the likelihood that same-gender group interaction influences attitudes towards risk-taking and sensation-seeking behaviours may also help to explain the findings linked to the male profile. Analysis of the profile groups identified as a key research outcome (see 8.8 and 9.7) positioned male, indie, sports and football attendees as groups with similar behavioural and attitudinal traits. What is noteworthy is that they shared the similar carefree but more negatively reactive traits, indicating an arguably stronger presence of males within these profile groups who are motivated (amongst other factors discussed further on) to act in such a way due to the like-minded attitudes of those around them. These gender-specific findings suggest the need to consider nuances in managing audiences with a predominance of one gender over another.

Similarly, findings from both phases of the research have identified prevalence of a younger audience in relation to event attendance (safety perceptions survey) and also to a significant number of the crowd incidents identified (crowd incident database). There is a considerable amount of research that has been done in relation to this profile group. Firstly, it has been noted that they can be impressionable, preferring to follow the crowd (Blackman 2008; Walters and Raj 2004), which can negatively influence their behaviour in a group situation regarding adoption of situation specific norms and values associated with a strong subcultural *social identity* (Reicher et al 2004; Hoggett and Stott 2010). Specifically, younger attendees were found to have experienced more hazards linked to critically dense crowding (bottlenecks and temperature issues) and outdoor events and festivals, experience of drug safety strategies, more likely to be students and with a less cautious attitude evident, connecting them to more energetic, thrill seeking and potentially unsafe behaviours such as physically expressive dancing or moshing (Kemp et al 2007), hedonistic tendencies, party atmospheres and sensation seeking motivations (Eachus 2004; Lepp and Gibson 2008; Zuckerman 2007) and deviant and unsafe behaviours such as intoxication via excessive drinking and drug usage (Fuller et al 2018; Glassman et al 2007; Josiam et al 1998; Menaker and Chaney 2014; Smith and Foxcroft 2009; Verkooijen et al 2007). Many recorded safety incidents from the crowd incident database shared characteristics linked to the youth profile specifically around deviance, disorder and crime-related behaviours (intoxication, sexual assault, rule avoidance) and more positive sensation-seeking but unsafe behaviours (cheering, moshing, crowd surfing, excitement, rowdiness and boisterousness). What is perhaps interesting however is that whilst the behaviours they engage with are *high risk* in nature, the survey findings also suggest this is not pre-meditated as the younger audience is also receptive to CM strategies, making them arguably more compliant.

Several key findings emerged regarding frequency and scale of events attended. Confidence in event attendance and safety is likely related to visit frequency and whilst frequent attenders cited experiencing the most hazards, very frequent attendees were less likely than expected to cite experiencing hazards at all. This arguably demonstrates a greater level of tolerance and

acceptance among frequent event attendees and connects to literature linked to collective behaviour, subculture and fan typologies. Specifically, subculture is defined as the representation of common goals, unity of purpose and intention (Green and Chalip 1998) linking to collective behaviour, shared identity, conforming to situation-specific norms and normative influence (Asch 1956; Drury 2020; McCloud 2008; Reicher et al 2004; Templeton et al 2018) through the acceptance of a crowded situation and the 'hazards' that may come with it (Cannetti 1973). Significantly, 'group herd behaviour' was identified as a key theme linked to *social identity* causes for crowd incidents observed in the phase 1 findings. Moreover, the notion of 'fan' behaviour is connected to subculture and the adapted typology of fans at events (Figure 2, p62) suggests that the most devoted fans are often frequent attenders, expert and loyal to the type of event attended as it has a central purpose in their daily life as well as being motivated by tradition, habit and a strong shared identity (Bladen et al 2012; 2018; Brotherton and Himmetoglu 1997; Henderson n.d.). With this in mind, referring back to their less cautious attitude and lack of hazard perception, it may indicate that frequent attenders are no less likely to be exposed to hazardous situations but although they may feel safe in crowded event scenarios, they are nonetheless at risk of lacking the situational awareness (Endsley 1995) to recognise the unsafe situations they may be exposing themselves to.

Behavioural findings linked to the quantitative survey also addressed the concept of attendance motivation and found that of the top five visit motivations, three resonate with the concept of social identity theory, collective behaviour, psychological crowds and the common sports attendee profile (Bladen et al 2012; Drury 2020; Templeton 2021), namely, socialising with friends, supporting a team / act / individual, and camaraderie. Moreover, socialising with friends plus festive / fun atmosphere (the fifth top motive overall) are frequently attributed in the existing literature to music attendance motivation, alongside entertainment and artist appeal (Anderson et al 1997; Bladen et al 2012; Mowen et al 2003; Templeton 2021), which was identified as being unique to music attendees. Moreover, socialising and having fun are widely regarded as the most common motive overall for event attendance (Crompton and McKay 1997; Getz 2005; Nicholson and Pearce 2001; Yoon and Uysal 2005) and help to give explanation for the fact that positive behavioural traits experienced recorded the highest frequencies overall, specifically in relation to cheering chanting and singing, friendly crowd moods and helpful crowd members. These findings point to expressive, revellous crowds with a positive social identity and attitude towards those they attend events with as well as a strong sense of audience empathy (Alnabulsi and Drury 2014; Berlonghi 1995).

Of the event types investigated, only music and sports events achieved sufficient responses to enable full sub-profiling analysis. These event type profiles exhibited specific attitudes, experiences and behaviours, affecting management styles (explored in 9.7). That said, regarding common behavioural patterns, being a member of a club or group was significant for metal and rock music, and football attendees, indicating likely strong social identity among these cohorts (See Table 32). Rock and metal music attendees shared some (not all) traits, and collectively these profiles are motivated by fun and shared experiences as well as being characterised as a physically energetic crowd but compliant, nonetheless. These findings link to the work of Kemp et al (2007) who observed in relation to a Green Day concert that incidents of conflict and crime were expected to be low, yet audience activity was expected to be lively and tightly packed (dense) with multiple incidents of moshing and crowd-surfing. These findings also link to

common behaviours observed in safety incidents in relation to the prevalence among this group of *positive but unsafe physically expressive behaviours*.

On the other hand, the football attendee profile is markedly different and much more connected to association with and experience of negative behaviours as well as being motivated solely by team support, whilst being confident in crowded situations and less cautious. Furthermore, the Indie music profile share the majority of behavioural and attitudinal connections with football attendees, indicating a strong social identity as well (although being a fan group member was one exception). These findings exhibit a common theme of rivalry and territorial behaviour linked specifically to sports events where opposing teams come together (Bladen et al 2018; Hoggett and Stott 2010; Stewart and Cole 2001; Stott et al 2008) and also connect to the gender-specific literature explored previously as well as further discussion of football attendees as a high-risk profile group in 9.7 later. Moreover, they support the crowd incident data regarding common behavioural patterns observed in event incidents:

- **Social identity** (emotionally charged, fighting, aggression, ‘herd’ actions, rivalry, riots)
- **Deviance, disorder and crime** (intoxication, riots, vandalism, mobs, violence/physical abuse, sexual assault, rule/instruction avoidance)
- **Positive but unsafe behaviours** (emotionally charged)

Table 32: Prevalence of a likely strong social identity, behaviour-specific findings only

Rock Profile	Metal Profile	Football Profile
<ul style="list-style-type: none"> • Attendance motivators: <i>fun atmosphere, entertainment offered</i> (two most common across music genres) • More likely to be members of fan clubs or interest groups • Associated behaviours: most factors identified. Themes of positive mood, energetic, close contact crowds. See A9. • Behaviours experienced: (See A9). <i>Themes - strong social identity, excited/energetic moods trigger the more negative opportunistic experienced behaviours. Links with metal crowds (See A9). Themes - lively, energetic crowd, although compliant</i> • Common behaviours experienced: <i>Intoxication (alcohol & drugs), rowdiness & boisterousness. Links with indie & metal.</i> • More sensible / cautious than perhaps expected. Accepting but uncomfortable in crowds • Cautious attitude also shown attendance influence links (see A9) 	<ul style="list-style-type: none"> • Not behaviourally influenced by any site design factors • Motivated to attend by <i>socialising with friends</i> • More likely to be members of fan clubs or interest groups • Shared similar tendencies with rock crowds in terms of behaviours they were less likely / more likely to associate with • Associated behaviours: <i>physically expressive and packed dense crowds (links with rock crowds)</i> • Behaviours experienced: <i>strong links with rock crowds (See A9). Points to a lively and energetic crowd, but one that is compliant and thus potentially easier to manage.</i> • Common behaviours experienced: <i>Intoxication (alcohol), rowdiness & boisterousness. Links with indie & rock.</i> 	<ul style="list-style-type: none"> • Attendance motivators: <i>solely supporting a team</i> • More likely to be members of fan clubs or interest groups than expected • Associated with several negative behaviours - a strong social identity: <i>aggression/violence, camaraderie, disorderly behaviour, emotional/tense atmospheres</i> • More likely to cite crowd behaviour as a contributing factor to safety incidents • Less likely to be supportive of, influence by or to favour a specific CM strategies • predominantly negative behaviours experienced - i.e., <i>rules/instruction avoidance, fighting/violence, group behaviour, intoxication, abuse. (See A9)</i> • More likely to feel comfortable in crowded spaces and less likely to be impacted in attitudes to crowded spaces as a result of covid-19 or perceived safety at future events • Less cautious, carefree crowd.

The number of parallels that can be drawn between the literature and research findings further exemplify the status of the football attendee as the highest risk-to-safety group. Moreover, intoxication (drugs or alcohol), which was linked to all three profile groups and emotionally charged atmospheres (football-specific) are known behavioural incident triggers, evident within the crowd incident findings and also the existing literature (Abbott and Geddie 2001; Brunt and Brophy 2004; Rutherford-Silvers 2008; Tarlow 2002; Templeton 2021). The profiles developed from the phase 1 and 2 research findings can be mapped (Table 33) and then plotted (Figure 27) according to prevalence of allocentric and psychocentric personality traits adapted from the tourism behaviour literature (Plog 1974; Tarlow 2002) to aid categorisation of risk. The research outcomes generated profile-specific findings linked to 28 event and user groups. To be included, sufficient data was required from the research findings meaning that some groups discussed within the earlier findings were not taken forward for risk profiling.

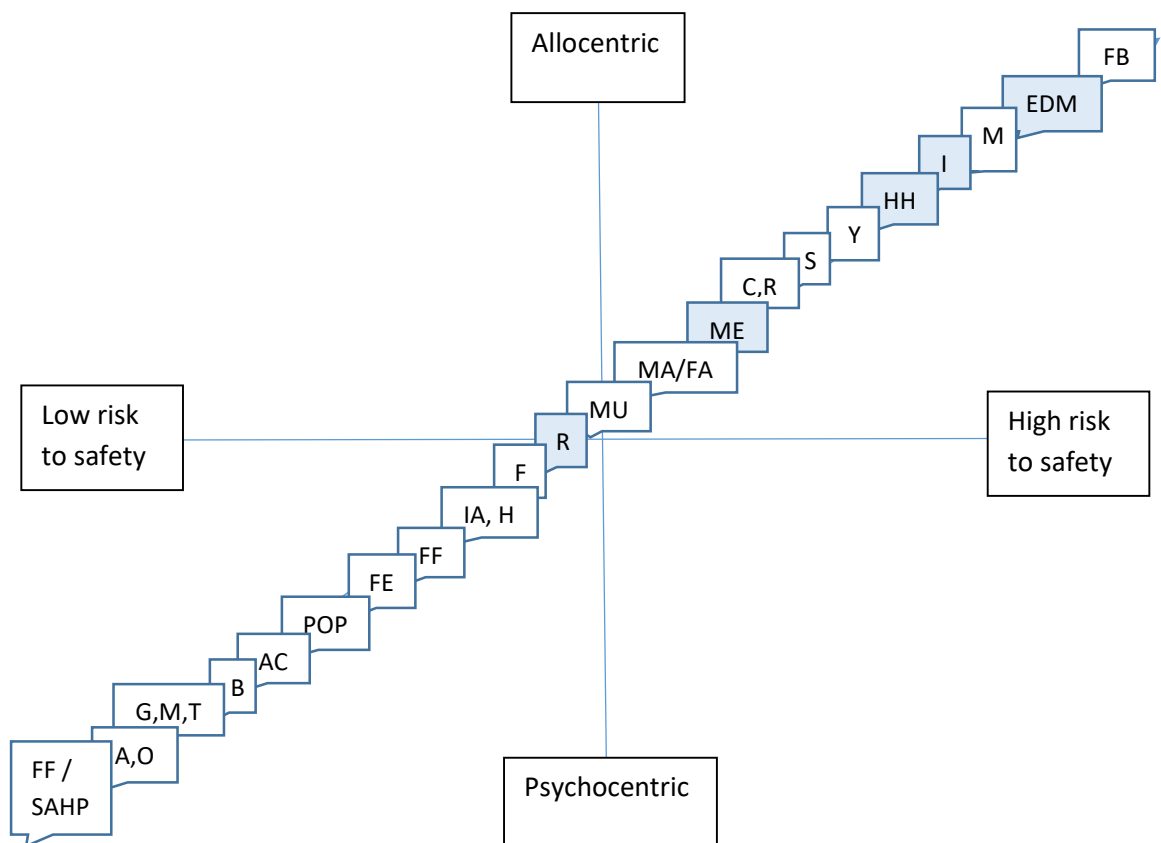
Table 33: Links between profile groups and allocentric / psychocentric personality traits

Allocentric	Profile group links	Psychocentric	Profile group links
Wants excitement, will tend to ignore security personnel's warnings (rule / instruction avoidance). More carefree.	Younger (Y), mid aged (MA), male (M), music (MU), EDM, folk (F), hip-hop (HH), indie (I), metal (ME), sports (S) cricket (C), football (FB), rugby (R)	Wants fun without danger, may be overly cautious	Female (FE), infrequent (IA), arts and cultural (AC), business (B), family friendly / Stay at home parent (FF/SAHP), food festivals (FF), folk (F), pop (P), rock (R), tennis (T).
Free with money		Frugal with money, may worry about being overcharged	
Bores easily, critical of management, will not complain until after an incident has occurred	Male (M), frequent attenders (FA), indie (I), sports (S), cricket (C), football (F)	Tends to complain about everything (i.e. atmospheric conditions)	Arts and cultural (AC), business (B), family friendly / Stay at home parent (FF/SAHP), food festivals (FF)
Person will climb onto stage, be physically expressive or seek crowds	Younger (Y), EDM, hip-hop (HH), indie (I), metal (ME), rock (R), football (F)	Wants to enjoy the show and avoid crowds or congestion where possible	Female (FE), business (B), family friendly / Stay at home parent (FF/SAHP), pop (P), rock (R), tennis (T).
Troublemaker – wants to challenge / engage in deviance, disorder or criminal behaviour	Male (M), EDM, hip-hop (HH), indie (I), sports (S), football (F), horseracing (H), rugby (R)	Does not want to stir the pot or make trouble. Compliant / content with CM.	Younger (Y), mid aged (MA), older (O), female (FE), infrequent (IA), arts and cultural (AC), family friendly / Stay at home parent (FF/SAHP), food festivals (FF), music (MU), hip-hop (HH), metal (ME), pop (P), rock (R), athletics (A), golf (G), horse-racing (H), motorsports (M)
Single		Family oriented	Family friendly / Stay at home parent (FF/SAHP)
NB: Insufficient links to group profile traits	Retired, classical, boxing		

(Adapted from: Plog 1974; Tarlow 2002)

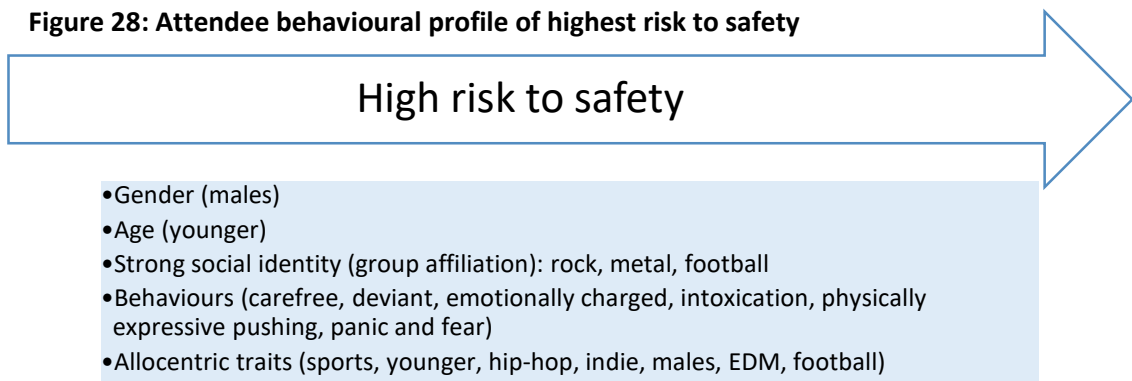
These findings broadly corroborate with those above, though what is interesting is the cautious attitude of *rock* attendees, despite being identified as having a strong social identity along with the *metal* music group. This differentiates them from the *metal* group, who are more allocentric in their traits. Moreover, the *indie* and *hip-hop* groups also plot as a high risk to safety, and when exploring Table 33. This is due to their shared traits with the *male*, and *football* groups (*Indie*) and the *younger* group through thrill and sensation seeking motives (*Hip-hop*, *EDM*). The groups from *cricket* and *rugby* at the top end and to *females* and *pop* at the lower end could arguably be classed as ‘mid—centric’ (Tarlow 2002), split at the mid-way point into ‘higher mid-centric’ and ‘lower mid-centric’. These insights are noteworthy for the categorisation of risk to be explored later (in 9.7).

Figure 27: Identified profile groups by prevalence of allocentric and psychocentric traits



In summary, the research outcomes linked to audience behaviour at events and influencing factors (Figure 28) highlights an emergent behavioural profile of high-risk-to-safety grouped characteristics that can support the categorisation of risk by user group type to be explored later in relation to RO7.

Figure 28: Attendee behavioural profile of highest risk to safety



9.3 Audience perceptions of safety and CM strategies at events (RO3)

Of those attendees to be influenced by site design, findings indicated that barriers, gates and queuing, poor audience communication and inadequate signage were most detrimental to crowd safety as long waits linked to queuing were seen to trigger frustration and rule avoidance, heavy or rude and aggressive control tactics linked to poor audience communication were felt to trigger crowd trouble, and poor layout was perceived by audiences to create confusion. These findings are consistent with literature around the principles of site planning in several ways. First, if human nature is to become frustrated with long waits then organisers must make wait times more comfortable through queue strategies such as batch processing through multiple ingress and egress points where possible, physical crowd calming measures such as barrier installation at the site design phase, hold and release and staggered entrance systems to maintain smooth crowd flow, and staff surveillance of long queues to monitor crowd mood (Getz 2005; Selley 2004; Still 2022; Tum et al 2006; Yeoman et al 2004). Second, the Green Guide to Sports Event Safety (2008) and Kemp and Hill (2004) identified one of the important components of communication for safety management to include effective communication with spectators both in and outside the ground. Thus, several authors have discussed requirements of effective crowd enforcement strategies, and agree that the context is crucial as the traditional physical presence of security and law enforcement, use of ‘spotters’ in the crowd, and forceful ejection strategies can evoke anger among an audience, though the more ‘rational’ approach (assuming that a crowd can be reasoned with through positive crowd interaction to communicate desired actions and outcomes in less volatile situations) does not adequately address the impact of internal crowd dynamics on emotional arousal, often resulting in the need for a more balanced strategy so as not to escalate or initiate conflict through a heavy-handed approach (Abbott and Geddie 2001; Borch 2013; Filingeri et al 2018; Menaker and Chaney 2014; Stott and Reicher 1998; Stott et al 2008). Third, Getz (2005) based a number of principles for maximising legibility on the work of Lynch (1960), and specifically argued that landmarks are needed to improve orientation at key points around an event, with pathways marked out using signage or some other types of visual indicators and clear demarcation of nodes (thoroughfares) and no-go areas. According to Tum et al (2006: 144), research has shown that movement as customers enter an event slows down as people look around to orient themselves and hence it is crucial that this is taken into account in both the site design and also communication strategy. Others have said signage should be used to warn, to inform and to direct a crowd, with clarity of signage such as

the type of information, size and dimension, wording specifications and location for visibility and crucial elements to its efficacy (Berlonghi 1995; O'Toole 2011; Tum et al 2006). Finally, regarding perceptions of site planning, respondents generally saw the value in complying with safety procedures and emphasised the importance they place on communication strategies for reassurance and to encourage future event attendance, despite evidently feeling at times as though some aspects could be managed better.

Regarding positive sentiments linked to CM strategies experienced, attendees generally favoured electronic communications overall (digital and audio / visual). This finding suggests the use of apps for wayfinding and updates, e-boards, tannoys, website and social media engagement is crucial for communications to be well-received by attendees and resonates with a broad range of literature (Martella et al 2017; O'Toole 2011; Rutherford-Silvers 2008; Still 2022). In contrast, non-verbal methods were perceived least useful except for layout / timing updates as crowds must be able to 'see' the instruction provided via stewards. Whilst there is clearly no one-size-fits-all approach to communication strategies, a broad range of techniques exist for onsite communication (OSC) and safety planners must remain mindful that a lack of efficient means of communication has been attributed to crowd disasters (Helbing and Mukerji 2012). Consequently, as noted by Abbott and Geddie (2001) effective communication should lead to successful coordination between employees and guests and between management and guests, and the communication process should therefore remain flexible in case the event environment changes.

The handling of emergencies at events (discussed in more depth in 9.5 and 9.6) was met with conflicting views through the audience safety perceptions findings. On one hand, they cited it as one of the most effective CM policies overall and it was also viewed as being important as an attendance influencer for future attendance (via visibility of emergency procedures and heightened security strategies), but on the other, incident management (linked closely to the handling of emergencies) was only felt to be handled adequately at best or extremely poorly by the majority. A closer review of the profile group findings explored in 9.2 above indicates that it was some of the lower risk to safety and more compliant attendee groups (business, family friendly and motorsports attendees) who were most likely to deem this effective. Conversely, sports (specifically football and cricket attendees) who present a much higher safety risk were generally found to be extremely dissatisfied with incident management, likely due to its strong social identity, history of territorial behaviour and other negative behaviours (Bladen et al 2018; Hoggett and Stott 2010; Stott et al 2008), which arguably contributes to more frequent incidents of a high-risk nature, making them less straightforward to manage effectively.

Conflicting views also emerged regarding perceptions of crowding at events. First, crowding was not found to be a significant deterrent for the majority of respondents who felt comfortable in crowds, viewed them as part of the atmosphere and for some, actively sought out crowded spaces to enhance their experience. Generally, this links to concept of positive crowding, collective behaviour and social identity theory whereby the individual views the crowded situation in a positive manner due to the shared atmosphere and experience (Anderson et al 1997; Berlonghi 1995; Bowen and Daniels 2005; Drury 2020; Sit and Johnson Morgan 2008; Templeton 2021; Wickham and Kerstetter 2001), and it was also found to be significant for certain types of music crowd in particular, as discussed in 9.2. Conversely, for those who viewed crowding in a more negative light as a deterrent to their experience or future attendance, this tended to be linked to their concerns regarding an anticipated lack of space and social

distancing, most likely as a risk-averse reaction to the recent influence of the COVID-19 pandemic on public perception. Supporting this finding, recently published research into post-pandemic event attendance by Hooshmand, Sung, Jefferies, Jefferies and Lin (2022) found that most respondents were comfortable attending an entertainment event post-lockdown and also with following COVID-19 safety precautions at events, but that the pandemic has prompted event attendees to prefer lower seating capacity at events, with the gradual easing of restrictions reducing their discomfort toward higher seat capacity. Moreover, referring back to the thesis' primary research findings, attendees valued crowd management strategies that would promote social distancing, which points to the prevalence of a more cautious and psychocentric attendee (See 9.2, Table 33). It seems that for the more cautious attendee, spatial density, which can be defined as the amount of space per person (Mehta 2013), is a cause for concern particularly post-COVID-19 that must be addressed through effective crowd spatial planning (Still 2013; 2022) in order to effectively meet and address their safety needs.

Also significant was the negative view towards drugs and alcohol policies, which were perceived least effective overall, contradicting the positive sentiment that also emerged around the efficacy of search policies. These conflicted views among attendees highlight a key issue for effective CM at events. That is to say, they arguably contradict the shift in thinking that has occurred in recent years regarding management of drugs and alcohol usage at events and the implementation of harm reduction strategies designed to educate and raise awareness through drug testing facilities rather than maintaining the traditional zero tolerance approach (Bladen et al 2018; Busby 2018). Moreover, findings in 9.2 have highlighted renewed links to intoxication and excessive drinking among attendees, which are consistent with literature for the youth music and sports profiles (Dun 2014; Glassman et al 2007; Menaker and Chaney 2014; Tarlow 2002). In an article about the 'civilising' effect of a more balanced night-time economy on Bournemouth, Haydock (2014) suggests that placing emphasis on atmosphere rather than the homogenized mainstream 'on the cheap' offer that exists on most night-time high streets, whereby more relaxed environments are created, so 'people will sit rather than stand and simply pour lager down their throats' (p180), could promote a 'better' drinking style through the audience it attracts, and thus exert a 'civilising influence' on the venue and its crowd. The issue of drugs and alcohol strategy efficacy is discussed in more depth in 9.5 further on, however, these findings do indicate that further investigation of this aspect specifically could be beneficial through future research studies.

On a final note, in relation to the event attendee safety perceptions identified through phase 2 of the research process, what is interesting in terms of its *lack* of prominence in the findings is the sentiment surrounding media influence (i.e., or coverage of crime or terror attacks) on perceptions of safety or future event attendance. The absence of this as a prominent theme among attendees consulted contradicts the literature that exists on the influence of the media on fear of crime and risk perception at events (Ferreira and Harmse 2012; Jeon et al 2023; Jewkes 2010; Rutherford-Silvers 2008; Sonmez and Graeffe 1998; Tarlow 2002). The reasons for this contradiction are not so easy to explain and thus may require further investigation via future research studies in order to confirm and elaborate further.

9.4 Crowd incidents and patterns in occurrence (RO4)

A review of the significant patterns to emerge from the research findings in relation to crowd incidents and the patterns in their occurrence (compiled from the attendee experiences survey and crowd incident database findings) has uncovered some interesting observations for discussion hereafter.

Crowd density is connected to a wide range of the documented crowd incidents and safety incidents experienced. Whilst other factors evidently contributed to the incidents, density was found to ultimately underpin the majority of incidents explored, including surges and ‘trampings’, crowd crushes and collapses, reduced pedestrian flow and congestion, and capacity management issues, all of which are consistent with the crowd density risks defined by Rutherford Silvers (2008). Moreover, density was linked to two of the three types of structural collapse identified through the research (barrier and railing as well as permanent structure collapses). According to Still (2013; 2022) once crowd density in a static crowd goes beyond 5ppm^2 to either 6 or 7ppm^2 (moving crowds require more space per person, with an optimum density of 2ppm^2) then the crowd is considered to be at a critically dense level and tightly packed. He goes on to state that without sufficient space between individuals, the crowd loses its ability to absorb shockwaves (i.e., pushes from neighbouring individuals) and is said to be at high risk of serious harm. Moreover, Bladen et al (2012) noted that most deaths in crowds result from suffocation as individuals, without the space to move freely (Canetti 1973), crush together, surge or potentially collapse whereby the force and momentum of the crowd pushing results in those at the front falling over, placing them at extremely high risk of being trampled and being unable to get to their feet. Research by Helbing and Mukerji (2012) and Still (2013) theorises that crowd surges and other density-based incidents are not always avoidable as crowds are often unaware of the domino-effect dangers involved in dense crowd situations and as they may be unaware of a problem in the system, they keep moving to the incident location. These issues with critical density and spatial density were linked through the audience perceptions survey to incidents in the main event area (or stage area for music events), whilst the incident database identified density-related incidents for all event types and scales, linked to capacity management. Therefore, many authors discuss the importance of controlling crowd density at events (Rutherford Silvers 2008; Still 2022; O’Toole et al 2020). These findings emphasise the role of onsite dynamic CM strategies such as real-time monitoring (Martella et al 2017; Still 2022), the OODA loop (Boyd 1998; Brehmer 2005, 2006) and situational awareness (Endsley 1995) as well as careful pre-event site and crowd management planning in effective CM, to be explored in sections 9.5 and 9.6 below.

Of concern through the audience survey was the low prevalence of incident triggers, such as the lack of sufficient exits as a recognised hazard among attendees, yet it was found to be a key contributing factor in surges and crushes at egress from venues. This points to a lack of attendee awareness around its potential risk as a hazard. Factors influencing pedestrian flow rates through doorways during egress and evacuation have been widely investigated within the literature as a consideration in effective management of bottleneck and congestion issues and have found that singular exits, small exit widths, high velocity pedestrian flow through a node (i.e., rushing and pushing) and increased levels of panic are all significant contributors to congestion and increased evacuation time (Wang et al 2016; Yugendar and Ravishankar 2018; Zhang et al 2017). These studies support the finding from the crowd incident database that

crowd crushes and surges featured heavily in the number of injured attendees for indoor and outdoor venues of all scales, most often linked to ingress or egress through a node (doorway or opening). This ingress-egress congestion factor was noted within the audience survey to predominantly link to sports events specifically whilst the incident database also identified the issue in relation to indoor local scale music events (i.e., in nightclubs). Furthermore, it follows that careful flow capacity, ingress and egress procedures and site planning (to maximise space) are fundamental to effective CM strategies generally regarding both normal and emergency operating procedures (Fruin 1994; Getz 2005; Still 2022).

Regarding behavioural-based incidents, the two most prominent across both phases of the research for events of all scales were physically expressive (i.e., moshing, dancing and pushing) and disruptive behaviours (i.e., boredom, deviance and aggression). As noted in 9.2, these behaviours share direct links with the four components of the sensation-seeking motivation scale, namely thrill and adventure seeking, experience seeking, boredom susceptibility and disinhibition (Eachus 2004; Zuckerman 2007) and provide insights to inform the categorisation of risk by attendee profile whereby evidently high sensation seekers would be classed as higher risk to event safety (see 9.7).

Finally in relation to crowd incident patterns, temporary structure failings noted within the crowd incident database were specifically linked to outdoor music events and triggered by extreme weather incidents such as the stage collapse seen at the Indiana State Fair in 2011 (Tuohy and Ritchie 2012), yet there was also a low recognition among event attendee survey respondents of temporary structure failings as hazards, likely due to a lack of incident-specific experience. Weather incidents and the safety risks they pose for outdoor events link to the literature around safe emergency planning, specifically related to stringent safety checks on temporary demountable structures (TDS) and appropriate use of show stop procedures and evacuation strategies (Abbott and Geddie 2001; HSE 2022; Kemp et al 2007; Still 2022).

9.5 Common components in crowd management and safety planning (RO5)

Emergency planning and crisis response was the most often visible CM strategy in relation to crowd incidents observed, as well as being cited as important to attendance motivation through the survey. However, *emergency preparedness* was also often observed to be a point of failure in documented incidents through issues such as slow emergency response or failure to act (i.e., show-stop). By revisiting the key factors linked to emergency crowd safety planning (Chapter 4.3, Figure 5, p69), these fail points are seemingly linked to the practicing of evacuation procedures (pre-event planning), early detection and implementation of appropriate emergency procedures during the crisis phase, as well as collaboration between the event, emergency services and other key stakeholders post incident during the recovery phase (Fema 2001 in Rutherford-Silvers: 134; Kemp et al 2007; Makarenko 2004; Pielichaty et al 2017; Tarlow 2002; Still 2022). These findings are supported by Rutherford-Silvers (2008), who argued that emergency response plans can be met with two key issues linked to the concept of preparedness; first, personnel not knowing what actions to take in an emergency and second, a lack of training or practice of emergency procedures. Linked to this, Raineri (2013) found that risk assessments for music festivals and mass gatherings have generally dealt with traditional

workplace hazards and risks without taking into account the dynamics of the crowd or those factors that might influence its behaviour. Moreover, Filingeri et al (2018) found organiser experience was often impeded by no crowd specific training and a crowd safety knowledge gap among organisers with limited practical experience, as well as a perception among some that crowd-specific training was unnecessary and 'common sense'. The potential impact of these oversights on the quality of decision-making required to undertake effective event safety crisis planning could arguably contribute to the escalation of crowd safety incidents at events. Furthermore, it could be argued that the inherent multi-agency collaborative nature of risk management planning for temporary events (Børve and Thøring 2022) and the aforementioned lack of specific crowd safety training among event organisers increases susceptibility to decision-making error in emergency crowd safety planning. Moreover, Still (2013; 2022) argues that control of the incident as it occurs is crucial to safe event planning by ensuring strong communication among the safety team and a well-informed chain of command and decision maker with primacy who holds a clear understanding of the site, its capacity, crowd density and flow. Evidence from the findings would suggest that it is this lack of preparedness and response that underpins many of the crowd incidents observed and negative audience perceptions of emergency management.

Connected to this was the evidence from the incident database of risk-averse decision making and lack of situational awareness, which further exacerbated some of the emergencies documented, predominantly in relation to overcrowding, crowd crushes, and critical density (but also terror attacks). More occasionally this was linked to non-adherence to public safety guidelines and practices. In relation to the predominant issue of incidents arising from critical density for instance, the findings suggest failure to notice the escalation in seriousness of a dense crowd situation. Still (2022) identified that detection of all affected areas and parties through onsite monitoring techniques is imperative as early response is crucial to minimise the incident impact. Moreover, cooperation and communication are required of all key agents in the emergency process to establish a common operational picture and shared understanding or awareness of the nuances involved in dynamic safety management (Seppänen et al 2013; Endsely 1995; Martella et al 2017; Nicklasson et al 2008).

Beyond emergency preparedness, a number of common significant findings emerged in relation to planning and operational phase CM strategies (Table 34). First, negative attendee views on the efficacy of drugs and alcohol strategies were commonplace among those who are frequent attenders, under 30, and attend music events (specifically EDM, Hip-hop, Indie and Metal attendees). These findings are consistent with existing literature around those more likely to engage in drug usage and excessive alcohol drinking (Glassman et al 2007; Josiam et al 1998; Kelly 1993; Menaker and Chaney 2014; Ryan et al 1996; Smith and Foxcroft 2009; Verkooijen et al 2007). Also noteworthy is the prevalence of these profile groups in the higher risk-to-safety group of profiles identified in 9.2. It is therefore arguable that strategies discussed within the literature and documented incidents such as drugs education and testing facilities as well as search and ejection policies (Abbott and Geddie 2001; Busby 2018; Menaker and Chaney 2014) are perhaps not as effective at managing intoxication at events and promoting change among higher risk groups at events as hoped, signalling a likely need for a dual approach of education, but also greater on-site monitoring via dynamic techniques such as the observe, orient, decide and act (OODA) loop (Boyd 1998; Brehmer 2006) linked to surveillance, knowledge gathering, knowledge sharing and control decision making.

Table 34: Significant CM (planning and operational phase) strategy findings

Significant CM Strategy Findings			
Drugs and alcohol strategies deemed least effective by attendees	Crowd control (police and security strategies) observed within the incident database	Ingress / egress management observed within the database frequently and also a key issue for attendees	Communication and signage strategies received most positively by attendees
Significant for under 30s and music attendees. Drug testing facilities and drug awareness strategies noted at EDM and music festivals (regional and major scale) for events with a higher risk of attracting drug taking visitors	Predominantly visible for major sports and music events Also, for events drawing BAME profile for Hip-hop or racial protest motives Dispersal techniques (pepper spray), segregation techniques (i.e., rival football supporters), police kettling or barricading (to prevent access or contain). Linked to major sport and music events, critically dense crowds, or crowd disorder When experienced, this was perceived negatively by attendees from survey and negatively altered crowd mood	Common safety incident observed in the database and also discussed by attendees in the safety perceptions survey Especially sports attendees Bottlenecks, blocked nodes, flow issues and critical density all common. Hold and release strategies observed	Approaches were consistent in incident database and survey findings and were two-fold. 1) messages to the crowd to guide behaviour (i.e., way-finding apps, big screen messages / updates, PA announcements, front-facing staff to crowd in-person updates, online press releases, social media strategies and signage. 2) messages to staff / event team to facilitate swift action (i.e., radio message, non-verbal gestures / signals, control room updates)

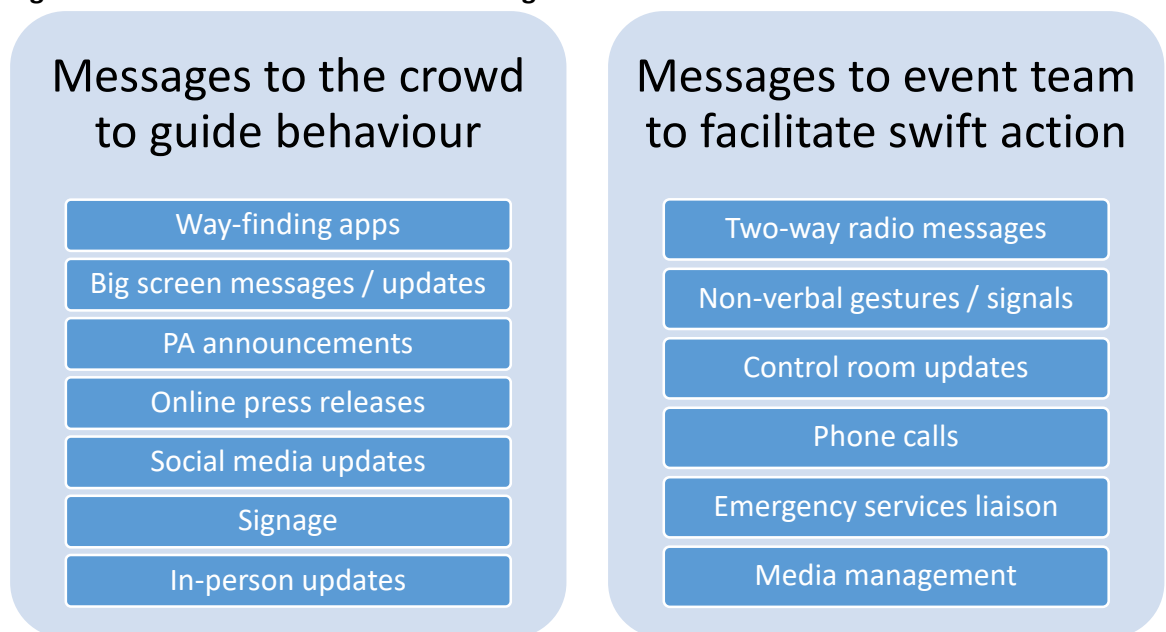
Also linked to crowd control, was the presence of seemingly heavy-handed strategies observed through the database and recalled negatively from attendee experiences through the audience survey. As expected, these findings link to the sports and football profile, whereby studies have reviewed control strategies in these areas and found that they are often adopted by police and crowd managers to tackle the problem of a volatile, more emotional, arguably less rational and territorial crowd (Hoggett and Stott 2010; Livingstone and Hoggett 2008; Stott and Radburn 2020). However, perhaps less straightforward is the finding that this approach is also connected to the Black and Minority Ethnic (BAME) community in response to racially motivated protests but also crowd control at hip-hop music events. Whilst it has been noted that the hip-hop music sub-profile has been linked to violence and use of weapons at events (Kemp et al 2007) it may also explain why emotions around racially motivated issues have been heightened in recent years, bringing about causes such as the Black Lives Matter social civil rights movement of 2020 (Black Lives Matter UK 2022) which calls for a cultural change towards racial equality. Given the sentiment of these profile types around the issues of crowd control they face, it arguably points to the need for a review of CM for these groups towards an approach that is more rational (Borch 2013) and less inflammatory (Filingeri et al 2018; Gorringer et al 2012; Stott and Radburn 2020).

As discussed in 9.4, issues around ingress and egress management linked to factors such as blocked nodes and thoroughfares, flow capacity issues and critical density were all common

documented safety incidents as well as being frequently experienced by event attendees. Findings also show that this type of density and congestion issue was particularly prevalent, though not exclusive, for sports attendees including cricket, football and motorsports profiles, as well as EDM and Indie music attendees, plus arenas and stadiums, large outdoor events, large regional city venues and small local venues. Zhang, Ma, Si, Ran, Wu, Wang & Chin (2017) reviewed width exits for evacuation in relation to the faster-is-slower (FIS) effect, whereby greater desired velocity through an exit (i.e., to flee and escape) leads to a slower flow rate through that node. The same phenomenon was also observed by Rutherford-Silvers (2008), referring to it as the trickle and dump effect whereby at nonpeak times, pedestrian flow trickles through a node (i.e., point of ingress or egress) but at peak departure times in particular, there is a departure dump as the vast majority of those onsite look to egress simultaneously. Other authors have referred to it as management of peak arrival and departure flow (Still 2013; 2022; Yeoman et al 2004). Moreover, the problem is exacerbated further during emergency scenarios (Rutherford-Silvers 2008). The work of Zhang et al (2017) found that to avoid the FIS effect, an exit must be wide enough to allow two persons to pass through it simultaneously. Whilst theoretically possible for outdoor venues, designing a site to accommodate this finding is rarely possible for fixed permanent venues, and therefore calls for careful pre event site planning to maximise space in key areas (Getz 2005; Rutherford-Silvers 2008; Still 2013; Tum et al 2006) as well as other key capacity management strategies such as batch processing (hold and release) and staggered ingress times (Yeoman et al 2004), multi-ingress/egress points (Wang, Zheng, Zhang, Zhang, Wang & Zhang 2016) and the use of congestion modelling approaches such as decision support matrices to help identify flow capacity and hotspots at different time points as well as real time observation and monitoring (Still 2013; 2022).

Finally, for significant CM strategy findings, communication (including signage) was most positively received by event attendees and approaches across the crowd incident database and survey findings were consistent and two-fold (Figure 29), sharing links with existing literature (Abbott and Geddie 2001; Berlonghi 2004; O’Toole 2011; O’Toole et al 2020; Watt 1998).

Figure 29: Common communication strategies



Receptiveness to communication strategies generally was significant for those who are younger, female, attend arts and cultural, food festivals, and music events (EDM, pop, rock). With the exception of the EDM profile, these groups all exhibit psychocentric, more cautious, personality and behavioural traits (Plog 1974; Tarlow 2002) as discussed in 9.2, Table 33. The fact that these attendees who were receptive to communication strategies were younger, may also help to explain the EDM group, who are likely to be younger when considering their sub-cultural profile, though who otherwise would appear to be the anomaly within this finding.

9.6 Audience behaviour, event crises and CM strategy efficacy (RO6)

O'Toole et al (2020) argue that one way of learning about emergency management is to look at the failure points in previous incidents and learn from those mistakes. With this in mind, critical density safety incidents, injuries and fatalities were by far the most consistent crisis issue from both phases of the research findings. Bottlenecks and overcrowding (as previously noted in 9.4 and 9.5), lack of space, and temperature issues were recognised hazards by event attendees exacerbated by critical density. Analysis of the crowd incident database emphasised that incidents attributable to event routes to site, areas and spaces within the event itself, and movement and flow around the site (Still 2013; 2022), were all linked in some way to dense crowds. A wealth of clear best practice guidance regarding optimum levels of density (optimum for static crowds at 5ppm² and moving crowds at 2ppm²) and flow capacity considerations (higher no of people per minute for flat areas than for stepped or unlevel surfaces) is set out in studies by Still (2013; 2022) and Fruin (1984; 1993) as well as advisory codes of practice documents such as the Green Guide for Safety at Sports Events (2008) and Fire Safety Risk Assessment Guidelines for Small / Medium, Large Places of Assembly and Open Air Events and Venues (2006), yet this is still the most common fail point linked to CM planning.

These findings are supported by Rutherford-Silvers (2008) who argued that effective crisis management planning for critical density issues involves ensuring sufficient space, time and staff resource is devoted to ingress and egress areas and procedures, as well as planning the site to encourage pedestrian circulation during the event. Building on this, Fruin (1984) argued that Force, Information, Space, and Time (FIST), are the key factors influencing the occurrence of crowd disasters and that perceived poor safety alone could result in a crowd disaster if improperly managed. These points emphasise the importance of investigating FIST factors for attending crowds during the information gathering and planning stages, potentially looking at past event perceptions and feedback, to identify the audience sentiment surrounding the factors that make them feel unsafe in a crowded environment (Alkhadim et al 2018). Similarly, Still (2013) acknowledged that if the arrival flow rate (number of people moving towards the entry system) exceeds the entry system capacity (number of people moving through the entry system), this will result in a gradual build-up of crowd density as those arriving at the back of the queue are arriving more quickly than those at the front can be processed, causing potential critical density issues that expose the crowd to the risk of crushing injuries or fatalities depending on the volume of build-up and impact this has on crowd density per m². Moreover, the profile characteristics seen to contribute to these critical density incidents emerged as disregard for safety or rules, the crowd as potential offenders, or rushing and pushing, drugs use, panic and fleeing, fighting and violence (fighting and violence-based incidents were all

linked to sports, predominantly football). Many of these behaviours link to the allocentric and sensation seeking behavioural traits (Eachus 2004; Plog 1974; Tarlow 2002; Zuckerman 2007) which is a helpful insight to inform the categorisation of risk by profile to be explored in 9.7.

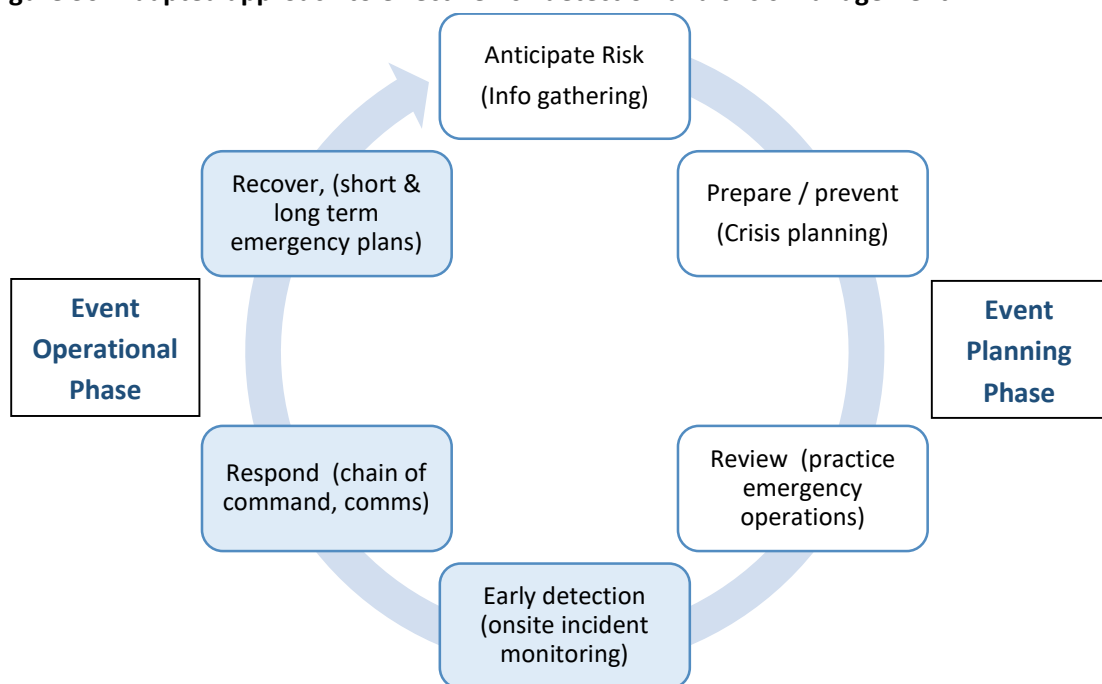
Regarding scale, whilst all scales of event, from local to mega events, saw ingress and egress as well as other density-related issues (9.4 and 9.5), small and intimate local scale venues (Bowdin et al 2010) were most frequently visited by event attendees and local scale events were strongly linked to indoor venues and crowd crushes, surges and egress issues in the incident database findings. Zhang et al (2017) reviewed width exits for evacuation in relation to the faster-is-slower (FIS) effect, whereby greater desired velocity through an exit (i.e., to flee and escape) leads to a slower flow rate through that node. Their work found that to avoid the FIS effect, an exit must be wide enough to allow two persons to pass through it simultaneously. Further guidance on escape route capacities advises for standard width (750mm) and wider width (1050mm) doors of 80, 100 or 120 people for high, medium or low risk venues respectively, as well as establishing that wheelchair users require a door width of 900mm minimum, whereby the number of people in attendance (capacity) must determine the number of escape routes (doors) that must be provided. Moreover, the rates of passage through escape routes are advised to be 73 people/meter/minute on uneven ground (with ramps, steps or in seated areas), and 109 people/meter/minute on all flat even surface areas or standing areas in outdoor areas and indoors, for a width of 1.2m, 79 people per minute on a stepped surface or 100 on a level surface (BSI Spectator Facility Standards 2012; Fire Safety Risk Assessment Guidelines for Small Medium, Large Places of Assembly and, Open Air Events and Venues 2006; The Green Guide 2008).

That said many incidents, as noted in 9.4 and 9.5 above, recorded for indoor venues (nightclubs and stadiums were frequently referenced in relation to such ingress and egress capacity issues) record injuries and fatalities as a result of bottlenecks on egress (Chen, Lin, Wu, Gao & Wang 2018; Helbing and Mukerji 2012; Zhang et al 2017) or even blocked exits altogether (Boyce 2014) and it seems that attendee decision-making during a multi-exit evacuation of which exit to use is influenced by the exit width, whilst increased density and panic also reduce the speed of egress (Wang et al 2016). This was exemplified by the safety failings and fatalities experienced as an outcome of the Kiss nightclub fire evacuation in Brazil (BBC News Online 2013b). Considering that pushing, impatience, panic, and escaping were common behaviours observed within the crowd incident database and among the behavioural profiles developed from the attendee survey (see 9.2), these findings highlight a strong argument for the emphasis on crowd spatial strategies (capacity management, spatial planning and site design) alongside multi-exit emergency evacuation strategies as being crucial to feelings of safety related to event attendance and safe venue evacuation strategies.

As noted in 9.5 above, another key issue linked to documented safety incidents involved poor decision making and response strategies relating to a lack of emergency preparedness. Many authors and advisory bodies have reviewed appropriate and effective response strategies to event crises management (NaCTSO 2017; O'Toole et al 2020; Ritchie 2009; Still 2022), agreeing that information gathering can assist crisis prevention through reducing exposure to risks, increasing resilience and the capacity to recover quickly or improve signal detection. To illustrate this process, an adapted approach to effective risk detection and crisis management is provided in Figure 30. The stages in blue represent the dynamic operational CM phase and evidence of failures within these specific areas was present in many cases explored through the crowd incident database, as well as through attendee experiences recalled from the audience

perceptions of safety survey. Furthermore, in relation to the planning phase (the stages in white) some cases within the crowd incident database and recounted by attendees indeed referenced errors and fail points within these stages too, for instance, lapsed permits and licenses, untrained, unresponsive and underprepared staff as well as blocked exit routes and poor site planning. These incident-based findings correspond with Reason's Swiss Cheese Model SCM (2020) developed from his earlier Organisational Accident Model (OAM), which draws comparisons between the holes in slices of Swiss cheese and the representative layers in a crowd management strategy; the SCM includes the identification during planning of all potential holes in its defence which could be linked to decision making and failure causation, and identifies two types of failure-related 'holes' in relation to CM planning that when aligned through the different layers of CM strategy, contribute to the likelihood of a hazard becoming an incident.

Figure 30: Adapted approach to effective risk detection and crisis management



(Adapted from NaCTSO 2017; O'Toole et al 2020; Ritchie 2009; Still 2013; Still 2022)

Reason (2020) cites these types of fail points in CM planning and delivery as *active* human errors and *systematic* errors such as site design, structures and procedures. O'Toole et al (2020: 83) further theorised that the active and systematic fail points in the layers of a CM strategy at events could be linked to decision-making failures associated with Fruin's (1984; 1993) FIST factors of pedestrian movement and behaviour, thus proposing that poor safety monitoring and management of these factors could allow a crowd incident to occur on site. The phase 1 and 2 research findings are consistent with these theories as attendee perceptions of safety were found to be influenced positively by the visibility of CM strategies (emergency procedures, heightened security, social distancing) and strong communication (WOM /online reviews, updated H&S info on website, PR and social media comms). Incidentally however, these aspects were identified through the DIM-ICE analysis of design, information and management approaches against ingress, circulation and egress procedures (Still 2013) conducted on the crowd incident database as fail points within safety incidents observed. Moreover, a shared situational awareness and common operational picture (Martella et al 2017; Seppänen et al 2013) was also lacking in many of the crowd incidents reviewed, whereby a systematic failure to

plan for the crowds who arrived (i.e., unsuitable site, blocked exits), or an active error to recognise the hazards before they escalated beyond control (i.e., over-capacity, failure to cancel) could be identified as a likely cause.

Dynamic CM techniques such as real time application of the OODA loop (Boyd 1998) are important to effective CM and crisis management planning due to the focus on observing, orienting (information gathering), decision making, and action taken during the operational CM phase of an event. Its value comes from its use of information gathering onsite in real time as well as being informed by previous experience and insight from experts alongside observation to inform early detection, decision making, and actions taken (Boyd 1998; O'Toole 2020). The research findings suggest greater focus on early detection and onsite monitoring plus implementing an *appropriate* incident response was required among many incidents observed, which informs the required emphasis for effective CM strategies as put forward later in 9.7.

9.7 Classification of event risk by crowd dynamics (RO7)

The vast range of findings and associations identified via the quantitative analysis process (Chapter 8) pointed to connections that exist between user profiles that would enable determination of the level of safety risk underpinning events aimed at specific groups and the threat they may pose to crowd safety. When considered in relation to the qualitative crowd safety incident findings (Chapter 7) this set of group profile findings was refined further.

Still (2013; 2022) advocates the implementation of a traffic light system to determine and map risk severity in relation to event safety planning, in a visual and easily understood manner. He notes that for qualitative risk assessment techniques (including matrix style techniques) the following colour coding should be used:

- Green is a low-risk indicator, used to signify a low risk to crowd safety.
- Amber is a medium risk indicator used to signify a medium-level risk to crowd safety.
- Red is a high-risk indicator used to signify a high risk to crowd safety.

Whilst originally specifically related to density per person per meter squared (ppm^2) according to Still (2013), the traffic light principles have been adapted to address density but also flow, crowd mood, attendee profiles and factors linked to the event type and scale (Borch 2013; Fruin 1993; Kemp and Hill 2004; O'Toole 2020; Rutherford-Silver 2008; Tarlow 2002), which have also been identified within the literature and the thesis research findings to be significant to the determination of event safety risks. Moreover, it was deemed necessary to also differentiate between *low*, *low-medium*, *medium-high*, and *high* or *very high* risk to safety as well. The adapted mapping of event safety risk related to the emergent profile and user groups from the thesis findings (Chapters 7 & 8) is presented in Table 35.

Table 35: Significant associated relationships, connections between user groups and level of risk to safety

	Low risk to safety		
	Low to medium risk to safety		
	Medium to high risk to safety		
	High risk to safety		
	Very high risk to safety		
	Insufficient data to take forward for risk profiling		
Profile Group	Summary profile	Links: other user groups	Risk level (safety)
FT Education	Experience crowding, lack of space. Line up influence links to music events. Generally content.	Younger, music, larger venues	
Employed	Line up / timings influence links to music events. Experience crowding, lack of space. Happy with e-comms. Unhappy with incident resolution.	Younger / mid aged, music, larger events, sport - cricket, football, music - Indie, rock	
Unemployed	Happy with e-comms. Generally content.	Young / mid aged.	
Home (kids)	More cautious. Unhappy with incident resolution. No issues or rivalry experienced.	Female, family-friendly, arts & cultural, food festivals, sports – partial – cricket, football, music – indie, rock. Absorbed to Family Friendly in matrix	
Retired	Do not favour verbal comms. Motivated by camaraderie, team support, fan club member. Experienced rivalry.	Male, sports (football, cricket, rugby, tennis)	
Residence (Loc)	Densely populated areas linked to lineup influence, V&A comms, confusing layouts and car park hazards. South linked to temperature issues. Dense & less dense areas linked to caution regarding social distancing	Younger / mid-aged, music, larger events	
Younger	Experienced more hazards, triggers. Receptive to range of comms. Carefree attitude to post-covid attendance. FT education links - activity type (incident trigger) & CM comms	FT education, males, music - EDM, hip-hop, metal, indie (carefree, drugs stance), sports – football, smaller venues (temp), frequent attenders	
Mid-aged	Experienced more hazards, triggers. Receptive to range of comms. Carefree attitude to post-covid attendance. Generally content with CM	Frequent attenders, males, larger events	
Older	Generally content with CM (crowd dispersal) and verbal comms preferred over others	Mid-aged, larger venues	
Male	More negatively influenced / triggered by CM issues, more likely to have experienced incidents yet carefree.	Younger, frequent attenders, sports – cricket, football, motorsports, rugby (site design influence, incidents on queuing / ingress etc)	
Female	More cautious, risk averse, compliant. Value space at events (inc. post-covid). Have experienced a range of hazards. More receptive to CM strategies.	Family-friendly, arts & cultural, food festivals, music (rock), large events, frequent attender	
Frequent Attenders	Either cited range of hazards experienced or none at all. Perhaps none at all suggests more tolerance. Rate several CM strategies as ineffective (inc alcohol, drugs, monitoring)	Younger, range of venue types (large, small), sports – cricket, football (sightlines), music - rock	

Infrequent Attenders	Less experience of hazards, more content with CM strategies and prioritise cleaning/hygiene post-covid to encourage attendance	Female, food festivals, arts & cultural, family-friendly, pop music – receptive to CM strategies, more cautious post-covid	
Small venues (Local scale)	Susceptible to temp hazards and environmental factors such as extreme heat, prefer more informal methods of comms updates (written). Less likely to find crowd monitoring effective, seek low infection rates for post-covid attendance, fan club member, motivated by entertainment, calm atmospheres or physically expressive behaviours are common, friendly and cheering too. Intoxication (drugs), rowdiness, boisterousness, rushing, sale of drugs, sexual promiscuity / assault, verbal aggression Do not place importance on relationship between staff, law enforcement and crowd, visible security and crowd and congestion measures.	Music (nightclubs), sports (football, local grounds), metal and rock (physically expressive, rowdy), hip-hop, younger, indie (drugs usage / sale), sexual assault and promiscuity (hip-hop, younger)	
Large city venues (Regional scale)	Indoor attendees more receptive to range of CM comms, susceptible to temp hazards and lineup/ performer influence, safety incidents linked to egress on way home, and more content with CM strategies (search policies, crowd monitoring). Motivated by entertainment, escapism, fun, line-up (indoor, music links). Emotional, tense atmospheres, premeditated violence and rivalry are common (outdoor, sports links). Physically expressive behaviours, packed, dense crowds, friendly, helpful crowds, rowdy, rushing, sale of drugs are common. Also, intoxication (drugs), sale of drugs, sexual assault / promiscuity, opportunistic theft, verbal aggression Crowd behaviour felt to contribute to incidents, and they place importance on relationship between staff, law enforcement and crowd, organised movement and crowd congestion measures.	Female, family-friendly, business, music (indie, rock), sports (cricket, football), young, mid-aged / older	
Large outdoor events (Major scale)	Wider environment (weather) as a trigger for incidents. Hazards – weather, or none at all. Influenced by venue, entertainment, line-up, performers but no issues experienced (festivals specifically). Motivated by escapism, entertainment, fun / calm atmosphere, happy / excited, supporting a team, fan club affiliation, Find written communication strategies, search policies effective and place importance on event staff / law / crowd relationship, organised crowd movement, crowd congestion measures, and more visible security / police. Attendees are helpful, but prone to intoxication (drugs), rushing / running, sexual promiscuity,	Music predominantly – EDM, hip-hop / urban, indie, rock, national scale events, festivals, females	
Arenas / stadiums Major or mega scale)	Aggression / violence, emotional / tense atmospheres, fighting / physical violence, premeditated violence, rivalry, verbal aggression and abuse (all consistent with sports attendees (football, cricket, rugby) happy excited, packed / dense crowds, and opportunistic theft. Less likely to cite experience of hazards / crowd incidents (possibly greater tolerance or genuinely less issues at this scale). But if cited, incidents primarily linked to offsite ingress/egress, crowd behavioural incidents or factors beyond event control. Generally happy with CM strategies (search policies, communication, crowd monitoring), and seek adoption of crowd congestion, visible security, and several key safety measures to attend post-covid (careful reopening and comms, enhanced cleaning / hygiene, low infection rates). Do not value the event staff / law / crowd relationship and feel comfortable in crowds.	Frequent attenders, males, sports (cricket, rugby, football), females (more likely through the content yet cautious attitude towards CM strategies and measures valued)	

Arts and Cultural	Wide range of hazards experienced, affected by site design and open to CM strategies and comms. Calm atmospheres but cautious regarding attendance	Frequent attenders, food festivals, female, mid-aged, older, larger venues	
Business	Associations that correspond with the activity type (business event) and enabling the event to flow better: ambiguity around effectiveness of congestion strategies and experience of bottlenecks, safety issues inside the venue as well as on egress, calm atmospheres, organised movement, clear signage, weather important for attendance, whilst lack of visible security is a negative attendance influencer.	Food festivals	
Family Friendly	One of the most cautious and risk averse user groups both in terms of the aspects they prioritise on site for attendance and what might encourage (socialising with family, fun / calm atmospheres, organised movement, space) or dissuade them from future attendance (i.e., lack of visible security, management of overcrowding, social distancing measures)	Arts and cultural events, food festivals, female, music (pop) – attendance motivators, factors to encourage/ dissuade from attendance.	
Food Festivals (FF)	Wide range of hazards experienced and open to CM strategies and comms. Calm atmospheres and entertainment motives but also pushing/impatience and cautious regarding attendance	Frequent attenders, food festivals, female, mid-aged, older, larger venues.	
Music	Generally, positive moods, strong social identity and excitement underpin many of the associations identified. Influenced by site design and receptive to CM comms and strategies, safety issues linked to this group seem likely to be triggered by density or excitement over spilling than mal intent.	Female, younger (up to early 30s), in FT education or employed, large city-based venues, national outdoor festivals/street events, frequent attenders (i.e., less concern about hazards)	
Classical	Only a few associations identified. Favoured V/A changes pre-event but likely to have experienced ingress incidents.	-	
EDM	More likely to have experienced a range of hazards (mainly linked to site legibility, dark spots, density, temporary structures) and crowd safety incidents (on way to venue or at point of entry). Sensation seeking crowd (motives of fun, entertainment associated behaviours of intoxication, drugs usage / sale, sexual promiscuity, organised violence). Most carefree music attendees, preferring informal comms, least likely to be put off attending by external factors and most high-risk crowd, with experienced behaviours linking to deviance, sensation-seeking.	Male (more likely to have experienced incidents yet carefree), younger, frequent attenders, Hip-hop, small venues (informal comms), large outdoor events	
Folk	Only a few associations identified but some connections with other user groups evident. Influenced by barriers/queuing, motivated by camaraderie, experienced fear and panic, avoidance of following instructions.	Male (influenced by queuing, camaraderie, instructions avoidance), sports (cricket, football, motorsports, rugby)	
Hip-hop / Urban	Influenced by some site design elements (ambience and lineup) and likely to have experienced overcrowding. Find crowd monitoring and security strategies effective. A sensation seeking (motives of fun, entertainment) and high-risk crowd, with experienced behaviours linking to deviance, sensation-seeking (sales of drugs, sexual promiscuity). Less likely to attend for security or WOM reasons.	Male (more likely to have experienced incidents yet carefree), younger, frequent attenders, EDM, employed, FT Education, residence, large city / outdoor venues	
Indie	Lack of space, overcrowding, temperature issues, incidents inside the event or at point of egress and a higher likelihood of experiencing safety incidents over other event types suggest these users attend larger more densely crowded events. Only music attendees to feel incidents tend to be poorly dealt with too. They have experienced a high no of hazards and behaviours (some	Music: rock, metal, EDM, hip-hop – dark areas, lack of visible exits, overcrowding, poor signage, temporary structure issues (EDM) and drugs issues (both), Sports: football (incidents poorly dealt with, obstructed sightlines, egress incidents,	

	deviant traits, links to camaraderie, excited / energetic moods triggering more negative behaviours (intoxication, rowdiness, sale of drugs, etc).	camaraderie) and cricket, rugby (lesser extent), large city-based venues, arenas and stadiums, Male, Younger	
Metal	Less likely to be influenced behaviourally by site design factors. Strong social identity – motivated by socialising with friends, more likely to be fan club members associated / experienced behaviours point to a lively, energetic crowd (intoxication, rowdiness, physically expressive, dense crowds) but generally compliant, nonetheless. Deem drugs strategies ineffective.	Music: rock (especially), indie, sports: rugby, small and city-based venues or outdoor national events, younger and mid-aged, frequent attenders, males, females	
Pop	More likely to have experienced poor signage, value organised movement, receptive to a wide range of comms and CM strategies. A positive crowd motivated by socialising with family and fun. Associated behaviours centre on excitement (happy, intoxicated, physically expressive, pushing/impatience, dense crowds). More cautious (experienced fear / panic) and likely to be influenced to attend by visibility of security / emergency efforts and strong comms.	Large outdoor events, arenas / stadiums, female, moderate / infrequent attenders, employed / in FT education, younger	
Rock	More sensible / cautious than expected – receptive to widest range of CM comms, influenced not to attend by a range of factors, uncomfortable but accepting of crowds, hesitant about post-covid attendance). Experience high no of hazards, plus safety incidents experienced tend to be in main stage area, motivated by fun, entertainment, with behavioural themes linked to positive moods, energetic close contact crowds with strong social identity yet compliant.	Music: metal (especially), indie, sports: rugby, small and city-based venues or outdoor national events, younger and mid-aged, frequent attenders, males, females	
Sports	Less mention of hazards, ingress/egress incidents, handled poorly. Behavioural themes – invested emotion, volatility. Low regard for / positive influence of CM.	Male, employed, FT education, all ages, frequent attender, large city venues, arenas/stadiums	
Athletics	Only a few associations identified. Positively influenced by more security / police presence, and less likely to have experienced physically expressive behaviour.	Compliant, older, family-friendly, infrequent attenders (likely to have experienced issues), positively influenced by CM.	
Boxing / Ring Sports	Only one association identified. Insufficient for commenting on profile. Favoured V/A changes pre-event.	-	
Cricket	Influenced by site design (qual findings suggest in a negative, antagonised manner). Obstructed sightlines only hazard mentioned but experienced safety incidents linked to ingress / egress. Less likely to be supportive of, influenced by or favour CM / comms strategies, security presence. Strong social identity (team support, camaraderie, emotional atmospheres, rivalry).	Sports: football, rugby, tennis, golf, Music: Indie, folk (camaraderie), EDM (organised violence), male, younger, mid aged, older, retired, large city-based venues, arenas / stadiums, frequent attenders	
Football	Influenced by site design (qual findings suggest in a negative, antagonised manner). Obstructed sightlines only hazard mentioned but experienced safety incidents linked to queuing, ingress / egress. Less likely to be supportive of, influenced by or favour CM / comms strategies, security presence. Less cautious, more carefree. Strong social identity (team support, fan club members, camaraderie, emotional atmospheres, rivalry). Wide range of negative behavioural traits – points to volatile crowd	Sports: cricket, rugby, tennis, golf, Music: Indie, folk (camaraderie), EDM (organised violence), male, younger, mid aged, older, retired, large city-based venues, arenas / stadiums, frequent attenders	

Golf	A few significant associations identified. Experienced fighting / violence, influenced to attend by updated H&S website info	Male, football, rugby (fighting / violence), but also seemingly cautious and positively influenced by H&S communication	
Horseracing / Equestrian	A few associations identified. Found search/drugs policies effective, more security/police presence has no attendance influence.	Complaint and content according to the quantitative findings. Mainly regional and Hallmark events. However, associations with male, football, fighting and violence) evident from the qualitative findings.	
Motorsports	Influenced by site design (barriers/queuing, signage), found handling of emergencies effective and experienced overcrowding / ingress-to-site incidents	Sports: football, cricket, rugby, frequent attenders, males, business, family-friendly (happy with emergency procedures)	
Rugby	Influenced by queuing (qual findings suggest negatively). Experienced overcrowding, motivated by team support, high no of negative behaviour traits	Sports: football, cricket, tennis, young/mid aged Music: rock, males, city venues, frequent attenders	
Tennis	Only a few associations identified. Cautious in prioritising social distancing to encourage attendance, solely motivated to attend for supporting a team / act / individual.	Female (more cautious attitude), focussed in attending to support a team / act / or individual. No incidents in the qualitative incident database.	

To summarise the key information (Table 36 below), the majority of profiles and user groups identified through the research findings can arguably be categorised as either low risk or medium risk to crowd safety, predominantly representing more cautious, compliant and positive crowds, some of which may trigger safety threats through reasons such as over-excitement, scale of event, or perhaps external factors inherent to the nature of the event type itself.

Table 36: Initial indication of risk levels obtained from the profile and user group table

Risk Level (crowd safety)	Profile / User Groups
	At home with kids, older, infrequent attenders, family-friendly, sports (athletics, tennis)
	Arts and cultural, business, music (pop), unemployed, retired, sports (golf, horseracing/equestrian, motorsports, cricket, rugby)
	FT Education, employed, mid-aged, place of residence, frequent attenders, small, large city, large outdoor and arena/stadium venues, food festivals, music (folk, metal, rock), sports (cricket, rugby)
	Younger, male, music (hip-hop, indie)
	Music (EDM), sports (football)

That said, a collective group of users emerged that displayed characteristics more strongly associated with high levels of threat to safety for reasons linked to traits such as deviance and sensation-seeking (Brunt and Brophy 2004; Menacher and Chaney 2014; Eachus 2004), heightened crowd emotion or volatility (Borch 2013), strong social identities and collective behaviours (Drury 2020; Drury et al 2021; Livingstone and Hoggett 2008; Reicher et al 2004) specific unsafe activities and behaviours engaged with (Hoggett and Stott 2010; Kemp et al 2007; Tarlow 2002; Verkooijen et al 2007), or connected to poor attitudes towards crowd management and low regard for CM procedures (Berlonghi 1995; Tarrant et al 1997). This emerging high-risk group included the following attendee profiles:

- Younger age groups (early 30s and under)
- Male attendees
- Music (EDM, hip-hop, indie)
- Sports (Football)

To consider the younger age group as a *high-risk* profile first, a wealth of literature exists to corroborate this research finding. It has been widely regarded that the youth market is more attracted to hedonistic-styled destinations, events or activities with a party atmosphere (Brunt and Brophy 2004; Sellars 1998 and Verkooijen et al 2007) and this type of crowd mood has been closely linked to crowd safety incidents as a significant crowd warning sign and sign of behavioural instability (Tarlow 2002). ‘Partying’ has been found to be synonymous with excessive alcohol consumption and intoxication among event attendees (Glassman et al 2007), which is a common catalyst for behavioural-related crowd incidents (Dun 2014). Younger audiences are also frequently connected to issues linked to intoxication and substance abuse. For instance, in their research into ejections at college football games, Menaker and Chaney (2014) identified the prevalence of alcohol consumption among younger and underage drinkers

and also the links between excessive alcohol consumption on match days, crowd disorder and criminal behaviour. Whilst Fuller et al (2018) and Smith and Foxcroft (2009) identified an association between the level of exposure to alcohol advertising and marketing, and subsequent increased levels of alcohol drinking related behaviours among the youth market. Furthermore, Verkooijen et al (2007) linked youth crowds with higher risks of substance use.

In support of the emerging finding that males fall within the *high* risk-to-safety group of attendees, many studies have reviewed gender in relation to behaviour and some interesting observations have been made. Booth and Nolan (2012) explored gender differences in risk attitudes and behaviours and found that women and men may differ in their propensity to choose a risky outcome because of innate preferences or because pressure to conform to gender-stereotypes encourages modification of innate preferences. Through their study into gender differences based on completion of Zuckerman's Sensation Seeking Scale (1979; 2007) according to Eckel and Grossman (2002), women were found to be consistently more risk averse, on average, than men in relation to financial risk. Moreover in terms of physical differences, gender has been found to influence crowd pedestrian speed; in a behavioural analysis of crowds at mass gatherings (Yugendar & Ravishankar 2018), the walking speed of the male pedestrian was observed to be higher than the female pedestrian, with the walking speed of younger pedestrians also found to be higher than for other age groups, suggesting that gender has an impact on crowd speed, and a marked reduction in crowd speed as the proportion of the female pedestrian increases. In terms of leisure and social choices, excessive alcohol consumption and intoxication has already been highlighted as a catalyst for crowd incidents and Holmila and Raitasalo (2005) theorised that most epidemiological studies comparing men's and women's drinking show that men generally become intoxicated more often than women and are more often heavy drinkers, linked to gender, cultural tradition, and social identity factors. As studies point to males being more risk-centric, physically energetic and heavier excessive drinkers for reasons linked to confirmation of societal and social norms, these characteristics highlight the most likely underpinning reasons for the prevalence of males as a higher risk-to-safety attendee profile.

Regarding the inclusion of hip-hop, EDM and indie music event attendees within the *high* risk-to-safety user group profiles (and EDM posing a *very high* risk), studies have found that the hip-hop subgroup in particular are perceived to carry the risk of violence at music events according to European event managers (Kemp et al 2007) which has become evident at crowd incidents such as the NWA riot in 1989 (Arbor 2015). Moreover, the hip-hop, techno or rave (EDM) and hippie youth crowds have been found to be more frequently associated with the high risk of substance abuse (Kemp et al 2007; Verkooijen et al 2007). Building on this, the underlying reasons for these three music attendee profiles being categorised as high risk arguably link to some of the factors discussed above in relation to the youth and male attendee profile groups. All three of the high-risk music groups shared associated characteristics with the younger and male attendee crowd profiles, providing further insight into likely associated attitudes and behaviours. The thesis' research findings connected these three user groups through identified common associations with sensation-seeking motivations (Zuckerman 1979; 2007; Eachus 2004) and some forms of deviant behaviour; specifically, drugs and intoxication (Glassman et al 2007; Menaker and Chaney 2014; Verkooijen et al 2007) were common to all three groups, whilst EDM and hip-hop attendees were linked to sexual promiscuity (Eckel and Grossman 2002; Kelly 1993),

and indie groups to rowdiness, and heightened emotion (Berlonghi 1995; Borch 2013) amongst other traits, that showed similarities with the sports attendee (football) profile.

Following on from this, the final profile group within the high-risk category and identified as the group of *highest risk* overall, was the sports attendee and most specifically, the football attendee profile. Considering the associations identified for this group of users through Phases 1 and 2 of the research in relation to the adapted typology of fans (Bladen et al 2012; Brotherton and Himmetoglu 1997, Henderson n.d.) presented within the conceptual framework discussion (Figure 2, p62), provides some insight and potential explanation for their *high-risk* status; of seven personality and behavioural traits in total that make up the 'Devoted Fanatic' extreme group of attendees, through the research findings, football attendees link to five of them:

1. Most loyal.
2. Frequent attenders.
3. Motivated by tradition.
4. Self-identification (Social Identity), hooliganism possible.
5. Sometimes irrational beyond reason.

The adapted typology of fans theorises that event attendees can be categorised according to their level of commitment and that groups can pose unique threats to crowd and event safety, with safety risks increasing with the level of fan commitment or devotion. Building on this, it is commonly regarded that specific subcultures bring with them their own unique identities, values, acceptable norms, and behavioural traits too; a concept known as Social Identity Theory (Alnabulsi and Drury 2014; Postmes and Spears 1998; Reicher et al 2004). It was argued within the conceptual framework (Chapter 4.2) that individual groups in crowds construct their own social identities, which can drive them towards an 'us and them' mentality whereby they hold negative perceptions of other groups; this territorial behaviour is well documented within the literature and translates to sporting events, when fans who share a common love for a sport but support opposing teams come together, with negative behavioural consequences (Bladen et al 2018; Hogget and Stott 2010; Livingstone and Hoggett 2008). Research outcomes support the literature around this subject and specifically, this group were found to be associated with a wide range of behavioural traits that point to the likelihood of this group being a more physical, violent and volatile crowd, including links to *avoidance of following rules and instructions, fighting and physical violence, group 'herd' behaviour, pushing and impatience, intoxication (alcohol), premeditated organised violence, rivalry, verbal aggression and abuse.*

The research findings when considered against existing literature provide explanation to address the 'who' and 'why' regarding the profile groups that present the biggest risk to event safety outcomes. Figure 31 below maps (as a visual representation) all profile groups examined through phases 1 and 2 of the research to illustrate this evaluation of risk by user group. To develop this map, a numerical value for each event profile type was assigned after an evaluation of the amalgamated crowd incident and survey findings (see Table 37) to determine the level of risk and threat to safety. The same process was undertaken regarding the classification of event scale most commonly attended. The mid-point 'medium' risk category was removed and absorbed in to the 'low to medium' and 'medium to high' risk categories for the matrix

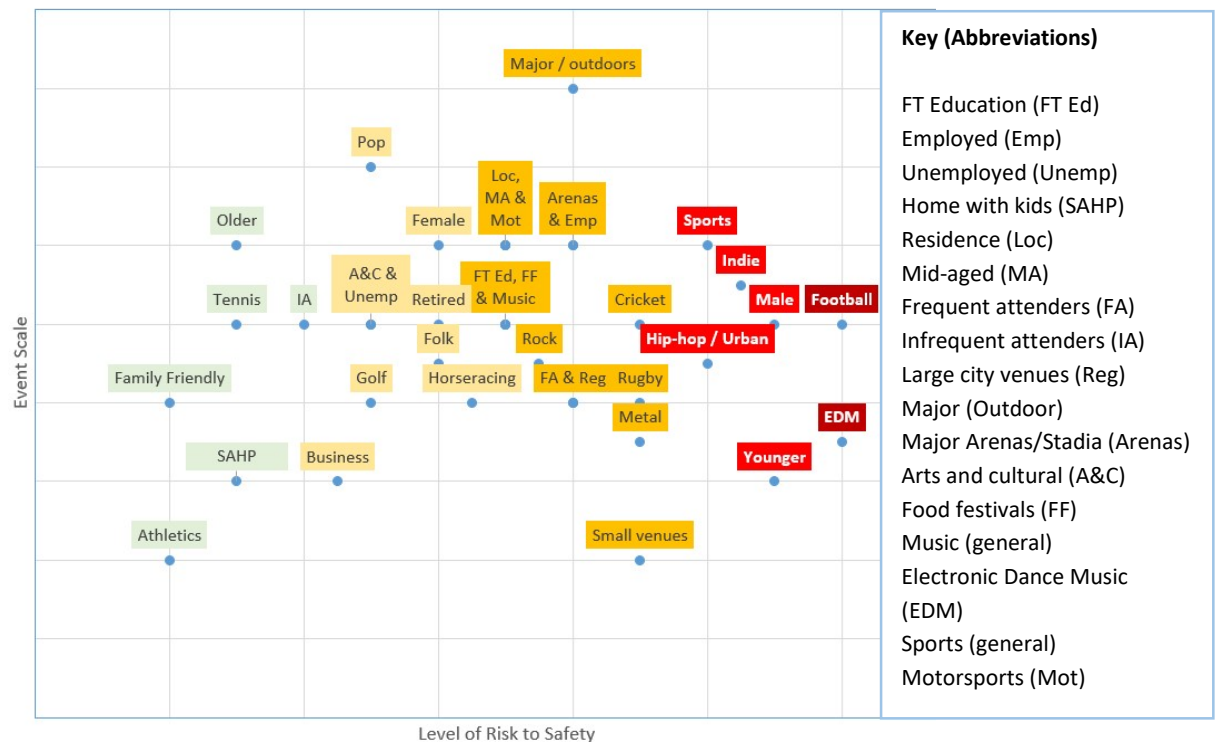
development. Similarly, the ‘mega’ event scale was subsumed into the ‘arenas and stadiums’ or ‘major outdoors’ scale, depending on the nature of the event being assessed.

Table 37: Coding scheme for event scale and risk severity visual mapping

Scale	Risk Severity	Risk Severity Colour
1 – Local (small venues)	1 – low risk	
2 – Large city-based (regional)	2- low to medium	
3 – Major arenas and stadiums	3 – medium	(‘medium’ removed)
4 – Major outdoor events	4 – medium to high	
	5 - high	
	6 – extremely high	

As has been identified previously and also earlier in 9.2 especially, many of the group findings are consistent with the literature around behavioural profiles of these specific groups. However, what is also noteworthy is the discussion of risk by event scale. Whilst as perhaps would be expected, large scale (major) outdoor events, major stadiums and arenas and large city-based (regional) venues and grounds are classified as medium to high risk due to the well documented risks associated with them linked to profile groups such as sports and music attendees, the smaller more local scale venues were found to present an arguably higher risk to safety within the medium-high risk group for key reasons: first, due to the previously documented issues around egress flow and capacity management, and second, the behavioural profiles of the groups most associated with events held in this scale of venue (who themselves were positioned in the higher risk to safety user groups).

Figure 31: Risk level by user profile or event group



As noted in relation to the adapted fan typology framework as taken from (Bladen et al 2012; Brotherton and Himmetoglu 1997, Henderson n.d.) in Chapter 4.2 (Figure 2, p62), different profile groups at events, and even those at the more casual fan, 'low risk' end of the risk-severity scale, can be linked to specific behavioural and personality traits that require managing. Moreover, in relation to the adapted typology of crowds at events presented in Chapter 4.1, (Table 1, p58) and also the adapted typology of crowd behaviour by risk severity in Figure 1, p60 (Abbot and Geddie 2001; Berlonghi 1995; Canetti 1973; Rutherford-Silvers 2008; Tarlow 2002; Zhen et al 2008), what still needs to be addressed is 'how' these different profile groups can arguably be most suitably managed.

The adapted crowd typology identified ten individual crowd types (casual, risk to life, deviant, violent / aggressive, psychocentric, expressive, political, non-conformist, allocentric and thrill-seeker), and the adapted typology of crowd behaviour by risk considered the defining characteristics of these crowd types and grouped them according to severity of safety risk, resulting in six categories of behaviour (casual, expressive, cautious, sensation seeker, political, and deviant) each with their own set of defining characteristics. These adapted typologies were considered in relation to the profile group findings and behavioural group links according to risk severity and scale assigned. It should be noted that for the purpose of this exercise, the venue-specific, destination-specific, and employment-specific groups, which arguably feed into the other user profiles were removed at this stage, as well as collapsing or removing any groups with insufficient associated findings from both phases of the research to be able to effectively determine a profile).

This profile-specific typology information was then overlaid with the findings linked to safety incidents documented (dynamic intervening variables) and perceived efficacy of strategic approaches against existing literature (see 9.5 and 9.6 specifically above), to develop a matrix of crowd dynamics by user group against recommended appropriate CM strategies (Table 38). This matrix is the culmination of all research outcomes from the thesis' research process and provides a contribution to the existing knowledge around event crowd dynamics and safety management. The concluding insights from this matrix will be discussed in Chapter 10.

Table 38: Matrix of crowd dynamics by user group and risk level against recommended appropriate CM strategies

Attendee Group Type (any lacking enough data removed)	Dynamic Intervening Variables (Data combined from qualitative and quantitative user group findings)								Emphasis for Effective Strategies (From findings and literature)	
	Associated Traits								Situation Awareness, Crisis Planning – all stages	
	Attendee Profile (Behaviour Type)	Audience Behaviour (Crowd Mood)	Density issues	Flow issues	Incident exp?	Event Scale	Event Type	Event conditions	Pre- Event Strategic Planning	Dynamic CM Strategy Focus
Athletics	Cautious (Ps), casual (neutral)	Cautious, compliant, want visible security presence	-	-	-	-	Sport, athletics	Calm but cautious	Capacity/flow, reassurance	Visible security and police presence
Tennis	Cautious (Ps), casual, expressive, cohesive	Cautious about attendance post-covid, team support	Crowding	-	-	Major (out)	Sport tennis	Calm but cautious	Focus on spatial planning, density management	Monitoring for congestion avoidance, weather issues
Infrequent Attender	Casual (neutral), Cautious (Ps)	More cautious but content with CM (i.e., alcohol / drug policies). Seek prestige, escapism, entertainment. Attendance influenced by weather, CM and security	-	-	x	-	-	Less hazard experience influenced heavily by environmt	Focus on reassurance post-covid	'Visible' monitoring for reassurance of safety
Family Friendly	Cautious, Casual (Neutral, cohesive, ambulatory)	Most risk averse. Want calm, fun, space, family socialisation, movement	Egress, main area	-	✓	Reg / Major (Out)	Family, pop	Car parks / 'open' sites as hazards	Capacity/flow, social distancing, signage, reassurance, security	Visible police / security plans, monitoring of overcrowding, weather
Older / Retired	Casual, Expressive	Camaraderie, fan, team support, rivalry, socialising, seek orderly movement	Congestion	Want free flow	-	All	Sport	Content - seek R&R	Communication (verbal and others)	Monitoring and crowd dispersal
Female	Cautious	Compliant, cautious, calm. Like space, digital/ AV comms, search policies, fun, education.	Temp issue crowding pushing	Stage area	✓	Local, (in) major (out)	Music, Family,	Weather / open sites issues experience Assault too	Capacity/space / areas planning, pit / TDS safety, clear comms	Monitoring for crowd issues and congestion avoidance, weather / TDS issues

Arts and Cultural	Cautious, cohesive / spectator	V. hazard-aware, calm, cautious, open to CM. Religious attendees show a strong social identity	Crowding Critical density at times	Layout, egress Contra-flow	✓	-	A&C Food	External / Site failings Content generally	Site / layout planning, signage, reassurance	'Visible' monitoring for reassurance / density
Business	Cautious	Want calm, organised movement & good CM	Congestion main space	Layout, egress	✓	Reg (in)	Food / exhibition	Flow egress	Flow capacity, site, signage, egress	Congestion monitoring, discrete security
Folk	Expressive Cautious (panic)	Camaraderie, line-up, panic, rule avoidance	-	Layout	-	-	Music	Weather	Queue management, layout legibility	Profile behaviour awareness
Pop	Casual, Expressive, Cautious	Cautious / panic. Calm, space, movement, fun, family socialisation.	Dense crowds, pushing	Layout	✓	Reg / Major (in)	Pop, link to Family	Car park issues excitement Drinking / drugs Terror risks	Capacity/flow, layout, reassurance, security, communication	Visible security and emergency efforts, density monitoring
Golf	Cautious	Cautious. Have experienced fighting	-	-	-	(out)	Sport	H&S info wanted	Reassurance, communication	Monitoring for reassurance / trouble
Horseracing / Equestrian	Expressive	Some fighting (linked to groups of males, alcohol) Happy with search/drug policy. Gambling/betting	×	×	✓	All (Out)	Sport, female	Drinking (database). Terror risks	Admittance, ejection, weather, search plan	Monitoring for crowd issues though low risk
Motorsport	Casual but cautious	Happy with emergency handing. Influenced by: signs, queue strategies.	Crowding, congestion	Ingress	✓	(Out)	Sport	Generally content	Congestion, ingress, emergency planning	Congestion monitoring, spectator safety
Food Festival (FF)	Cautious	Calm, seek space / CM, escapism, impatient but compliant, cautious	Crowding Pushing	Egress movement layout	-	(Out)	Food, exhibition A&C	Dark spots parking TDS weather	Site / layout planning, good signage/comm, legibility, egress plans	Monitoring for density, crowd issues, weather & TDS
Mid-aged	Expressive and thrill seeker	Friendly, 'herd' identity, fan, carefree. Drugs	Congestion	Nodes	-	All (in / out)	Sport male	Used to hazards	CC comms, search policies, site, layout	Profile awareness, Congestion monitoring
Music	Expressive, Thrill seeker	Positive, strong identity, fan, fun, excitement, compliant, energetic	Crowding temp issue pushing	Stage area	✓	All (in / out)	Not pop or folk	Dark spots drinking / drugs - key	PR & WOM, pit / TDS safety, layout, dark	Profile awareness, monitoring for

								hazards. Terror risks.	spots, digi/AV comms	density, crowd, weather & TDS
Rock	Cautious Expressive Thrill seeker	Sensible, cautious. Fun, positive, strong identity, energetic, compliant	Crowding Bottleneck issues temp issue	Nodes Stage area	✓	Local / Major (Out)	Rock metal female	Weather Do not seek/enjoy crowds	Capacity/space /areas weather, pit / TDS plans, clear comms,	Profile awareness, monitoring for density, crowd, weather & TDS
Frequent Attender	Expressive and thrill seeker	Tolerant of hazards, fan, not receptive to CM	Crowding temp issue	Ingress, sightline	✓	All (in / out)	Music sport	Male/fem Age: Young or mid age	Capacity/nodes , pit safety, clear comms	Profile awareness, density monitoring
Metal	Expressive, Thrill seeker	Seek crowds, energetic, strong identity, carefree, frequent visit, compliant	Dense, packed crowds	Stage area	-	Local / regional mainly	Rock males young	Lively, energetic intoxicated	Pit safety, search, drugs and alcohol policies	Profile awareness, monitor density, stage safety, intoxication
Cricket	Political (non- conformist, demonstrator) Expressive, Thrill seeker, Deviant (aggressive/hostile)	Antagonised by queues, staff/crowd comms and security. Strong identity, team support, rivalry, emotionally charged, camaraderie.	Queuing BUT dense crowds are less likely	Ingress egress queuing	✓	All (out)	Sports cricket football rugby males indie	Only hazard obstructed sightlines Drinking / drugs issues less likely	Queue, flow capacity, ingress/egress plans, balanced approach to security/ CC /comms, weather, segregation, dispersal plans	Profile awareness and early issue detection (spotters), monitoring (for arrival and departure flow issues, queue congestion)
Rugby	Expressive, Thrill seeker Deviant (aggressive / hostile)	Antagonised by site design (queues). Team support motives. Many negative traits - Verbal aggression, rivalry, herd behaviour, fighting, violence, rowdiness and boisterousness.	Crowding congestion queuing	Queuing	✓	All Mostly out but also Stadia	Sports Cricket rugby football males	No recognition of hazards at all – perhaps more tolerant of them	Queue management, flow capacity plan, ingress/ egress plan, balanced approach to CC, security, comms, weather, segregation, dispersal containment	Profile awareness, early issue detection, queue, density, congestion monitoring, spotters, clear command chain for incident escalation, close liaison

									and ejection plans	with law enforcement, rapid response plans
Younger	Expressive Thrill seeker	Escapism, fun socialising with friends, physically expressive, pushing and impatient, influenced by performers, sexual assault/promiscuity, seek crowds, like info about past events, crimes. Very carefree. Prefer informal and digi comms. Drugs policies deemed ineffective.	Crowding packed and dense crowds	Pushing	✓	Local & reg city-based venues (in), plus major festival (out)	Music	No recognition of hazards at all or experience of safety issues recorded – perhaps tolerant of safety issues also, happy in crowds	Thorough density and spatial capacity management plan, crowd control, search policies, digital and informal in person comms favoured (verbal/non-verbal), drugs education, medical facilities and ejection policies, bad weather planning	Profile awareness and monitoring, spotters (early issue detection), congestion monitoring for queues and also density issues, clear chain of command for incident escalation / medical emergencies, rapid response plans, close liaison with emergency service
Male	Thrill seeker Political (non-conformist) Deviant (aggressive / hostile)	Antagonised by queues, staff/ crowd comms / security. Comfortable in crowds. Strong identity - team support, verbal abuse / aggression / pushing / impatience, fighting / premeditated violence, rule avoidance, herd behaviour, tense/ emotionally charged atmospheres, rivalry, intoxication (alcohol)	Bottleneck issues - Congestion, pushing	Ingress, egress queues	✓	Local reg major (in and out)	Sport mainly males Indie	Queuing frustration volatile and easily agitated crowd.	Queue management, flow capacity plan, ingress/ egress plan, balanced approach to CC, security, comms, segregation, dispersal containment and ejection plans, alcohol	Profile awareness and monitoring, spotters (early issue detection), congestion monitoring for peak arrival and departure flow dumps, plus queue congestion, rapid response

									policy, bad weather plan	plans, close liaison with law enforcement and emergency services
Hip-hop / Urban	Thrill seeker Deviant (allocentric) Political (non-conformist, prohibition)	Influenced by ambiance and lineup. Content with monitoring. Contradiction around security. Sensation seeker – fun, entertainment, deviance, sale of drugs, sexual promiscuity. Carefree. Unfriendly and unhelpful crowds.	Crowding packed crowds	No regard for ordered flow	✓	Local reg, and major festival (out)	Hip-hop EDM young male	Risk taking crowd easily influenced and not friendly	Thorough density, spatial capacity / flow management plan, crowd control, search policies, drugs education, medical facilities and ejection policies. Bad weather plan.	Profile awareness and monitoring (unfriendly and likely drugs intoxication), spotters (early issue detection), congestion monitoring for density issues, clear chain of command for incident escalation / medical emergencies, rapid response plans
Indie	Thrill seeker Deviant (allocentric, aggressive / hostile) Political (non-conformist, prohibition)	Incidents poorly dealt with. Cheering, friendly, camaraderie, helpful, fighting / physical violence, rowdiness, rule / instruction avoidance, verbal abuse, fear/panic, rushing, herd behaviour, pushing / impatient, intoxication (drugs, alcohol), entertainment.	Lack of space crowding temp issue bottleneck issues	Egress nodes	✓	Major (In) festival (out) Local, reg too but to lesser extent	Music male football cricket rugby	Hazards - bottleneck dark spots lack of exits, TDS density obstructed sightlines poor signage temp issues	Egress management, flow capacity plan, density and capacity management plans, balanced approach to CC, security, comms, dispersal and ejection plans, drugs and alcohol policy, medical	Profile awareness and monitoring, spotters (early issue detection), congestion monitoring for peak departure flow dumps, plus spatial density congestion, rapid response plans, close

									facilities, search policies	liaison with law enforcement and emergency services
Sport	Expressive Thrill seeker, Deviant, also nonconformist	Antagonised by queues, staff/crowd comms, and security. Ingress/egress incidents (felt handled poorly). Behaviours – team support, verbal aggression / abuse, camaraderie, disorderly behaviour, fighting / physical / premeditated violence, tense / emotional atmospheres, rivalry, invested emotion and volatility. Low regard for or positive influence of CM. More carefree. Rule / instruction avoidance.	Bottleneck issues queuing	Ingress Egress nodes	✓	Local Reg major (in and out)	Sport mainly males Music Indie Frequent event goers	Queuing frustration volatile and easily agitated crowd Less mention of hazards – bottleneck issues only Also, more tolerant of safety issues	Queue management, flow capacity plan, ingress/ egress plan, balanced approach to CC, security, comms, segregation, dispersal containment and ejection plans	Profile awareness and monitoring (volatile crowd antagonised by staff, security, law enforcement and CM / CC policies), spotters (early issue detection), congestion monitoring for queues and also density issues, clear chain of command for incident escalation, close liaison with law enforcement, rapid response plans
EDM	Expressive, Thrill Seeker, Deviant	Sensation seekers. Look for fun, entertainment. Deviant – intoxication / sale of (drugs), sexual promiscuity, organised violence. Most carefree. Prefer informal comms. Influenced by event site.	Crowding packed crowds	Ingress – on way to site / on entry no regard for ordered flow	✓	Local / reg / major festival (out)	EDM, young hip-hop more male traits Frequent event goers	Hazards – legibility lack of exits dark spots density TDS issues	Thorough density, site, spatial capacity, flow, ingress planning crowd control, focus on search policies, drugs	Profile awareness and on/off site monitoring (i.e., for congestion and drugs intoxication), spotters (early

		Not dissuaded from attending by any factors.							education, medical facilities and ejection policies. Bad weather plan and TDS safety checks.	issue detection), clear chain of command for incident escalation / medical emergencies, rapid response plans.
Football	Thrill seeker Deviant Political (non-conformist, demonstrator, reversal, prohibition)	Antagonised by queues, staff/ crowd comms, security. Feel incidents handled poorly. Comfortable in crowds. Strong identity – fan, team support, cheering chanting, camaraderie, verbal abuse/aggression disorder, intoxication (alcohol), emotional/ tense atmosphere, rule/ instruction avoidance, rivalry, fighting/ physical / premeditated violence, volatility. Low regard for or positive influence of CM. More carefree.	Queuing congestion pushing impatience bottleneck issues	Ingress and egress nodes (on way to /from site and through ingress / egress nodes)	✓	Local / reg (out) Major (in) stadia	Sports cricket & rugby in particular music, esp Indie, frequent event goers	Hazards – bottleneck obstructed sight lines. Terror risks observed at larger scale events	Queue management, flow capacity plans, ingress/ egress plan, site layout design plans to reduce bottlenecks and queuing, balanced approach to CC, security, comms, segregation, dispersal containment and ejection plans. Alcohol and bad weather strategies.	Profile awareness and monitoring (volatile crowd antagonised by staff, security, law enforcement and CM / CC policies), spotters (early issue detection), congestion monitoring for queues/density issues, clear chain of command for incident escalation, law enforcement liaison, rapid response plans. Coordinate offsite monitoring (incidents to / from venue).

10. Conclusions and contribution to existing theoretical knowledge

The main purpose of this study was to gain clear insight and create new knowledge that draws together existing conceptual thinking around crowd dynamics and event safety management. With this in mind, the thesis aims and objectives below in Table 39 demonstrate how each objective provides the origin for an aspect of the research undertaken. The data was gathered via two research phases (1. Crowd incident database, and 2. Audience safety perceptions survey) and followed a pragmatic but largely inductive process, whereby the emerging findings from phase 1 informed the development of phase 2 and the findings from both of these research phases informed the development of the matrix of crowd dynamics and appropriate crowd management strategies by event and user group type (A3 and RO7). The outcomes of this research process were considered and discussed comprehensively throughout Chapter 9 and ultimately produced a number of interesting findings as discussed within this chapter that demonstrate the achievement and satisfaction of all research aims and objectives. This chapter is organised into four distinct subsections to explore the study conclusions.

Table 39: Map of research objectives, data gathering exercise and achievement status

Objective Status	Research objective	Research Phase	Objective Status
A1, A2	RO1: To create a database of historical crowd incidents at events to document their defining characteristics and outcomes	1: Crowd incident database (Chapters 7 & 9)	Achieved
A1, A2	RO2: To analyse event audience behaviour and the influencing factors involved	1: Crowd incident database 2: Audience perceptions survey (Chapters 7, 8 & 9)	Achieved
A1, A2	RO3: To identify audience attitudes towards event safety and crowd management strategies	2: Audience perceptions survey (Chapters 8 & 9)	Achieved
A1, A2	RO4: To determine common crowd safety incident types and explore occurrence patterns	1: Crowd incident database 2: Audience perceptions survey (Chapters 7, 8 & 9)	Achieved
A2	RO5: To explore common components in crowd management and safety planning	1: Crowd incident database 2: Audience perceptions survey (Chapters 7, 8 & 9)	Achieved
A1, A2	RO6: To explore links between audience behaviour, event crises and efficacy of crowd management strategies	1: Crowd incident database 2: Audience perceptions survey (Chapters 7, 8 & 9)	Achieved
A3	RO7: To classify event risk based on crowd dynamics, as well as internal and external environmental event factors	1: Crowd incident database 2: Audience perceptions survey (Chapters 7, 8 & 9)	Achieved

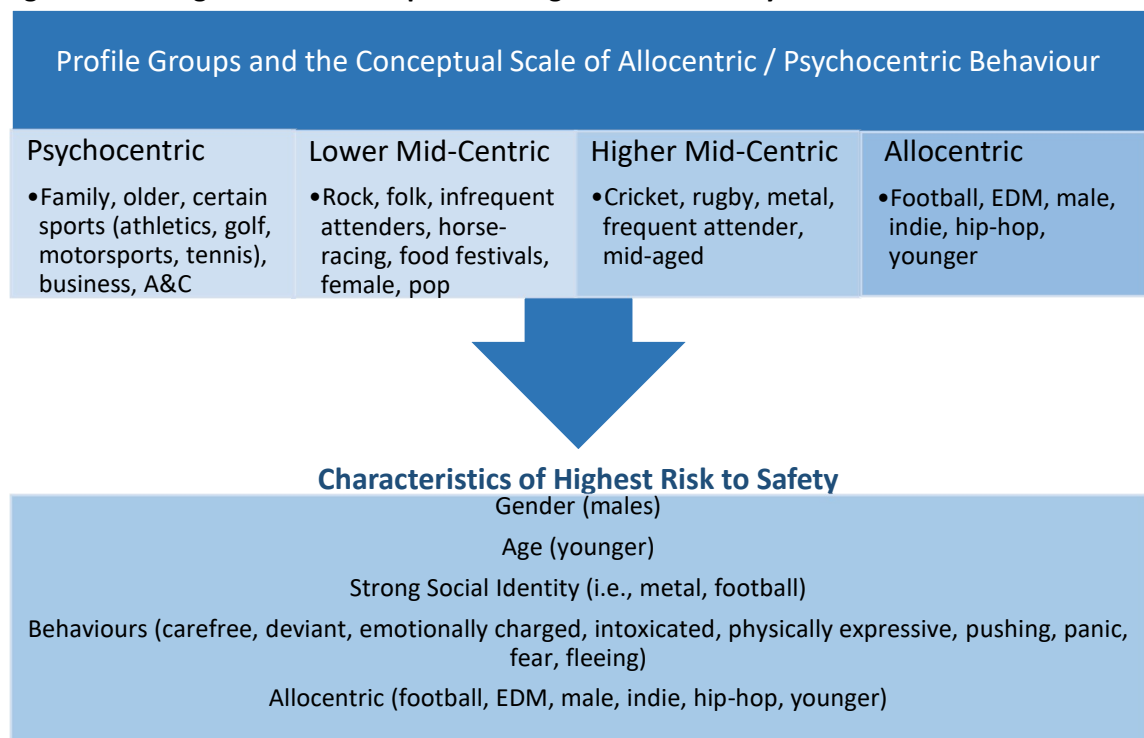
10.1 Study conclusions

The first research outcome achieved was the production of the database of global historical crowd incidents at events (**RO1**). This database contained information linked to 65 individual crowd incident cases dating from the 1960s to the present day but with the greatest emphasis on incidents that occurred within the past 20 to 30 years. It provided insight linked to each case about the event type, scale, incident type, trigger (catalyst), and incident description (including the number of injured, fatalities and incident outcomes). Its development was informed by the original conceptual framework presented in Chapter 4 (Figure 6, p71) and enabled further

information to be documented linked to key crowd management theory such as the DIM-ICE and RAMP analysis (Still 2013; 2022) and FIST (Fruin 1994) and Situation Awareness (Endsley 1995) models. The behavioural and management-related insights derived from the database satisfied the need for learning from past event incidents to aid in the development of a common operational picture and shared situation awareness for effective crowd management planning (Seppänen et al 2013; Endsely 1995; Martella et al 2017).

The outcomes linked to audience behaviour at events and influencing factors generated profile-specific findings linked to 28 different event and user groups. An emergent behavioural profile of highest risk to safety was determined (Figure 32) that satisfied **RO2** and aided in the subsequent categorisation of risk by user group. These findings were informed by the tourism behavioural scale of allocentric and psychocentric behaviour developed by Plog (1974), and adapted to the events perspective by Tarlow (2002), as well as the traits linked to the Sensation Seeking Motivational Scale (Eachus 2004; Zuckerman 1979; 2007) and the theory of social identity linked to subculture and situation-specific norms (Alnabulsi and Drury 2014; Drury 2020; Hoggett and Stott 2010; Reicher et al 2004; Stott et al 2008). The profile groups of highest risk to safety were found to be male, of a younger age group, with a strong social identity, exhibiting behaviours from carefree to emotionally charged, physically expressive and deviant, as well as associating with a high number of allocentric personality traits.

Figure 32: Emergent behavioural profile of highest risk to safety at events



A series of findings were identified in relation to audience attitudes towards event safety and crowd management strategies (RO3), providing new insights about how *crowd members* themselves feel in relation to crowd behaviour and safety management as opposed to the majority of studies that were found to be linked to crowd management, based on pedestrian movement modelling, or crowd behaviour observation (Fruin 1993; Still 2013; 2022; Tatrai 2021; Wang et al 2016; Yungendar and Ravishankar 2018; Zhang et al 2017). First, strategies linked to site design and layout were the biggest source of frustration for attendees, including the

experience of barriers, gates and queuing, and poor staff-to-audience communication linked to heavy, rude or aggressive crowd control tactics (both were significant for male sports attendees) and confusing site layouts, significant for more cautious attendee profile groups. These factors were found to be triggers for the manifestation of many of the emotionally charged and physically expressive behaviours identified as the highest risk-to-safety. This arguably prompted the need for a range of sympathetic measures; namely, multi-method ingress, egress and crowd calming strategies to manage waits and crowd mood, alongside a more balanced approach to crowd control of more *high risk* crowds through traditional control tactics such as spotters, segregation and dispersal strategies as well as greater emphasis on rational communication as a primary approach, plus maximisation of the *legibility* for audiences of signage and layout-related information to improve flow and enhance crowd mood.

Second, in relation to the audience perspective (and also addressing RO5) the findings connected to the efficacy of drugs and alcohol strategies for those most likely to be associated with intoxication were arguably contradictory to current *harm reduction strategies* evident at events nowadays, focussed on awareness raising and education as opposed to the more traditional zero tolerance attitude. Several groups linked to intoxication as a key behavioural trait (younger, male, football and metal attendees) deemed such strategies to be ineffective and several others (EDM, hip-hop, and indie music attendees) showed a strong behavioural prevalence for drug usage, sale of drugs and intoxication at the events they attend, highlighting a potential failure point in current strategies. These profile-specific findings were consistent with the literature concerned with those more likely to engage with drug use and excessive alcohol drinking (Dun 2014; Glassman et al 2007; Menaker and Chaney 2014; Smith and Foxcroft 2009; Verkooijen et al 2007). Moreover, given the identified prevalence of intoxication and drug related activity among specific attendee profiles at certain events, alongside the harm reduction, awareness-raising and ejection and medical policies evident in the incidents observed in this study, it could be argued that more could be done to *detect and prevent*. It therefore follows that the 'sweet spot' for better drug and alcohol related policies likely engages harm reduction strategies, rigorous ingress search procedures and surveillance, medical and rapid response policies through tactics such as embedding the OODA loop during the event operational phase (Boyd 1998; Brehmer 2006).

Third, conflicting views were identified around the handling of emergencies at events as well as perceptions of crowding which highlighted the differences in thinking between those who are more cautious and those who are more carefree. Those profiles considered more high risk to safety were found to perceive incident management negatively, with the more cautious attendee type content with this factor (which also addresses RO5). Conversely for those cautious attendees who viewed crowding in a more negative light as a deterrent to their experience or future attendance, this tended to be linked to their concerns regarding an anticipated lack of space or social distancing most likely as a risk-averse reaction to the recent influence of the COVID-19 pandemic on public perception. Moreover, when exploring the profile-specific findings, the opposite was in fact true for many of the higher risk, carefree groups whose activities tend to seek out and / or expect crowds as a part of their experience. It is therefore arguable that the adoption of strategies that '*speak*' best to the profiled group(s) in attendance are important to the audience's perception of the event experience, demonstrating the importance of profile consideration within an event's crowd management strategy.

Finally, whilst most findings were to some extent consistent with the literature, such as the positive reception of digital and audio/visual communication strategies as the favoured approach for the majority of event attendees, what was interesting in terms of its *lack of prominence* in the findings was the sentiment surrounding media influence (i.e., coverage of crime or terror attacks) on perceptions of safety and future event attendance. The reasons for this contradiction are not easily explained and thus point to the need for further investigation via more targeted future research studies in order to confirm and elaborate further. That said, collectively, the event attendee findings that emerged provided a great deal of insight in relation to audience attitudes towards event safety and crowd management strategies, which contributed knowledge to the development of the matrix of crowd dynamics and safety strategies by event and profile type, thus demonstrating the achievement of **RO3** in full.

Regarding crowd incidents and patterns of occurrence (RO4), and also examination of these crises against crowd management efficacy (RO6), *crowd density* was found to ultimately underpin the majority of incidents explored including surging and ‘trampings’, crowd crushes and collapses, reduced pedestrian flow and congestion, and capacity management issues. Often these incidents were found to be linked to organiser error but at times, the crowd itself was found to be at fault, not recognising the domino effect of the dangers of pushing, for instance, in a dense crowd in terms of the pressure and shockwaves experienced. Linked to this, the ingress and egress congestion factor that contributed to many of the crowd crush and surge incidents featured heavily in the number of injured attendees for indoor and outdoor venues of all scales, associated frequently with sports events or indoor local scale music events, such as nightclubs. These findings were consistent with the literature which argues for the importance of controlling density (Bladen et al 2018; Helbing and Mukerji 2012; O’Toole et al 2020; Rutherford-Silvers 2008; Still 2013; Zhang et al 2017). It emphasises the role of careful flow capacity, ingress/egress and site spatial layout planning at the pre-event phase for normal and emergency operating procedures (Fruin 1993; Getz 2005; Still 2022) as well as the adoption of onsite crowd management strategies such as the OODA loop (Boyd 1998; Brehmer 2006) and Situation Awareness (Endsley 1995) to monitor dynamic crowd issues in real time.

Prominent within the patterns of occurrence findings were behavioural-based incidents which were rooted in the sensation-seeking traits (Eachus 2004; Zuckerman 1979) of being physically expressive (i.e. moshing, dancing, pushing) or disruptive (i.e. boredom, deviance, aggression). Moreover, temporary structural failings were also relatively commonly observed or expressed as a hazard by event attendees, linked mainly to outdoor music events and triggered by extreme weather incidents, which corroborated literature that emphasises the need for stringent emergency planning particularly in relation to effective TDS safety checks and appropriate use of showstop procedures and evacuation strategies (Abbott and Geddie 2001; HSE 2022; Kemp et al 2007; Still 2022). Overall, these emerging findings linked to patterns in incident occurrence satisfied **RO4** and provided insights to inform the development of the matrix of crowd dynamics and safety strategies around targeted density management strategies to address specific types of density problems, classification of evidently high sensation seekers as higher risk to event safety, and management considerations for outdoor events including TDS checks and emergency planning.

Furthermore, the main research outcome linked to common components in crowd management and safety planning (RO5) also contributed to the achievement of RO6 which explored links between crowd behaviour, event crises and CM efficacy. Interestingly, emergency

preparedness, failure to notice issues before they escalated, and risk averse decision making and response (i.e., absence of an individual with clear primacy) were identified as key interconnected factors underpinning the crowd incidents observed and negative audience perceptions of incident and emergency management. These fail points were found to be consistent with existing literature (Martella et al 2017; Rutherford-Silvers 2008; Seppänen et al 2013; Still 2013; 2022) and emphasised the need for greater focus on early detection of strategic fail points (Reason 2020) and onsite monitoring as well as implementing an *appropriate* response and recovery plan, among many of the incidents observed.

Beyond emergency preparedness, the common significant crowd management findings linked to RO5 (and as discussed previously in relation to the achievement of RO3 and RO4), involved a series of key issues. These were highlighted as: perceived ineffectiveness of drugs and alcohol strategies, negatively perceived heavy handed crowd control strategies (affecting sports crowds as well as events drawing a black and minority ethnic, BAME, crowd), fail points linked to ingress and egress procedures, and receptiveness towards online and A/V communication strategies amongst event attendees (messages to the crowd to guide behaviour, or messages to staff and the event team to facilitate swift action). Moreover in relation to the achievement of RO6, incidents linked to critical density (as discussed previously pertaining to RO4), uncovered a range of profile and managerial-specific findings linked to density management that highlight a strong need for emphasis on crowd spatial strategies (capacity management, spatial planning and site design) alongside multi-exit evacuation strategies as being crucial to feelings of safety related to event attendance and safe venue crises and evacuation strategies. Together, the insights obtained around emergency preparedness and appropriate incident response, common crowd management strategies and fail points, as well as those linked to effective density management, represent the satisfaction of **RO5** and **RO6** and have contributed significant crowd management knowledge towards the fulfilment of RO7 and A3.

10.2 Contribution to existing knowledge, theory and practice

The two-phase research process undertaken and the achievement of **A1** & **A2** through the satisfied **ROs 1-6** as discussed above, led to the generation of detailed profile-specific findings linked to 28 different event and user groups, as well as clear information regarding attendee attitudes, incident patterns and common crowd management strategies, alongside insights regarding their efficacy in relation to the crowd incidents and crises observed. These findings were collated and evaluated to establish a categorisation of risk by profile type (Figure 31, p202) and finally, to develop a matrix of crowd dynamics and safety strategies by event type and user group (Table 38, p204). These research outcomes signify the achievement of **RO7**, regarding the classification of risk based on crowd dynamics, internal and external factors as well as the satisfaction of **A3**, through the development of the matrix. The knowledge contained within these outputs provides concluding insights summarised hereafter that contribute to the existing body of knowledge around crowd dynamics and managing safety for events. Specifically, the work represents a significant contribution to current events management theory, strengthened by its grounding in the cohesion of multiple fields of discipline including crowd psychology, event safety management, risk and resilience planning and event design and experience, alongside

acknowledgement of the attendee perspective, which is arguably underrepresented currently compared to studies that focus on observation or expert opinion.

It should be noted at this point that events, and thus, the crowds in attendance, are unique (Getz 2005) and therefore the information contained within this matrix is designed to be illustrative, not exhaustive, of the likely crowd profiles in attendance at different event types, defining intervening onsite variables likely to impact on incident detection and management as well as the tailored key planning and operational phase strategies that could arguably facilitate strategic efficacy and reduce an event's inherent strategic fail points. Moreover, it should be recognised that some categories, such as the arts and cultural events group contain reference to events of an arts perspective but also those of a more religious or societal celebration purpose, which may contain further subtleties in strategic management approaches, whilst the behavioural principles arguably hold true. Similarly, as shown within the risk classification findings, the *scale* of an event will to some extent influence the risk severity and management approach even of those profiles at the low-risk end of the matrix, for the associated reasons and subtleties noted throughout this thesis. That said, and with this in mind, the matrix generated some interesting findings overall.

First, as a profile group becomes more homogenous in their behaviours and attitudes, and these become more risk-centric, and sensation seeking, then the likely threat they pose to event safety increases. Second, those profiles which are lower mid-centric or psychocentric are inherently more cautious. Whilst this often makes them more compliant, it does not reduce the associated risks of external triggers and catalysts (i.e., extreme weather incidents, structural collapses, terror or criminal attacks and other crowd factors). Thus, the strategies used to mitigate crowd incidents for these groups needs to come from a position of information, clarity and reassurance. Third, differences between what are commonly discussed as one overarching profile group (the rock and metal profiles) emerged from the study's findings. Both were found to have strong social identities and to share a number of behavioural traits (i.e., physically expressive behaviour and compliance with CM strategies), however, rock attendees were found to be much more cautious than their metal counterparts and exhibited less of the sensation seeking traits. These differences in their characteristics created considerable distance between them in the risk matrix, which could arguably be a significant finding in relation to effective safety management for the two groups. It appears that gender and visit frequency could potentially help to explain these differences with rock attendees more likely to be female (found to be more risk-averse) and metal attendees more closely linked to the male, carefree and frequent attender profile. With this in mind, it follows that to manage these profiles in the same way may not be as effective at dealing with the nuances that differentiate them. Fourth, indie crowds were found to be very closely linked in terms of behavioural traits, incident experience and hazard perception to the male sports (specifically football profile). This can likely be explained through the strong football subcultural social identity that throughout the 90s saw popular bands like Oasis make clear their support for the sport and ardent support of their team, coupled with anthems such as 'football's coming home' for EURO 96 and Fat Les' 'Vindaloo' for the '98 World Cup (Harrison 2021); both anthems became a part of the football subculture and inspired enduring links between the two genres to the present day. Moreover, the shared identity is further cemented through the common style known as the 'football casual', where fashion brands synonymous with the football subculture (The Cool Things Collection 2022) such as Lacoste and Stone Island have been made popular by 90s indie music icons such as Liam

Gallagher (Oasis); as noted by Maoui (2022) his 'Madchester' style has traversed football stadiums, nights out and music festivals alike. Fifth, links between the hip-hop and EDM profiles existed in terms of many behavioural traits despite some distinctions as well. Predominantly these profiles point to a younger, more carefree crowd with strong sensation seeking motives. Whilst distinct in their overall management styles, there are certain strategies applicable to both profiles that would arguably enable more effective crowd management at these types of events.

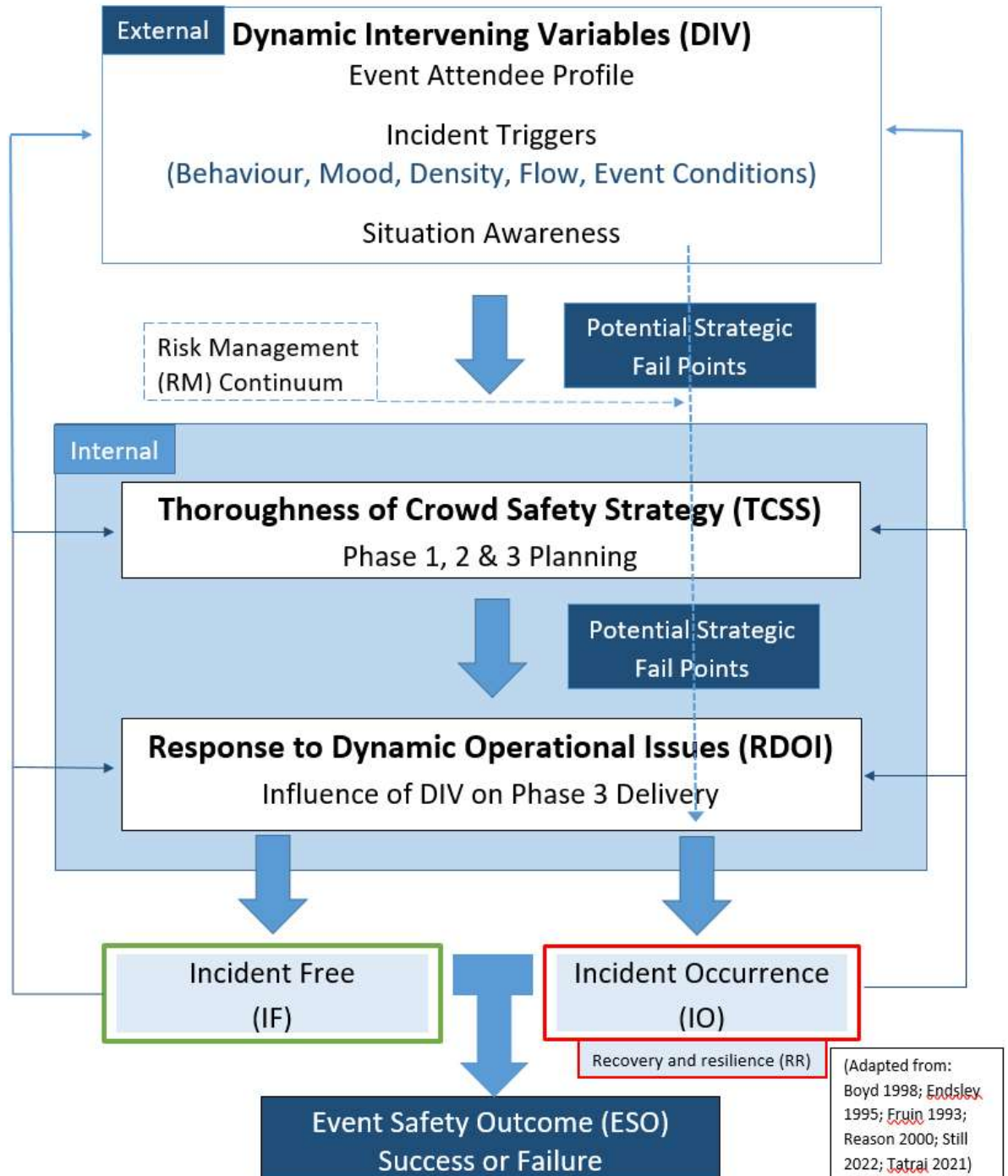
Finally, drawing on the concluding insights from the crowd dynamics and effective safety strategies matrix alongside the existing interdisciplinary body of literature pertinent to the topic, a new theoretical representation of crowd dynamics and strategic event safety management has been proposed (Figure 33). The new theoretical knowledge draws together conceptual thinking for a range of interconnected topics and from a range of disciplines to suggest an influential process for effective crowd management strategies and safer event outcomes (Boyd 1998; Brehmer 2006; Eachus 2004; Endsley 1995; Fruin 1994; Plog 1991; Reason 2020; Still 2022; Tarlow 2002; Tatrai 2021; Zuckerman 2007). Rather than concentrating on a specific area of focus, this model reviews the strategic crowd management and safety process in its entirety to provide an overview of the process, its influences and potential strategic fail points that can impact on an event's safety outcome and ultimate success or failure.

In essence, it proposes that an effective crowd safety strategy is developed over three phases, which is influenced by a set of external *dynamic intervening variables (DIV)* linked to the attendee profile, incident triggers (behaviour, mood, density, flow and event conditions) and situational awareness that will impact on each phase of strategic development. The first internal phase in the development of an effective crowd safety strategy is an *information gathering* pre-planning phase that must explore the dynamic intervening variables in relation to past events, mapping of the learning derived from previous incidents as well as identification of the common legislative considerations and experience-based knowledge of the key agents responsible for delivery of the strategy. The second phase requires the development of the *pre-event crowd management* plans, considering both the normal and emergency operating procedures in relation to the event environment, site planning, and crowd management and control requirements associated with effective management of the event. The third and final internal strategic development phase is the *operational crowd management* phase, which requires stringent consideration of the event's operational environment, alongside the real-time onsite monitoring and decision-making strategies to be employed that will be pivotal to the safe management of attendees once onsite, through early detection, strong collaboration and communication between all crowd safety agents, as well as the implementation of rapid response and recovery plans.

Underpinning the three phases of crowd safety strategic development is the potential for the aforementioned external *Dynamic Intervening Variables (DIV)* to expose fail points within the layers of strategy via the *risk management continuum* in terms of exposing holes in the *thoroughness of the crowd safety strategy (TCSS)* or in the organisational *response to dynamic operational issues (RDOI)* as the layers of strategy are both developed and then delivered. The model then proposes that the extent to which these strategic fail points align, will arguably determine if the event is likely to experience an *incident occurrence (IO)* or remain *incident free (IF)*, thus impacting on the *event safety outcome (ESO)* and ultimately, the success or failure of the event. Moreover, in the case of incident occurrence, the strength of the *incident recovery and resilience (RR)* plan in place has the potential to further influence the overall *ESO*. Finally, it

is theorised that the event safety outcome (for both incident free and incident occurring events) should feed knowledge, insight and learning back into all external and internal phases of the strategic development process to enhance the safe delivery of future events.

Figure 33: Theoretical representation of crowd dynamics and strategic event safety management



The new knowledge developed from the research outcomes of this thesis provide a practical interdisciplinary contribution to the field of crowd safety management in several ways. First the matrix of crowd dynamics and effective safety strategies provides detailed insights in relation to likely crowd profiles attending different events as well as the unique recommendations for their

safe and effective management. This has the potential to be used as a reference guide for crowd safety managers during the strategic development process. Second, these findings are strengthened by their grounding in existing interdisciplinary theoretical knowledge but also through their consideration of best practice guidelines and a research programme that explored both past crowd incidents globally for their influencing factors, as well as the attendee perspective of crowd safety at events. Practically, this joined up approach provides a robust overview of crowd dynamics and its relationship to strategic event safety management to aid in the activity of profiling crowds in attendance at events, alongside the likely dynamic intervening variables of influence which must be determined in order to develop targeted and effective crowd management strategies. Third, from a practical perspective, event organisers are often not experts in all aspects of the event management process, devolving certain activities (such as those linked to crowd and safety management) to external experts, and, in the case of safety management, will consult with advisory bodies such as the HSE or manage the safety of their event through groups known as Safety Advisory Groups (SAGs). It has been recognised that this often creates a knowledge gap among event organisers regarding management of crowd safety. One of the common strategic fail point themes identified through this thesis was the lack of preparedness, understanding of the common operational picture and a shared situational awareness among event organisers (Martella et al 2017; Rutherford-Silvers 2008; Seppänen et al 2013; Still 2022). Whilst the research outcomes do not claim to make event organisers experts in the field of crowd safety, the risk matrix (Table 38, p204) and its underpinning model (Figure 33, p218) could arguably aid in the development of organiser understanding to instil a crowd safety 'overview' or shared situational awareness and common operational picture, that is underpinned by an understanding of the fundamental elements involved in the crowd safety strategic process. This enhanced understanding would arguably be beneficial to the event safety management process as a whole.

10.3 Study limitations

A key limitation of the matrix of crowd dynamics and effective safety strategies by profile and user group was that it provides an illustrative but not exhaustive review of event and profile types. Some profiles originally investigated through the attendee safety perceptions survey, for example, were removed from the profiling exercise due to the lack of sufficient responses for statistical analysis in the first instance, or due to the lack of significant associated findings and thus an insufficient amount of associated information for profiling. In other cases, profile groups were collapsed and amalgamated into one another, such as the 'arts and cultural' events group. This attendee profile group contains reference to events of an arts perspective but also those of a more religious or societal celebration purpose, which may contain further subtleties in strategic management approaches, whilst many of the behavioural principles would arguably still hold true.

Similarly, as shown within the risk classification findings, the scale of an event will to some extent influence the risk severity and management approach even of those profiles at the low-risk end of the matrix, for the associated reasons and subtleties noted throughout this thesis. It is

therefore important to also be mindful of the characteristics associated with the differing event scales explored through this thesis when categorising risk for events.

The scope of this thesis also meant that there was not an equal review of crowd incident cases linked to all scales of event. In particular, the mega event scale was underrepresented. Whilst this is less problematic for a qualitative line of enquiry such as this, and although inclusion of a number of mega events within the crowd incident database was achieved to give insight to their common issues, this scale of event was ultimately absorbed into either the major outdoors or major indoors (stadiums) categories for risk analysis and thus true risk profiling for the mega event in its own right was not achieved through the outcomes of this thesis.

Finally, in relation to the study limitations, the research parameters meant that the attendee safety perceptions survey occurred in line with the 2020 outbreak of the COVID-19 pandemic and as a result, whilst this study did not set out to explore this influence, its likely impact on attendee safety perceptions meant that some targeted questions needed to be built in to establish clear differences between general perceptions of safety and the ways in which their views had potentially been influenced by the Pandemic. It is therefore probable that some level of influence has been recorded that may have otherwise been different regarding safety perceptions linked to event attendance and crowd safety strategies. That said, this residual impact of the COVID-19 pandemic is likely to influence audience perceptions for some years to come and thus could arguably provide some timely insights for event managers in the development of effective crowd management strategies.

10.4 Considerations for further research

Regarding considerations for future research there is scope to conduct investigations to further develop the matrix of crowd dynamics and effective safety strategies. A review of a greater number of mega event scale events, for instance, (and of different types, such as sports, music, and cultural mega events), may provide further insights and nuances linked to crowd safety strategy efficacy that would benefit the overall usability of the risk matrix model.

A logical next stage to this study would also be to test the robustness of the theoretical model of crowd dynamics by strategic event safety management. For example, would the diligent application of this model in practice influence the event safety outcomes as proposed? The selection of a number of live case study events to which the model could be applied may generate further useful findings that would ultimately benefit crowd safety management practice for events.

An additional consideration for further research would be to look at the attendee profile categories generated as an outcome of this research with a review to developing and expanding upon them further. Time spent gathering data linked to underrepresented or collapsed categories as well as those not able to be included within the parameters of this study could provide further behavioural insights to enhance the usability of this matrix for practical strategic crowd management as well as theoretical purposes going forwards.

Finally, whilst the scope of the crowd incident database explored incidents globally, the ultimate focus of this thesis and its research outcomes was from the perspective of crowd dynamics and strategic crowd safety management within the UK. It would be interesting through further investigations to test the study's key outcomes for other countries to explore variances in terms of behaviour, attitude, safety strategies, and subsequent effective managerial approaches.

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Appendix 1: Factors identified from the conceptual framework and specific related measures for literal content analysis

Time points	Location	Incident type	Fan behaviour	Crowd type	Behaviour	Event type & Scale
Pre-start	Event zones	Safety regs incident	Casual dabblers	Casual	Audience profiles	Business
Beginning	Hotspots	Structural failure	Enthusiasts	Expressive	Subcultural Behaviours	Arts and cultural
Middle	Ingress	Crowd crush	Devoted fanatics	Sensation seeker	Crowd types	Sports
End	Circulation	Terror act		Political	Crowding types	Music
Post-event	Egress	Fire		Cautious	Behaviour NOP	Local
		Weather incident		Deviant / Criminal	Behaviour EOP	Regional
		Performer incident				National
		Organiser error				National /Major
		Audience incident				Hallmark
						Internatnl / Mega

Outcomes	Event CM success	Incident factors	CC strategies	CM planning	site factors	Site design factors	Catalysts & triggers
Fatalities	Design related	Design related	Sweeps / checks	Comms	Activity	Alcohol	
Injuries	Info related	Info related	Staffing	Staffing	Aesthetics	Audience	
Court case	Managemt related	Managemt related	Comms	Alcohol	Cleanliness	Dark spots	
Event cancelled	Audience compliant	Beyond organiser control	Monitor	Event conditions	Coherence	Weather	
Other	Red	Red	Capacity managemt	Monitor	Complex	Panic	
	Amber	Amber	Ejections	Signage / legibility	Density	Terror	
	Green	Green	Evacuation	Queuing	Familiarity		
			Show stop	Accessible	Flow		
				Flow	Legibility		
				Structures	Lighting		
				Space	Noise		
				Safety	Novalty		
				Temp.	Organised		
				Timings	Space		
				Utility	Safety		

Crowd Safety Survey - After pilot

Survey Flow

Block: Introduction (9 Questions)

Standard: Event Environment and Site Planning (5 Questions)

Standard: Crowd management strategies (5 Questions)

Standard: Perceived fear of threat to safety and criminal activity at events (5 Questions)

Standard: Demographics (6 Questions)

Start of Block: Introduction

This questionnaire is looking to understand the perspective of the event audience (visitors) in relation to crowd safety at events. It is part of a wider University of Plymouth PhD study being undertaken to investigate audience behaviour at events, influencing factors on crowd safety and the effectiveness of event industry strategies for crowd management.

As such, the following survey will explore your personal views on crowd safety at events, your own feelings of the way crowd safety is managed at events, and your thoughts on the contributing factors behind incidents that you have either experienced first-hand or heard about in the public domain. It is not essential that you have been involved in audience safety incidents yourself, but it is important that you have visited events of some nature in the past to be able to share your views and sentiments in relation to the topic.

The survey should not take more than 15 minutes to complete and when you have finished, please hit the 'save and send' button to record your response. Your answers will be treated in the strictest confidence and all results generated for the final report and any further academic publications produced as a result of this study, will be generalised and anonymised so that individuals are unidentifiable; data will be kept securely for a period of 10 years before being destroyed. You have the right to withdraw from the survey at any time and if you would like any further information about the wider study or, more specifically, completing this questionnaire then please feel free to contact Kristin Finn, Lecturer in Event Management, University of Plymouth - kristin.finn@plymouth.ac.uk.

Please ensure that you follow the instructions and guidelines throughout the survey closely for its accurate completion.

Thank you very much for your time!

Q1 Prior to the current UK situation where events are postponed indefinitely due to covid-19, **how often do you typically choose to attend events?** Please select **one** option

- Very frequently (at least once per month) (1)
- Frequently (almost every month) (2)
- Occasionally (3-6 times per year) (3)
- Infrequently (1-2 times per year) (4)
- Rarely (less than once per year) (5)
- Never (6)

Skip To: End of Survey If Q1 = Never

Q2 What type of events do you **prefer to visit?**

Select **all** that apply

- Arts and cultural events (1)
 - Business events (2)
 - Family-focussed events (3)
 - Food Festivals (4)
 - Music events / concerts (5)
 - Sports events (6)
-

Display This Question:

If Q2 = Music events / concerts

Q2a What type of music events do you **most enjoy** visiting?

Select **up to three** that apply

- Classical (1)
- Electronic Dance Music (2)
- Folk (3)
- Hip-hop / Urban (4)
- Pop (5)
- Indie (6)
- Rock (7)

Display This Question:

If Q2 = Sports events

Q2b What type of sports events do you **most enjoy** visiting?

Select **up to three** that apply

- Athletics (including marathons) (1)
- Boxing (2)
- Cricket (3)
- Football (4)
- Golf (5)
- Motorsports (6)
- Racing (greyhound) (7)
- Racing (horse / equestrian) (8)
- Rugby (union or league) (9)
- Swimming (including diving) (10)
- Tennis (11)
- Other (12)

Q3 Please provide some detail about **the last event you visited** (i.e. what type of event was it, what was its name, where was it, etc):

Q4 What size or scale of event do you **most frequently** enjoy to attend?

Select **one** option

- Local / small / intimate venues (indoor or outdoor) (1)
 - Large city-based indoor venues (regional or national entertainment acts or competitions) (2)
 - Large city-based outdoor events (regional or national entertainment acts or competitions) (3)
 - Outdoor festivals (national / international scale) attracting high profile acts and very large crowds (4)
 - Outdoor street events (national / international scale) for high profile acts or causes, attracting very large crowds (5)
 - Arenas and stadiums for high profile national and international entertainment acts, competitions or causes (6)
-

Q5 Please select **the 3 aspects** that motivate you **most** to attend the events that **you prefer to visit**:

- Achieving awareness for a cause (1)
 - Camaraderie with like-minded people (2)
 - Education value (3)
 - Entertainment: appeal of artist / activities (4)
 - 'Escape' from everyday pressures (5)
 - Festive / fun atmosphere (6)
 - Networking opportunities (7)
 - Novelty / uniqueness (8)
 - Prestige / status (9)
 - Realisation of business objectives (10)
 - Rest and relaxation (11)
 - Socialise with friends (12)
 - Socialise with family (13)
 - Supporting a team / act / individual (14)
-

Q6 Are you a member of any event-related organisations / forums / social media pages / fan clubs?

Yes (1)

No (2)

End of Block: Introduction

Start of Block: Event Environment and Site Planning

Q7 What types of audience behaviours do you associate with the type of event **you most prefer to attend?**

Select **any** that apply

- Aggression or violence (1)
 - Calm and relaxed atmosphere (2)
 - Camaraderie with like-minded people (3)
 - Disorderly / illegal behaviour (4)
 - Emotionally charged atmosphere (5)
 - Happy and expressive crowds (6)
 - Intoxication (drugs or alcohol) (7)
 - Moshing, crowd surfing types of behaviours (8)
 - Orderly behaviour from the audience attending (9)
 - Pushing and dense (tightly packed) crowds (10)
-

Q8 Which of the following factors do you believe have contributed to or caused crowd safety incidents **at events you have attended?**

Please select **up to 3** that **most** apply.

- Audience behaviour (i.e. boredom, impatience, aggression) (1)
 - Environmental factors outside event's control (i.e. extreme weather, heat) (2)
 - Event venue (i.e. size, venue layout) (3)
 - Event type (i.e. activities, people attending, location) (4)
 - Organiser / site set-up failings (5)
 - Performer behaviour (i.e. encouraging audience to act / react a certain way)
(6)
 - Timing issues (i.e. late starts, no-shows, long waits) (7)
 - Real / fear of threat to safety (8)
 - Never experienced an issue (9)
-

<p>Q9</p> <p>How important are the following factors to your satisfaction at the events you attend?</p>	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)
<p>1. The crowd (i.e. size / atmosphere) (1)</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<p>2. Socialising with like minded people (2)</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<p>3. The event and surroundings (i.e. line up, look and feel, timings, unrestricted viewing, lighting, sound) (3)</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<p>4. The weather (4)</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<p>5. Relationship between event staff, law enforcement and the audience (5)</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<p>6. Clear directions and signage around the site (i.e. for information and to inform about unsafe, no-go areas) (6)</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

7. Organised movement of crowds and queuing zones (i.e. effective use of barriers, roped areas, entry systems, disability access) (7)

8. Space to move freely (8)

9. Handling of emergency situations and procedures (9)

Q10 Have you been to events in the past where any of the following aspects of an event's design have **influenced the way you behaved or acted** as a result?

Select **any** that apply

Signage, furnishings and facilities provided (1)

Lighting, sound and colour used (2)

Barriers, queuing and waiting areas (3)

Points of interest, event 'look' and theme, entertainment and performers (4)

Staff-to-audience communication (5)

None of the above aspects have influenced my behaviour (6)

Q11 Please select **any** of the commonly discussed event hazards below that you have personally experienced at events you have attended:

- Bottlenecks and congestion (1)
- Car parks/ contact with vehicular traffic (2)
- Confusing layouts (3)
- Dark or dimly lit areas (4)
- Electrical hubs and other no-go areas (5)
- Lack of visible, fit for purpose exits (6)
- Obstructed sightlines (7)
- Open-air sites without clear boundaries (8)
- Overcrowding and densely-packed audiences (9)
- Poor clarity of signage (10)
- Temperature issues (i.e. too hot) (11)
- Temporary structure issues (i.e. stage, barrier, marquee failings) (12)
- The weather (i.e. wind, rain, extreme heat) (13)
- Uneven ground, steps, stairs (14)
- I have not experienced any event hazards at events I have attended (15)

End of Block: Event Environment and Site Planning

Start of Block: Crowd management strategies

Q12 Five common methods of audience communication used at events for different purposes are listed below.

Please select **any** which you find to be **the most** helpful for the different event scenarios stated:

	when informing audiences about event layout and timings on-site? (1)	when notifying audiences about necessary changes ahead of the event? (2)	when providing live information and updates as they occur? (3)
Verbal (i.e. PA systems, radio, mobile phone) (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Non-verbal (i.e. hand signalling and gestures) (2)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Written (i.e. signage) (3)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Visual & audio (i.e. big screen updates) (4)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Digital (i.e. social media, apps, websites, email) (5)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q13 In your opinion of the events you have attended...

How effective are the following crowd management strategies used by events for event safety:

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)
<p>1. Metal detectors and bag searches i.e. for weapons, contraband (1)</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<p>2. Alcohol policies i.e. Challenge 25, refusal to serve (2)</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<p>3. Drug policies i.e. drug testing and awareness raising, stop and search, police dogs (3)</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<p>4. Security and law enforcement i.e. ejection policies, crowd control, uniformed/plain clothed police presence, arrests (4)</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<p>5. Communication to, from and around the site i.e. verbal (stewards and ushers, tannoy), digital (social media, email, website), and visual (big screens, signage) (5)</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<p>6. Congestion avoidance (capacity management) i.e. multiple entrances, staggered entry times, allocated seating/standing zones, effective spacing of key facilities (bar, toilets, food areas, stages) (6)</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

7. Crowd monitoring i.e. of queues / dense areas / hotspots, CCTV surveillance (7)



8. Crowd dispersal i.e. in congested areas, end of event (8)



9. Handling of emergency situations and procedures i.e. temporary show stops, evacuations, deployment of emergency services (9)



Q14 Have you ever experienced a crowd safety incident at an event **linked to one or more of the following factors**:

Please select **any** that apply

- The arrival process (on the way to the venue) (6)
- The entry / admission process (prior to the event starting as people were starting to arrive)? (1)
- The event (somewhere inside the site whilst it was taking place) (2)
- The exit process (after the event had finished and as people were leaving the venue) (3)
- The exit process (outside the venue on the way home) (7)
- Overcrowding and congestion (where event security, organisers or emergency services have had to intervene in some way) (5)
- Not applicable - I have never personally experienced a crowd safety incident (4)

Skip To: End of Block If Q14 = Not applicable - I have never personally experienced a crowd safety incident

Display This Question:

If Q14 = The event (somewhere inside the site whilst it was taking place)

15a Where inside the event did the incident occur?

- Bar area (1)
 - Stage / main event area (2)
 - Queues for facilities (toilets, food, merchandise) (3)
 - Foyer (4)
 - Other (5)
-

Display This Question:

If Q14 = The arrival process (on the way to the venue)

And Q14 = The entry / admission process (prior to the event starting as people were starting to arrive)?

And Q14 = The event (somewhere inside the site whilst it was taking place)

And Q14 = The exit process (after the event had finished and as people were leaving the venue)

And Q14 = The exit process (outside the venue on the way home)

And Q14 = Overcrowding and congestion (where event security, organisers or emergency services have had to intervene in some way)

Q15b How well do you feel the incident was dealt with by the event staff, organisers, emergency services, etc?

If you have experienced more than one crowd safety incident, please answer for the most memorable one.

Please select one answer

- Extremely Well - i.e. swift /coordinated action, calm audiences, well communicated instruction (1)
- Adequately - i.e. incident resolved but some audience confusion or issue could have been dealt with more smoothly / swiftly (2)
- Extremely Poorly - i.e. lack of clear instruction to audience, panic, poorly coordinated or delayed action (3)

End of Block: Crowd management strategies

Start of Block: Perceived fear of threat to safety and criminal activity at events

Q16 Which of the following **crowd behaviours** have you (or those around you) experienced at the events you have attended?

Please select **all** that apply.

- Cheering, chanting, singing (1)
- Avoidance of following **instructions** when needed (2)
- Avoidance of following **rules** of the event / venue (3)
- Fear and panic (4)
- Fighting and / or physical violence (5)
- Friendly crowd attitudes (6)
- Group 'herd' behaviour (i.e. people following one another, copying what others do) (7)
- Helpful members of crowd (8)
- Pushing and impatience (9)
- Intoxication (alcohol) (10)
- Intoxication (drugs) (11)
- Premeditated (organised) theft (12)
- Premeditated (organised) violence (13)
- Rivalry (14)
- Rowdiness and boisterousness (moshing, heckling, crowd surfing, etc) (15)
- Rushing or running (i.e. for a good view, to get out of venue, etc) (16)

- Sale of drugs (17)
 - Sexual promiscuity (18)
 - Sexual assault (19)
 - Theft (20)
 - Verbal aggression / verbal abuse (21)
 - I have never experienced any of these crowd behaviours at the events I attend (22)**
-

Q17 Personal safety at events. Which of the following statements would you say has typically applied to you **at the events you have attended in the past?**

Please select **one** option only

- I feel extremely uncomfortable in overcrowded conditions at events and will seek to find less crowded areas (1)
 - I feel uncomfortable in over-crowded conditions at events but accept it as a consequence of the events I choose to attend (2)
 - I am neither comfortable nor uncomfortable in over-crowded conditions at events and thus it does not impact on my experience (3)
 - I feel comfortable in over-crowded conditions at events and view it as part of the event atmosphere (4)
 - I feel extremely comfortable in over-crowded conditions at events and actively seek them out (i.e. front of stage) as an important part of my event experience (5)
-

Q18 Do you think the Covid 19 Coronavirus pandemic will change your attitude towards being in crowded spaces at events **in the future** once we are able to begin attending events again?

Please select **one** option only

Yes (1)

No (2)

Unsure (3)

Q19 To what extent would the following factors **influence your feelings, attitudes and behaviour** towards events you consider attending in future? For each factor listed below, please determine the influence it will likely have on your attitude towards **attending an event:**

	Positive Influence (1)	No Influence (2)	Negative Influence (3)
Coronavirus (Covid-19) (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Coverage of recent crimes (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Coverage of recent terror attacks (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Crowds (i.e. congestion, queues, lack of space) (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fellow audience members (i.e. behaviour, mood, etc) (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Heightened security measures (i.e. rigorous entry checks, venue and surrounding area safety enhancements) (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of visible security / police presence (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Media portrayal (of past events / area) (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
More visible security / police presence (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
More visible emergency services / emergency procedures (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Press releases and public communication (i.e. via social media) (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Updated health and safety information on website (12)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Word of mouth / online reviews (for event / area) (13)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q20 Coronavirus (Covid-19) specifically

On a scale of 1-10 (where 1 is No Influence At All and 10 is Extremely Strong Influence), how

much has the recent coronavirus global crisis influenced...

Influence of Coronavirus (Covid-19) global crises
on your attitudes and decision making

0 1 2 3 4 5 6 7 8 9 10



End of Block: Perceived fear of threat to safety and criminal activity at events

Start of Block: Demographics

Q21 Please state your age in years:

Q22 Are you:

Male (1)

Female (2)

Other (3)

Q23 Where do you live? **Tick one:**

- East of England (1)
 - East Midlands (2)
 - Greater London / London (3)
 - North East (4)
 - North West (5)
 - South East (6)
 - South West (7)
 - West Midlands (8)
 - Yorkshire and Humber (9)
 - Northern Ireland (10)
 - Republic of Ireland (11)
 - Scotland (12)
 - Wales (13)
 - Other (14)
-

Q24 Are you (**please tick**):

- Employed / self employed (1)
 - Unemployed / redundant (2)
 - Retired (3)
 - In full time education (4)
 - At home with children (5)
-

Q24a Please provide the occupation of the **main income earner** for your household:

If no-one in the household is currently working, (**i.e.**, unemployed / redundant, retired, in education or at home with children), please describe the occupation most recently held

End of Block: Demographics

Appendix 3: Map of audience survey questions against existing literature

Survey Section	Question Number	Question	Description / Links to relevant literature	Influencing authors
1	Questions 1-9, 10-12, 14 partial, 20, 22, 21, 23-25 partial		Audience profile	
	1	How often do you attend events?	<p>The fan at events: Sliding scale typology:</p> <ul style="list-style-type: none"> ▪ Dabblers – relatively unconvinced / uncommitted, lack specific knowledge ▪ The Enthusiast – clearly defined ideas of what they enjoy, seek company of like-minded and knowledgeable people as part of the social experience ▪ The Expert – Significant knowledge and a clear focal point to interest, self-identification or even adulation become important. Interest takes a central role. ▪ The Fanatic – highly committed but viewed as eccentric / irrational, interest pursued beyond reasonable limits in eyes of many, overriding own voice of reason. Behave in a very independent manner. Social interaction is of less relevance. <p>Sports fan classification:</p> <ul style="list-style-type: none"> ▪ Devoted – <i>most loyals: high or vested, devoted, fanatical, dysfunctional, frequent, season-ticket holders, hard core, old, genuine, traditional</i> ▪ Moderates – <i>fans showing average support: medium or focused, local, enthusiast, moderately frequent attendance</i> 	<p>Brotherton & Himmetoglu (1997):</p> <p>Bladen et al (2012)</p>

			<ul style="list-style-type: none"> ▪ Less Frequent – occasional fans: low or social, temporary, casual, infrequent, sporadic spectator ▪ New – New fans: usually only watch majority teams /stars, corporate, temporary fans 	
	2	What type of events do you visit?	<p>Typology of planned events (4 types): Cultural celebrations, political & state, arts & entertainment Business & trade, educational & scientific Sport competition /recreational Private events</p> <p>SIZE: Local, major, hallmark, mega events FORM/CONTENT: Cultural, sports, business</p>	<p>Getz (2007);</p> <p>Bowdin et al (2010)</p>
	2a	What type of music events?	<p>Youth crowds and substance abuse – if identify with the pop, punk, skate, hip-hop, techno and hippie subcultures</p> <p>Hip hop sub-group associate with violence; mosh pit phenomenon and missile throwing at music events associated with youth market</p>	<p>Verkooijen, de Vries and Nielsen (2007) and Kemp et al (2007)</p> <p>Kemp et al (2007)</p>
	2b	What type of sports events?	<p>Combination of Britains most popular sports in 2003 and highest attended sports in UK in 2017, plus any others noted as popular from the final two sources adjacent</p> <p>Subcultural profile:</p> <ul style="list-style-type: none"> - Sports fan typology - Identity and pride - Social drinking - ‘mine’s a pint’ culture 	<p>Ipsos Mori (2003). Mori Sports Tracker. In: Rugby Union Britain’s Second Most Popular Sport. [Online]. Available at: https://www.ipsos.com/ipsos-mori/en-uk/rugby-union-britains-second-most-popular-sport [Accessed 20.08.19]</p> <p>Statista (2019). Highest attended sports in the UK in 2017. [Online]. Available at: Statista Research Department [Last Accessed 05.05.22]</p> <p>https://www.greatbritishtrips.com/home/sports 2019 - accessed on 30.07.19</p>

			<ul style="list-style-type: none"> - Frequent specific places i.e. pre-match pubs - Unique behavioural traits, chants 	https://www.worldatlas.com/articles/most-popular-sports-in-the-united-kingdom.html Bladen et al (2012) – fan typology Dun (2014); Green and Chalip (1998); Henderson (n.d.) – the rest in this list
3	Please provide some detail about the last event you visited	Event Typologies subcultural profiles (i.e. music and sports events)	Getz (2005); Bowdin et al (2010); Verkooijen, de Vries and Nielsen (2007) and Kemp et al (2007) Bladen et al (2012); Dun (2014); Green and Chalip (1998); Henderson, n.d.	
4	What size of event do you most frequently like to attend?	<u>Event Typologies – General, by SIZE:</u> Local, major, hallmark, mega events <u>Event Typologies – General, by Content:</u> Cultural, sports or business <u>MUSIC TOURS:</u> Regional, National, International <u>TYPOLOGY OF SPORTS EVENTS:</u> Local, regional, national, international, global (Mega Event) Willingness to travel for events is evident	Bowdin et al (2010) Bladen et al (2012) Bladen et al (2012)	
5	Please select the three aspects that motivate you most to attend events	<ul style="list-style-type: none"> - Subcultural identity - Includes Social Identity Theory – gaining social identity by conforming to situation specific norms. Become involved in atypical behaviour to get ‘lost in crowd’. Some even join crowds to offend. Contact with other groups not seen as a part of their own social identity viewed negatively by individuals and can trigger reactions (i.e. rival teams / factions) DISTINCT SOCIAL IDENTITIES – ‘US & THEM’ MENTALITY	Green and chalip (1998) Reicher et al (2004); Stott and Reicher (1998); Berlonghi (1995) Stewart and Cole (2011) Bladen et al (2012) Iso-Ahola (1983); Getz (2005); Yoon & Uysal (2005), Nicholson & Pearce (2001); Crompton & McKay (1997); Gelder & Robinson (2009)	

			<ul style="list-style-type: none"> - Motivation by event type - Event visit motivations (general) - Common audience profile traits in socialisation motives - Good crowding (event atmosphere) and functional density linked to spatial crowding – individual stops viewing crowd in a negative manner as they become familiar with it. Crowds viewed positively due to shared atmosphere, revelry, experience. Plus, social crowding linked to enjoyment for visitors with enjoyment, pleasure, hedonism/partying motives. Also, crowding seen by majority as an essential part of festival experience with 92% enjoying crowd sights, sounds and movements - Sensation seeking (and links to novelty/regression, socialisation, recovering equilibrium/escapism domains by Crompton & McKay) - Links to: Rational view of crowds – people behave in specific ways in crowds due to factors such as 	<p>Berlonghi (1995); Bowen & Daniels (2005); Kim et al (2001) Eroglu, Machleit & Feldman Barr (2005) Wickham & Kerstetter (2001)</p> <p>Sit & Johnson Morgan (2008)</p> <p>Anderson et al (1997)</p> <p>Mowen, Vogelsong and Graeffe (2003) Lepp & Gibson (2008); Eachus (2004)</p> <p>Canetti (1973) Brunt & Brophy (2004); Menaker & Chaney (2014); Seekings (1998) Le Bon (2003-republished works); Berlonghi (1995); Borch (2006); Hoggett and Stott (2010)</p>
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			<p>escapism, crowd equality, liberation of daily norms, removal of social norms and boundaries</p> <ul style="list-style-type: none"> - Deviance - Deindividuation (loss of inhibitions, acceptance of new situation-specific norms, collective mindset) 	
	6	Are you a member of any event-related organisations / forums / social media pages / fan clubs?	<p>Fan situational framework The fan at events (sliding scale typology) Sports fan typology Fan behaviour can link to sensation seeking and deviant behaviours (aggression, stalking, fighting, rivalry)</p>	<p>Henderson (n.d.) Brotherton and Himmetoglu (1997) Bladen et al (2012) Eachus (2004)</p>
2	Questions 7-11		Event Environment and Site Planning	
	7	What types of audience behaviours do you associate with the type of event you most prefer to attend?	<p><u>11 types of crowd:</u> Ambulatory, disability/limited movement, cohesive/spectator, expressive/revellous, participatory, aggressive/hostile, demonstrator, escaping/trampling, dense /suffocating, rushing/looting, violent</p> <p><u>Crowd types and symbols:</u> TYPES: Invisible, bating, fleeing, prohibition, reversal, feast SYMBOLS: fire, sea, rivers</p> <p><u>5 Typical crowd types:</u> Casual, cohesive, expressive, aggressive, explosive</p> <p><u>Adapted typologies for the event setting:</u> Allocentric/psychocentric (Plog 1973) Fires and crowds (Canetti 1973)</p>	<p>Berlonghi (1995)</p> <p>Canetti (1973)</p> <p>Rutherford-Silvers (2008)</p> <p>Tarlow (2002)</p> <p>Berlonghi (1995); Borch (2013); Reicher et al (2004)</p>

			<p>Crowd warning signs (Tarlow 2002)</p> <p>Crowd behaviour influenced by:</p> <ul style="list-style-type: none"> ▪ Emotional arousal ▪ Crowd characteristics ▪ Situation-specific norms ▪ Subculture ▪ Audience motivation ▪ Environmental factors <p><i>Negative perceptions of crowding occur when behaviour of other users interferes with an individual's own goals, norms or experience</i></p> <p>Contact with other groups not a part of their own social identity viewed negatively and can trigger reactions (i.e., rival teams / factions)</p>	<p>Tarrant et al 1997: 111)</p> <p>Stewart and Cole (2011)</p>
	8	Which of the following factors have caused crowd safety incidents at events you have attended? (Please select up to three that resonate the most with you)	<p><u>CROWD CATALYSTS:</u></p> <p>Operational circumstances, event activities, performers actions, spectator factors, security/police factors, social factors, weather, natural disasters, man-made disasters.</p> <p>Crowd emotions, event circumstances, host destination profile, climatic elements</p> <p>Nature of crowd, performer's actions, Improper management, operational circumstances, phantom panic</p> <p>Phantom panic</p> <p>Darkness, inadequate security, boredom, alcohol, the weather, young people</p>	<p>Berlonghi (1995)</p> <p>Abbot and Geddie (2001)</p> <p>Zhen et al (2008)</p> <p>Helbing and Mukerji (2012)</p> <p>Tarlow (2002)</p>

	9	<p>How important are the following environmental factors to your satisfaction at the events you attend?</p>	<p>Socialisation, weather, drug and alcohol usage, crowd size, atmosphere, line-ups, timings, event info, queue management, relationship with event staff / law enforcement, restricted visibility, site layout</p> <p>Functional density – Good Crowding</p> <p>Crowding that augments an experience is a major part of a festival experience In a survey of those at a festival, 92% said sights, sounds and movements of crowds were enjoyable</p> <p><i>Negative perceptions of crowding occurs when behaviour of other users interferes with an individual's own goals, norms or experience</i></p> <p>See CATALYSTS AND TRIGGERS (Q8) and Qs 1-7 ATTENDANCE AND BEHAVIOURAL PROFILES</p> <p>Helps to identify perceived fail points and also tolerance levels, preferences.</p> <p>7 elements of site planning to influence behaviour of the audience:</p> <p>Access, atmosphere, escape, services, signage, staging, structures</p> <p>Site legibility principles:</p> <p>Landmarks, nodes, pathways, edges, districts</p> <p>Capacity management strategies:</p> <p>Avoiding congestion and bottlenecks, staggered / gated entry, 'batch' entry procedure, ample space in busy areas, ropes and barriers</p>	<p>See theory linked to:</p> <p>1, 2, 2a, 2b, 4 ATTENDANCE PROFILES</p> <p>5, 6, 7 BEHAVIOURAL PROFILES</p> <p>Programme staging, timing, staging, experience, audience engagement, performer actions, weather.</p> <p>Also, Berridge (2007); Malouf (1999); Munroe (2006); Mudie & Pirrie (2006); Hoffman et al (2009); Getz (2005); Berlonghi (1995); Zhen et al (2008)</p> <p>Anderson et al (1997).</p> <p>Tarrant et al 1997:111)</p> <p>Berlonghi (1995); Abbot and Geddie (2001); Zhen et al (2008); Helbing and Mukerji (2012); Tarlow (2002)</p> <p>Rutherford-Silvers (2008)</p> <p>Lynch (1960)</p> <p>Yeoman et al (2004)</p> <p>Maister (1984) in Yeoman et al (2004) and Hoffman et al (2009)</p> <p>Bang Goes the Theory (BBC 2012)</p> <p>Eroglu & Harrell (1986); Blumer (1946)</p>
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		<p>8 principles of waiting and their influence on crowd behaviour</p> <p>Avoiding bottlenecks – some argument for placement of posts near doorways to split flow around obstacle, reduce crowd pressure and improve flow rate through door</p> <p>Atmosphere – most people desire /expect crowds to be present at events. They form a crucial part of the event experience</p> <p>For positive crowding, plan an event space with the following in mind: Aesthetics, sensory influences, organisation / arrangement of the event site</p> <p>Functional density (Good crowding) - linked to spatial crowding. Individual stops viewing crowd in a negative manner as they become familiar with it.</p> <p>Crowding that augments an experience is a major part of a festival experience. In a survey of those at a festival, 92% said sights, sounds and movements of crowds were enjoyable.</p> <p>- Shared atmosphere, revelry, experience</p> <ul style="list-style-type: none"> - Plus, social crowding linked to enjoyment for visitors with enjoyment, pleasure, hedonism / partying motives - Links to expressive/revelous crowd types <p><i>ALSO: Audiences act differently depending on the event... Organisers must consider the impact that event conditions have in order to</i></p>	<p>(Berridge 2007; Bladen et al 2012; Hoffman et al 2009; Pine and Gilmore 1999; Rutherford-Silvers 2008; Sonder 2004)</p> <p>Eroglu, Macheit and Feldman Barr (2005)</p> <p>An Anderson et al (1997)</p> <p>Wickham and Kerstetter (2001) Sit and Johnson Morgan (2008)</p> <p>Berlonghi (1995)</p> <p>Makarenko (2004)</p>
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			<i>predict and manage crowd behaviour effectively.</i>	
10	Aspects of event design that have influenced the way you have behaved or acted at events?	<p>colour, light and sound, queuing / barriers / wristbands for smooth ingress, entertainment / points of interest whilst queuing, queue management, holding areas, staff interaction fail points</p> <p>For positive crowding, plan an event space with the following in mind: Aesthetics, sensory influences, organisation / arrangement of the event site</p> <p>ALSO: identifies importance of specific crowd management and safety related aspects to people’s overall experience at events.</p> <p>Barriers</p> <p>Ingress – visitors slow as they enter a site to orientate themselves</p> <p>Ingress, circulation, egress issues (including flow rates, congestion modelling, route to/from site)</p> <p><i>ALSO: Audiences act differently depending on the event... Organisers must consider the impact that event conditions have in order to predict and manage crowd behaviour effectively.</i></p>	<p>Pine and Gilmore (2011) Berridge (2007); Malouf (1999); Munroe (2006); Mudie & Pirrie (2006); Hoffman et al (2009);</p> <p>Berridge 2007; Bladen et al 2012; Hoffman et al 2009; Pine and Gilmore 1999; Rutherford-Silvers 2008; Sonder 2004)</p> <p>Selley (2004); Getz (2005) (Tum et al 2006)</p> <p>Still (2015)</p> <p>Makarenko (2004)</p>	
11	Please select any of the commonly discussed event hazards below that you have personally experienced at events you have attended:	<p>Designing to avoid common event hazards</p> <p>DIMICE meta-analysis & RAMP analysis</p> <p>See also Q8– Crowd Catalysts. Some are evident in this hazard’s list</p>	<p>Rutherford-Silvers (2008); Getz (2005)</p> <p>Still (2015)</p> <p>See Q8</p>	
3	Questions 12-15	Crowd management strategies		

12	Five common methods of audience communication at events for different purposes are listed. Please select which ones you find to be helpful for the different event scenarios stated.	<p>On site communication (OSC) strategies for events: Onsite/sponsor promotion, signage, voice comms, event ops manual, digi comms (SMS, Twitter, web announcements), Info booths, visual / audio cues, on-site briefings, print – programmes, leaflets, newssheets</p> <p>5 specific methods of OSC: Verbal, non-verbal, written, visual, electronic</p> <p>Signage – 4 types: directional, operational, statutory, facilities-based</p> <p>Signage – must be clear: type of info, wording, material, size / material, well located</p> <p>Signage – also, unambiguous, readily recognisable (in addition to clear, concise, well-written)</p> <p>OSC strategies and methods, plus more depth on signage</p> <p><u>Also</u>, resilience strategies (website announcements post-crisis to rebuild audience confidence and assure them about how to behave and keep safe on site as well as what to expect (i.e., new / extended security procedures requiring early arrival)</p>	<p>O’Toole (2011)</p> <p>Watts (1998)</p> <p>O’Toole (2011)</p> <p>Berlonghi (1994)</p> <p>Abbot and Geddie (2001)</p> <p>NACTSO – see also Q19</p>
13	How effective are the following crowd management strategies used by events for event safety: 1. Metal detectors and bag searches i.e., for weapons, contraband (1)	<p>Crowd management strategies: Ample space around key nodes, avoid bottlenecks, adequate signage, disperse functional areas, block off no-go areas, staff to visitor assistance, separate vehicle, pedestrian movement, signs</p>	<p>Getz (2005)</p>

		<p>2. Alcohol policies i.e., Challenge 25, refusal to serve (2)</p> <p>3. Drug policies i.e., drug testing and awareness raising, stop and search, police dogs (3)</p> <p>4. Security and law enforcement i.e., ejection policies, crowd control, uniformed/plain clothed police presence, arrests (4)</p> <p>5. Communication to, from and around the site i.e., verbal (stewards and ushers, tannoy), digital (social media, email, website), and visual (big screens, signage) (5)</p> <p>6. Congestion avoidance (capacity management) i.e., multiple entrances, staggered entry times, allocated seating/standing zones, effective spacing of key facilities (bar, toilets, food areas, stages) (6)</p> <p>7. Crowd monitoring i.e., of queues / dense areas / hotspots, CCTV surveillance (7)</p> <p>8. Crowd dispersal i.e., in congested areas, end of event (8)</p> <p>9. Handling of emergency situations and procedures i.e., temporary show stops, evacuations, deployment of emergency services (9)</p>	<p>announcements to advise crowd of rules, visible on-site security, lighting/staff radios to increase security & avoid hazards, test all systems and exits, avoid crowd stressors (wait times, bottlenecks, etc)</p> <p>Barriers</p> <p>Optimise movement, reduce congestion, maximise use of space</p> <p>CM, CC and Communication, Signage, Ushering & Security, Event Conditions, Alcohol Issues</p> <p>CC – pre-planning to avoid hazards, plan for capacity crowds, crowd dispersal</p> <p>Pedestrian flow, optimum vs critical density guidelines/regs, Swiss Cheese & FIST models</p> <p>Capacity management strategies (density / congestion avoidance – links to monitoring and site planning techniques, DIM-ICE & RAMP</p> <p>OODA Loop, Situational Awareness, 3 main impacts on crowd: crowd density (ppm²), crowd flow, crowd mood</p> <p><i>Attendees must feel safe with presence of sufficient levels of security but not so overwhelmed that it has the opposite [negative] effect on audience experience</i></p> <p>Emergency incident checklist for event crowd management plans</p> <ul style="list-style-type: none"> ▪ Safe and swift evacuation 	<p>Selley (2004)</p> <p>Tum et al (2006)</p> <p>Abbot and Geddie (2001)</p> <p>Fruin (1993), Reason, in O’Toole (2020)</p> <p>Yeoman et al (2004), Rutherford-Silver (2008); Still (2013; 2022)</p> <p>Brehmer (2005; 2006), Endsley (1995); Martella et al (2017); O’Toole (2020)</p> <p>Tassiopoulos (2005)</p> <p>Tarlow (2002), Still (2013, 2022), O’Toole (2020)</p> <p>NACTSO (2017)</p> <p>Abbot and Geddie (2001)</p>
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			<ul style="list-style-type: none"> ▪ Strong communication and leadership with employees and guests during evacuation ▪ Effective communication according to emergency planning procedures ▪ (Immediately afterwards): <ul style="list-style-type: none"> ▪ visible police and security personnel ▪ high levels of lighting wherever possible to make people feel more secure ▪ public reassurance and proactivity in terms of looking out for suspicious activity ▪ vigilant checks on all sub-contractors, employees and volunteers ▪ review of CCTV footage to identify security breaches ▪ Crucial need for a recovery plan after the attack ▪ organised and orderly evacuation, show stop procedures ▪ Close collaboration with emergency services <p><u>CONCEPTUAL FRAMEWORK:</u> When developing event CM strategies, organisers must:</p> <ul style="list-style-type: none"> - profile of audience likely to attend - map against design, site / CM ops plan 	
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			- consider all potential safety triggers	
14	<p>Have you ever experienced a crowd safety incident at an event linked to one or more of the following factors</p> <p>Looking at:</p> <ul style="list-style-type: none"> - Ingress (pre-arrival and onto site) - Circulation (identification of hotspots on site) - Egress (off-site and outside venue) - Overcrowding and congestion - Nothing experienced 	<p>DIM ICE meta-analysis (design, information, management, ingress, circulation, egress)</p> <p>RAMP analysis (routes, areas, movement, profile)</p> <p>Pedestrian flow and density / congestion avoidance in circulation and ingress / egress</p> <p>People stop or slow down to orientate themselves when they enter a venue</p> <p>8 principles of waiting and their impact on behaviour (i.e., waits to exit, and unannounced or uninformed waits feel longer)</p> <p>Incidents caused by congestion and dense crowds – analysis of the Love Parade 2010</p>	<p>Still (2015)</p> <p>Fruin (1993); Still (2013;2022), HSE (2022); O’Toole (2020); Green Guide (2008)</p> <p>Tum et al (2006)</p> <p>Maister (1984) in Yeoman et al (2004) and Hoffman et al (2009)</p> <p>Helbing and Mukerji (2012)</p>	
15a	<p>If circulation selected, where did the incident occur?</p> <ul style="list-style-type: none"> - Bar area - Stage / main event area - Queues for facilities (toilets, food, merchandise) - Foyer 	Density and hotspot mapping	Still (2015)	
15b	<p>How well did you feel this incident was dealt with by the staff, organisers and emergency services?</p>	<p>Statements developed from review of crowd incidents (phase 1 of the research study) and from well documented incidents, common issues and resolutions</p> <p>Emergency incident checklist for event crowd management plans</p> <ul style="list-style-type: none"> ▪ Safe and swift evacuation ▪ Strong communication and leadership with employees and guests during evacuation 	<p>Historical content analysis of crowd incidents (PhD phase 1)</p> <p>i.e., Zhen et al (2008); Helbing and Mukerji (2012), Still (2015)</p> <p>Tarlow (2002)</p>	

			<ul style="list-style-type: none"> ▪ Effective communication according to emergency planning procedures ▪ (Immediately afterwards): <ul style="list-style-type: none"> ▪ visible police and security personnel ▪ high levels of lighting wherever possible to make people feel more secure ▪ public reassurance and proactivity in terms of looking out for suspicious activity ▪ vigilant checks on all sub-contractors, employees and volunteers ▪ review of CCTV footage to identify security breaches ▪ Crucial need for a recovery plan after the attack <p>Situational awareness analysis OODA loop Crisis management</p> <p>Response Activity Over Time: 1) Emergency services; 2) incident management; 3) Crisis management; 4) Business Continuity; 5) Recovery</p> <p>Crowd safety and risk management strategies utilised to protect against the threat of terror activities:</p>	<p>Endsley (1995); Martella et al (2017) Brehmer (2006) Still (2013; 2022); O’Toole (2020)</p> <p>NACTSO (2017)</p> <p>Adapted from FEMA (2001) in Rutherford-Silvers (2008: 134); Tarlow (2002)</p>
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			<ul style="list-style-type: none"> ▪ procedures for handling unattended packages or unauthorised parcel deliveries ▪ pre-event security sweeps of the site ▪ limiting concealment areas where weapons or perpetrators may be hidden, and ▪ employing appropriate admittance controls ▪ instructing staff not to discuss the incident with anyone (especially the media) ▪ practicing of evacuation procedures and crowd calming measures ▪ strong knowledge and communication of all escape routes ▪ stringent employee checks ▪ special security instructions for those working at front desks and points of ingress or egress <p>policies for dealing with secondary crises (e.g. breakout of fire after a bomb) are all imperative</p>	
4	Questions 16-20		Perceived fear & safety	
	16	How many of the following crowd behaviours have you (or those around you) experienced at the events you attend	<p>Rowdiness, aggression, fighting / violence</p> <p>Hooliganism (organised)</p> <p>Intoxication (alcohol or drugs)</p> <p>Sexual promiscuity, sexual assault</p> <p>Opportunistic vs organised crimes</p> <p>SEE ALSO THEORY LINKED TO Qs 5-7 around Behavioural profiles</p>	<p>(Berlonghi 1995); Rutherford Silvers (2008)</p> <p>Bladen et al (2012), BBC (</p> <p>Josiam et al (1998); Glassman et al (2007); Menaker and Chaney (2014); Verkooijen, de Vries and Nielsen (2007);</p> <p>Josiam et al (1998);</p>

				SEE ALSO THEORY LINKED TO Qs 5-7 around Behavioural profiles
17	Personal safety at events. Which statement applies to you	<p>RESILIENCE: Strong, self-reliant individuals as leaders – Social Unity Theory</p> <p>Plog’s Allocentric / Psychocentric behavioural model</p> <p>Sensation seeking behavioural scale</p> <p>Psychological crowd influencing factors – collective mindset, crowd contagion, leaders/followers, links to subculture and perceived norms, Deindividuation (loss of inhibitions, acceptance of new situation-specific norms, collective mindset)</p> <p><i>Crowding is a normal experience at events and density can impact experience / perception of crowding in either a positive or negative manner</i></p> <p>Crowding preferences:</p> <ul style="list-style-type: none"> - Crowding is perception based - Density is a physical actuality - Both relate to personal space preferences - Preference varies (enviro / social / cultural factors) - Density can intensify positive or negative magnitude of whatever is occurring (e.g. increase pleasure or dissatisfaction) <p>Negative crowding:</p> <p>Social density vs Spatial density – actual no. of people in a space (i.e., queues, bottlenecks, ingress/egress time) vs amount of space per person (poor visibility,</p>	<p>Blackman (2008)</p> <p>Plog (1991)</p> <p>Eachus (2004)</p> <p>Classical view of crowds: Le Bon (2003); Borch, (2006), Berlonghi (1995), Tarde (1968); Hoggett and Stott (2010); Blackman (2008)</p> <p>(Fruin 1984)</p> <p>Rutherford-Silvers (2008:248)</p> <p>Mehta (2013)</p> <p>Manning (1999)</p> <p>Eroglu et al (2005)</p> <p>Tarrant et al (1997)</p> <p>Q8, Q9</p>	

			<p>pushing/shoving, fighting, trampling, suffocation/asphyxiation)</p> <p>Crowding is said to occur if a certain density is seen as negative from a visitor perspective</p> <ul style="list-style-type: none"> - Occurs due to large volumes of people in confined spaces - When behaviour of other individuals interferes with an individual's own goals, norms or experiences <p>LINKS TO CROWD CATALYSTS AND IMPORTANCE OF THE EVENT ENVIRONMENT</p> <p>I.E. Queuing with long waits (pushing / queue jumping), Poor visibility, Cramped conditions, other factors linked to large no. of people at events</p>	
18	Do you think the Covid 19 Coronavirus pandemic will change your attitude towards being in crowded spaces at events in the future once we are able to begin attending events again?	<p>Perceived fear influences:</p> <p>Social density vs Spatial density – actual no. of people in a space (i.e., queues, bottlenecks, ingress/egress time) vs amount of space per person (poor visibility, pushing/shoving, fighting, trampling, suffocation/asphyxiation)</p> <p>Crowding is said to occur if a certain density is seen as negative from a visitor perspective</p> <ul style="list-style-type: none"> - Occurs due to large volumes of people in confined spaces - When behaviour of other individuals interferes with an 	Mehta (2013) and theory linked to Qs 5, 7, 8, 9, 10, 13 & 17	

			individual's own goals, norms or experiences	
19	<p>To what extent would the following factors influence your feelings, attitudes and behaviour towards events you consider attending in future?</p> <p>For each factor listed below, please determine the influence it will likely have on your attitude towards attending an event:</p> <p><u>-positive, no impact, or negative</u></p>	<p>Perceived fear influences:</p> <p>Social density vs Spatial density – actual no. of people in a space (i.e., queues, bottlenecks, ingress/egress time) vs amount of space per person (poor visibility, pushing/shoving, fighting, trampling, suffocation/asphyxiation)</p> <p>Crowding is said to occur if a certain density is seen as negative from a visitor perspective</p> <ul style="list-style-type: none"> - Occurs due to large volumes of people in confined spaces - When behaviour of other individuals interferes with an individual's own goals, norms or experiences <p><i>Attendees must feel safe with the presence of sufficient levels of security but not so overwhelmed that it has the opposite [negative] effect on audience experience</i></p> <p>Visible security needed but important it doesn't intervene with audience experience to maintain satisfaction</p> <p>Understanding risk perception enables organisers to gain perspective on how individuals interpret threats to their own security</p> <p>Reduced / alleviated negative perceptions = more attendees</p> <p>Low risk perception is linked to strong event satisfaction</p>	<p>Manning (1999)</p> <p>Eroglu et al (2005)</p> <p>Tarrant et al (1997)</p> <p>Tassiopoulos (2005)</p> <p>Boyle & Haggerty (2009)</p> <p>Inns (2004)</p> <p>Ferreira and Harmse (2012)</p> <p>Taylor & Toohey (2007)</p> <p>Jewkes (2010); Ferreira & Harmse (2012)</p>	

			<p>Media influences risk perception and fear of crime – lowers attendance and causes financial and reputational damage for events</p> <p>Media can highlight positive event and destination aspects to encourage visitation and repeat visitation</p> <p>Terrorism is a contributing factor to perceived fear</p> <p>Terrorism can affect the decision-making process</p> <p>Certain destinations avoided due to perception of their ‘high risk’</p> <ul style="list-style-type: none"> ▪ Either due to previous attacks or political instability ▪ Fear diminishes over time <p>Information searching is a key part of the decision-making process regarding perceptions of safety to travel (i.e., online reviews, word of mouth)</p> <p>Commonly used resilience strategies (website announcements post-crisis to rebuild audience confidence and assure them about how to behave and keep safe on site as well as what to expect (i.e., new / extended security procedures requiring early arrival)</p> <p>Response Activity Over Time:</p> <ol style="list-style-type: none"> 2) Emergency services; 2) incident management; 3) Crisis management; 4) Business Continuity; 5) Recovery 	<p>Cianfrone and Zhang (2006); Roche (2006)</p> <p>Baker and Coulter (2007)</p> <p>Sonmez & Graefe (1998)</p> <p>Altheide (2006)</p> <p>Getz (2005)</p> <p>Sonmez & Graefe (1998)</p> <p>NACTSO Crowded Spaces Guidance (2017)</p> <p>Grimm & Needham (2012); NACTSO (2017)</p> <p>(Houlihan and Giulianotti 2012)</p>
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			<p>Security information updates posted on event websites - Allows consumer to see for themselves the quality of the security effort in place and ways to avoid becoming a target LINKS TO INCIDENT & CRISIS MNGMT, BUSINESS CONTINUITY & RECOVERY - NACTSO</p> <p>PR Strategies and Security go hand in hand for high profile events with a high perceived risk of terror attack or crime</p> <p>Example: London Olympics 2012</p> <ul style="list-style-type: none"> ▪ Perceived as a terror threat ▪ PR strategy – security not just stewards and police but also British armed forces ▪ Cost – estimated £9.3bn ▪ In total, 40000 individuals were part of security detail ▪ PR&SECURITY LINKS TO EMERGENCY SERVICES, CONTINUITY PLANNING - NACTSO <p>Reference to Manchester Arena crisis management and recovery continuity strategy:</p> <p>- security info on website for future events (Links to NACTSO business continuity and recovery)</p> <p>- expectation management – advice from the Peace Foundation (Links to NACTSO Crises Management):</p> <p><i>“The foyer is only going to be open to ticketholders, and it’s important to stress, to manage expectations, that it’s going to look</i></p>	<p>NACTSO (2017)</p> <p>Manchester Arena (2019); NACTSO (2017)</p> <p>Manchester Evening News (2017)</p> <p>Adapted from FEMA (2001) in Rutherford-Silvers (2008: 134); Tarlow (2002)</p> <p>Also, Still (2013; 2022), NaCTSO (2017)</p>
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			<p><i>very different.....It's a working area, a ticket area, there will be 5,000 people passing through it. It's been renovated to make it look bright and celebrate what the Arena's all about.....It doesn't yet contain anything like a memorial, the floor's been repaired, but the roof has not been, therefore there's no natural light, and there will be special lighting grids in place to ensure it's bright."</i></p> <p>Crowd safety and risk management strategies utilised to protect against the threat of terror activities:</p> <ul style="list-style-type: none"> ▪ procedures for handling unattended packages or unauthorised parcel deliveries ▪ pre-event security sweeps of the site ▪ limiting concealment areas where weapons or perpetrators may be hidden, and ▪ employing appropriate admittance controls ▪ instructing staff not to discuss the incident with anyone (especially the media) ▪ practicing of evacuation procedures and crowd calming measures ▪ strong knowledge and communication of all escape routes ▪ stringent employee checks ▪ special security instructions for those working at front desks and points of ingress or egress 	<p>Manchester Evening News Online (2017)</p> <p>Sonmez & Graeffe (1998)</p>
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			<ul style="list-style-type: none"> ▪ policies for dealing with secondary crises (e.g. breakout of fire after a bomb) are all imperative <p><i>RESILIENCE: "Some people affected by the Manchester Arena bomb blast have said they'll never set foot in the venue again... Others say they won't give in to fear, and that returning to the Arena is a mark of respect."</i></p> <p>Perceived risk and decision making for attending events</p>	
	20	<p>Coronavirus (Covid-19) specifically</p> <p>On a scale of 1-10 (where 1 is No Influence At All and 10 is Extremely Strong Influence), how much has the recent coronavirus global crisis influenced...</p> <p>Your personal fear for safety at events in the future</p>	<p>LINKS TO Q18 THEORY</p> <p>Understanding risk perception enables event organisers to gain perspective on how individuals interpret threats to their own security</p> <p>LINKS TO</p> <ul style="list-style-type: none"> -experience economy -audience perceptions of safety information -audience perceptions of relationship between event safety and security, and experience. <p>Allows organisers to know how to best communicate with the audience about the safety of their event</p> <p>Reduced / alleviated negative perceptions = more attendees</p>	<p>Mehta (2013) and theory linked to Qs 5, 7, 8, 9, 10, 13 & 17</p> <p>Inns (2004)</p> <p>Pine and Gilmore (2011)</p> <p>Rutherford-silvers (1998), Tarlow (2002), Plog (1991);</p> <p>Tassiopoulos (2005), Boyle and Haggarty (2009)</p> <p>Ferreira and Harmse (2012)</p>
5	Questions 21-24		Demographic Variables for Profiling	

21	How old are you?	<p>Social Unity Theory – youth are perceived to be followers, in modern era, for example at music festivals</p> <p>Youth crowds and substance (drug) abuse – if identify with the pop, skate/hip-hop, techno and hippie subcultures</p> <p>Youth crowds and sensation seeking motives: hedonistic tendencies and seeking party atmospheres</p> <p>Mosh pit phenomenon and missile throwing at music events associated with youth market</p> <p>Youth crowds and alcohol abuse / related crowd issues</p> <p>Youth market and deviance</p>	<p>Blackman 2008 and Raj & Walters 2004</p> <p>Verkooijen, de Vries and Nielsen (2007); Josiam et al (1998)</p> <p>Lepp and Gibson (2008); Tarlow (2002)</p> <p>Kemp et al (2007)</p> <p>Glassman et al (2007); Ryan, Robertson & Page (1996), Menaker and Chaney (2014); Smith & Foxcroft (2009)</p> <p>Kelly (1993); Josiam et al (2008)</p>
22	Gender	<p>Social Unity Theory – Blackman discussed the work of Le Bon and Tarde, who theorised that those who were found to be self-reliant, strong in their convictions and individual were perceived to have leadership qualities whilst women were perceived to be followers</p>	<p>Blackman (2008)</p>
23	Please select the option that most applies to where you live	<p>Schools of thought underpinning the way crowds behave:</p> <p>Psychological influencing factors – collective mindset, crowd contagion, leaders/followers, links to subculture and perceived norms, Deindividuation (loss of inhibitions, acceptance of new situation-specific norms, collective mindset)</p> <p>Proximity factors – unified behaviour begins to occur in situations of close proximity and there is acceptance of loss of personal space</p>	<p>Classical view:</p> <p>Le Bon (2003); Borch, (2006), Berlonghi (1995), Tarde (1968); Hoggett and Stott (2010); Blackman (2008)</p> <p>Contemporary view:</p> <p>Canetti (1973)</p> <p>Plog (1991); Eachus (2004)</p>

			<p>in crowded situations (i.e., city living / urbanised areas).</p> <p>Links to Plog's personality type scale – psychocentric (more fearful, cautious, risk averse, measured behavioural characteristics) to allocentric (fearless, risk-taking, thrill-seeking, prone to boredom behavioural characteristics)</p> <p>Crowding preferences:</p> <ul style="list-style-type: none"> - Crowding is perception based - Density is a physical actuality - Both relate to personal space preferences - Preference varies (enviro / social / cultural factors) - Density can intensify positive or negative magnitude of whatever is occurring (e.g. increase pleasure or dissatisfaction) <p>SO, size of hometown could impact on acceptance / tolerance of crowded situations and exhibited situation (event) specific crowd behaviour norms. Those from cities may be:</p> <ul style="list-style-type: none"> - more tolerant of crowded situations and - less fearful/cautious of the loss of their personal space and of the issues that being in densely crowded spaces can create <p>Due to their daily environment and social factors.</p>	Rutherford-Silvers (2008: 248)
	24 24a	Which best describes the occupation of the principal income earner in your household	Categories taken from the Standard Occupation Classifications 2010 SOC2010 version 5, August 2016	https://www.ons.gov.uk/methodology/classificationsandstandards/standardoccupationalclassificationsoc/soc2010/soc2010volume2thestructureandcodingindex https://www.ons.gov.uk/methodology/

		Please provide the occupation of the main income earner	ALSO, LINKS TO THE NS-SEC – National Statistics Social Economic Classification based on the SOC2010	classificationsandstandards/otherclassifications/the-nationalstatistics-socioeconomicclassificationnssec-basedonsoc2010
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Appendix 4: Consideration of cluster and factor analysis

Cluster analysis was considered for implementation to group objects from the participant cohort (e.g. respondents, products, other entities) on the user characteristics they possess to exhibit high internal (within cluster) homogeneity and high external (between cluster) heterogeneity (Hair, Black, Babin and Anderson 2014); the purpose of this process is typology construction and if successful, the objects within clusters will be in close proximity when plotted, whilst different clusters will be far apart. However, it was also noted that the researcher must have a strong conceptual rationale for why certain groups exist and what variables logically explain why objects end up in the groups that they do, as the technique is exploratory in nature and considered more dependent on the measures used to characterize the objects than other techniques and thus, not generalizable (Hair et al 2014). To overcome this limitation, the secondary data informing the literature review, conceptual framework and also the crowd incident database analysis in phase one of the primary research were identified to be utilised to aid in the categorisation of objects to clusters, strengthening the robustness of the cluster rationale via triangulation through a variety of data sources, methods and perspectives to study and interpret the problem (Finn et al., 2000).

As the analysis phase progressed, to enable some questions within the dataset to be used for chi-square test analysis, this resulted in a need to recode and break down the nominal categorical variables into a series of binary or dichotomous one-hot (i.e., present, not present) variables. The result of this process was an extremely large number of variables in some cases, with nine attached to one question or overarching variable alone. This presented the need for data reduction (factor analysis) to be conducted before cluster analysis could be completed as otherwise there would be too many variables for the cluster analysis phase, which would make the data difficult to manage. The variables from the dataset were therefore grouped according to the conceptual framework, and findings from the qualitative analysis and descriptive plus chi square test analysis, whereby certain connections between variables were identified. All ordinal, continuous and binary, dichotomous variables within the dataset were therefore indexed according to their similar features (A4, Table 1 below).

A4, Table 1: Index of clustered variables for analysis by event, music and sports type

Category of Variable	Variable cluster	Variables	Data Type
Environment, site and CM	Safety incidents	Contribution to crowd incidents	Binary
		Hazards experienced	Binary
		Safety incidents	Binary
		How incident was dealt with	Ordinal
	CM strategies	Site design influences	Binary
		Most helpful communications	Binary
		Effectiveness of CM approaches	Ordinal
Behavioural profile	Reasons for attending	Prioritised safety measures	Binary
		Attendance motivators	Binary
		Preferred event scale	Ordinal
		Preferred event type	Binary
		Preferred music type	Binary
	Preferred sports type	Binary	
	Explanations of behaviours	Important factors for attendance	Ordinal
		Fan club member	Binary
		Visit frequency	Ordinal
		Age	Cardinal / continuous
Associated behaviours		Binary	
Perceived risk to safety	Behaviours experienced	Contribution to crowd incidents (behaviour)	Binary
		Personal safety in crowds	Ordinal
	Attendance influencers	Ordinal	
	C-19 impact on future attendance	Ordinal	

(NB: Incident location, gender, C-19 attitudinal change towards crowds, residence and occupation were removed as these were all nominal variables and not in any way ordinal, thus not appropriate for factor or cluster analysis).

Factor analysis was then completed on these five identified variable groupings (example for *reasons affecting attendance* is provided in A4, Table 2 below). However, whilst four significant underlying factors were found to underpin a range of the variables within this group, some of the key variables linked to the objectives of the study from this variable grouping (i.e., event scale and those linked to nuances in event, music and sports type) were significantly under-represented in the final identified factors due to the scale reliability scores associated with the Cronbach's alpha coefficient falling below the accepted cut off of .7. Thus, these key variables to the study objectives would not be taken forward as variables for testing through cluster analysis, as they cannot be reduced into more meaningful groups, which arguably would result in a data gap linked to the attendee profile objectives. This lack of fit for the study parameters linked to the data reduction exercise outcome and its meaningfulness to the study aims resulted in the decision *not* to progress with the cluster analysis process for the purpose of this study.

A4, Table 2: Factor analysis: Reasons affecting attendance

Reasons affecting attendance	Factor 1 Importance for attendance	Factor 2 Sports and team support	Factor 3 visible / communicated safety procedures	Factor 4 Negative publicity – crimes and attacks
Clear signage	.834			
Organised movement	.801			
Emergency situation	.793			
Space to move freely	.749			
Staff, law and audience relationship	.705			
Surroundings	.499			
The weather	.420			
Preferred sport event - cricket		.727		
Preferred sport event - football		.604		
Attendance motivators - Supporting a team / act / individual		.487		
Attendance influencers – Visible emergency procedures			-.822	
Attendance influencers – Visible security			-.795	
Attendance influencers – More security			-.738	
Attendance influencers – H&S Info on website			-.715	
Attendance influencers – Press releases and public comms			-.636	
Attendance influencers – WOM / online reviews			-.360	
Attendance influencers – Crime coverage				.801
Attendance influencers – Terror coverage				.788
Cronbach's alpha coefficient	.816	.679	.798 or .815 with WOM/online reviews removed	.722

The exercise of *attendee profiling of behaviour, impact and risk* in line with the study objectives has therefore instead been based on the high volume of significant chi-square test associations uncovered within the dataset (988) as well as the earlier descriptive quantitative findings and also those which emerged from the qualitative data analysis as well. These emerging findings linked to profile, impact and risk are discussed and presented in Chapter 8.

Appendix 5: Confirmation of ethical approval letter



Date: 20 December 2018

Dear Kristin,

Ethical Approval Application No: FREIC1819.09
Title: Crowd Dynamics and Managing Audience Safety at Events

Thank you for your application to the Faculty Research Ethics & Integrity Committee (FREIC) seeking ethical approval for your proposed research.

The committee has considered your application and is fully satisfied that the project complies with Plymouth University's ethical standards for research involving human participants.

Approval is for the duration of the project. However, please resubmit your application to the committee if the information provided in the form alters or is likely to alter significantly.

The FREIC members wish you every success with your research.

Yours sincerely
(*Sent as email attachment*)

Dr James Benhin
Chair
Faculty Research Ethics & Integrity Committee
Faculty of Business

Appendix 6: Crowd incident database headline content analysis findings

Table 1 - Incident issue and cause, observations by country p. 301

Table 2 - Event scale and event type by incident, fatalities and injured p. 304

Table 3 - Event scale, type, location and incident against incident analysis models p. 307

Table 4 - Incident association with crowd risk analysis factors p. 310

A6, Table 1: Crowd Incident Database Headline Content Analysis Findings – Incident issue and cause, observations by country

Country of Incident by Issue and Its Cause					Observations by Country		
					Positive (+)	Negative (-)	Pos&Neg (+/-)
Country	No.	Issue	Cause / Trigger	No.			
UK	29	Crowd crush	Density (congestion, capacity)	5	<p>Behavioural causes were observed as trigger for the vast majority of UK incidents; most were (-) behaviours (drugs use, rivalry, aggression, rule avoidance, pushing and rushing). A few were positive (helping others, excitement).</p> <p>Crowd crushes were fairly common, typically due to peak congestion at ingress or egress.</p> <p>Weather and bombings were also triggers for several incidents each.</p>		
		Drugs use	Behaviour (deviance, criminality)	5			
England	26	Riots	Behaviour (violence, looting)	4			
N. Ireland	0	Terror attack	Bombings	4			
Wales	1	Crowd surge / push	Behaviour (pushing, rushing)	4			
Scotland	2	Gangs and mobs	Behaviour (rivalry, subculture, football)	3			
		Heavy crowd control	Behaviour (crowd disorder, aggression)	3			
		Weather / cancellation	Weather (storms, heavy winds, structure issues)	3			
		Poor social distancing	Behaviour (crowds, Covid)	2			
		Show stop	Behaviour (crowd illness)	1			
		Fire	Behaviour (smoking in stands)	1			
		Moshing (earth tremors)	Behaviour (revellous, expressive, dancing)	1			
USA	10	Weather / evacuations	Big storms, structural collapse, organiser error	3			
		Terror	Mass shooting (lone wolf), bombing	2			
		Sex assault	Behaviour (Deviance, criminality)	2			
		Riots	Behaviour (riots, protest, subculture)	1			
		Moshing (crowd death)	Behaviour (Expressive, subculture)	1			
		Pushing / surge	Behaviour (panic, fear, fleeing)	1			
France	4	Terror	Bombing, mass shooting, vehicle	2	<p>Attacks were most cited trigger – mixed methods. Structural collapse, behaviour (-) & weather noted too</p>		
		Pushing / surge	Behaviour (panic, fear, fleeing)	1			
		Structural collapse	Weather (bad storm)	1			
Germany	3	Terror	Vehicle, bombing	2	<p>Attacks were most cited issue. Crush (Density & organiser error) noted too</p>		
		Crowd crush	Density (congestion, capacity), organiser error	1			
Italy	2	Trampling / surge	Behaviour (panic, fear, fleeing)	2	<p>Behavioural (-) causes alone were cited (crowd as victim <u>or</u> offender)</p>		
		Mob crowd violence	Behaviour (rivalry, subculture, football)	1			
Belgium	2	Crowd crush	Behaviour (pushing, rushing), Weather (storm)	1	<p>Crush as sole issue. Behaviour (-), weather, density were noted causes</p>		
		Crowd crush	Density (congestion, capacity)	1			
	2						

Japan		Moshing (structure issue) Crush, trampling / surge	Behaviour (revellous, expressive) Density (capacity) behaviour (panic, fear, flee)	1 1	Behavioural (+/-) (i.e. revelry, panic). Crush, density & trampling also.
Sweden	1	Sex assault	Behaviour (Deviance, criminality)	1	Behavioural (-) cause; deviance.
Norway	1	Terror	Mass shooting, Bombing, lone wolf	1	Attack on crowds; mixed methods.
Denmark	1	Crowd crush	Behaviour (pushing, rushing), Weather (storm)	1	Behavioural (-), crush & weather
ROI	1	Drugs	Behaviour (deviance, subculture)	1	Behavioural (-) ; deviance / drugs
Poland	1	Structural collapse	Weather (heavy snow)	1	Structural collapse; Weather cause
Croatia	1	Fire (evacuation)	Natural (forest fire, weather - high winds)	1	Fire with Weather as sole trigger.
Russia	1	Crowd surge / fleeing	Behaviour (pushing, escaping rain)	1	Behavioural (-) ; fleeing & pushing
Ukraine	1	Air crash / fatalities	Event-specific, crowds close to flight path	1	Event-specific & organiser error.
Brazil	1	Fire / crush, trampling	Behaviour (performer error, pushing), site safety	1	Behavioural (-) & organiser error
Guatemala	1	Crowd surge	Density, behaviour (crowd excitement, pushing)	1	Behaviour (+) & Density causes.
S. Arabia	2	Crowd crush	Density (congestion, capacity, contraflow)	2	Crush; Density sole cited trigger.
S. Africa	1	Crowd surge	Density, behaviour (crowd excitement, pushing)	1	Behaviour (+) & Density causes.
S. Korea	1	Dancing (structural issue)	Behaviour (Fans, excitement), error - safety regs	1	Behaviour (+) & organiser error
Australia	1	Stadium flood	Weather (heavy rain)	1	Weather noted as sole trigger.

Headline Findings (Overleaf)

Behavioural causes (-); most prevalent cause overall. Mentioned 37 times. They were cited as triggering a range of incidents including drugs use, riots, gangs and mobs, crowd surges, crushes and trappings, sex attacks and poor social distancing. Pushing, panic, deviance & criminality, cultural identification, rushing & fleeing, rule avoidance were all mentioned multiple times. Rivalry was also noted as a cause of the issue on two occasions (both were associated with football matches).

Crowd surges sometimes cited as **trappings** were observed in 13 incidents. Most often these were caused by pushing and rushing either to ingress or egress, or panic, fear and / or fleeing from something. Occasionally these incidents were caused by audience over-excitement and pushing. **Crowd crushes** were listed

as a prevalent issue, mentioned in 11 incidents. Incidents were primarily due to problems associated with critical density (i.e., congestion & capacity), but also often behavioural causes (-) including pushing, rushing and occasionally, organiser error.

Behavioural causes (+); Mentioned as incident trigger 6 times. Themes included empathy for others (helping), subcultural identity, excitement, revelry & moshing.

Terror attacks were cited as issues in 5 different countries, often with multiple attacks. Bombings were cited most often across countries. However, some differences in mode of attack by country were evident. Vehicular attacks on crowds were linked to European attacks, bombings were solely noted in UK attacks whilst shootings were not noted at all in UK attacks, though were cited in USA and European countries.

Drugs use was noted as an incident issue on 6 occasions and primarily linked to behavioural traits such as subcultural identity (often dance event-related) and deviance.

Riots and protests were noted as crowd incidents on 5 occasions mainly linked to behavioural traits such as subcultural identity protest, violence, and looting

Gang and mob behaviour was noted in both the UK (3 occasions) and Italy (1 occasion). Associated traits included rivalry, subcultural identity and violence. All were football-related as were the incidents attributed **to heavy crowd control tactics**.

Moshing and dancing was a behavioural trait noticed as an issue that caused several incidents within the database. Never bad-intentioned, it was found to contribute to structural failings (mentioned 2 times), earth tremors and even death (mentioned once each).

Fire; whilst only acknowledged as an issue and contributing factor for three incidents listed, only one was cited to be a natural cause linked to evacuation. For two of these incidents, malpractice was recognised; rule avoidance (smoking in wooden stadium stands) and indoor pyrotechnics as well as poor safety procedures during evacuation.

Weather. Cited as an incident cause or contributing factor across many countries (cited 11 times). Predominantly recognised to be a natural event catalyst (predominantly storms and high winds), forcing cancellations and event evacuations. Occasionally, organiser error is cited as playing a part in some of these incidents, namely mismanagement of emergency and evacuation procedures. So too, on occasion, was its contribution to crowd crushes and structural collapses (mentioned at least twice each).

Deviant and criminal behaviour; associated themes linked to this factor included (all on more than one occasion each) drugs usage, sexual assaults, gangs and mob violence, riots and terror attacks. This factor considers the audience as the offender and perpetrator.

Structural collapse; mentioned as an issue in 5 crowd incidents, structural collapse was primarily associated with weather factors (high winds) but also linked to fan behaviour on two occasions (dancing, moshing and excitement).

Density; mentioned 12 times, density was a contributing factor in multiple crowd incidents cited. Predominantly this was linked to congestion and full or over-capacity pedestrian flow at peak times around nodes, ingress or egress points.

Organiser error; this was cited in 7 incidents in overall. Themes included poor evacuation and emergency procedures (failure to act) or poor site planning and crowd management procedures in hazardous situations (i.e., in relation to weather, fire, structures). In one case (an air show crash), crowds too close to the flight zone was also mentioned.

A6 Table 2: Crowd Incident Database Headline Findings: Event scale and event type by incident, fatalities and injured

Event Scale	No.	Event Type (linked to scale)	Location (Indoor vs Outdoor)	No. Fatalities by Event Scale	No. Injured by Event Scale	Incident Type (linked to event scale fatalities and injured findings in adjacent columns)
Local Local to a town or city	12	5 music 2 sports 2 cultural events 2 business (indoor) 1 Political 7 indoors, 5 outdoors	All indoor Both indoor Both outdoor Both indoor Outdoor	21, 0, 2, 245, 6 0, 0 77, 12 65, 0 69	50, 60, 1, 200, 52 0, 0 543, 56 170, 0 66	Nightclub (4). Crush, surge, trample (4) fire, egress (1) Football. Hostile crowd / crowd control (2). Local derbies. Air crash (1) Vehicle terror attack (1). Structural collapse, weather (1). Organiser error (1) Terror attack, lone wolf, bombing & shooting (1) Slightly more incidents indoors than out.
Regional (Within region)	11	5 music (3 in, 2 out) 3 sports (in) 2 political (out) 1 culture (out) 6 indoors, 5 outdoors	More in than out All indoor Both outdoor Outdoor More in than out	54, 16, 2, 0, 1 56, 0, 0 0, 5 10	150, 11, 13, 2, 0 265, 0, 0 7, 16 100	Behaviour (5). Deviant (3: 2 drugs, 1 sex); surge, structure (1) All stadiums (3). Weather (2). Fire (1) - rule avoidance / safety Both protests / riots (2). Violence, looting, criminal damage. Celebration on bridge (1). Crush, poor capacity / egress mgmt All drug / riot issues at outdoor events. All stadiums for sports
Hallmark (Place synonymous with name)	3	2 sports (out) 1 music (out) Both outdoor	Outdoor Outdoor Both outdoor	0 0	0 1	Behaviour (-) – rule avoidance, dense crowds (1) fighting (1) Behaviour (+) - showstop; ill crowd member, empathy (1) All behavioural causes (1 positive, 2 negative), both outdoor
Major	40	21 music (15 out , 6 in) 15 sports (5 out, 10 in) 2 political (1 out, 1 in) 2 culture (out)	Vast majority out Majority were in No difference Outdoor	11,2,0,9,11,21 ,7,5,0,0,0,22, 0,59,0,0,0,0,1, 0,0 39,96,18,83,0, 43, 3, 0, 0,130 0, 0, 0, 0, 0, 0	26,0,0,26,60,5 50,50,140,0,1, 0,800,0,527,0, 0,0,0,0, 0 600,?, 2300 ,18 0,0, ?, 264, 0, 0, 494 1527 , 0, 5, 0,1 50, 31 50, 0, 450 ?, ?	Rock: surge (2), crush (1), moshing (1) Hip Hop: riot (1), fire (1) Pop: weather (1) terror (1) EDM: Drug (2) crush (1) moshing (1) Mixed: weather (3), structure (1), sex assault (1), moshing (1) Indie: density (1) Country: structure (1), weather (1), terror (1) Football: crush (4), surge (3), deviance (2 – hostile, revelry), structure, terror (1) Horse racing: terror (1) Marathon: terror (2). US Football: weather (1) Both terror (2): party conference, military ceremony, bombings Terror (2 vehicle, bombing) Ceremonies (military, celebration).

Mega		2 culture (out) 41 (24 out, 18 in)	Outdoor Majority outdoor	1426, 2431		Crowd crush, trampling, peak flow density (2). Large majority of music incidents outdoors, but sports, indoors
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Headline Findings:

At the local level, nightclubs were the most common location for music incidents, typically linked to crushes, surges and trappings on egress. Sports events centred on hostility at derby-based football matches. Terror attacks were observed twice at this level, at political and cultural events. Slightly more indoor than outdoor incidents too. Local sports incidents recorded no injuries or fatalities, whilst all other types generated significant numbers of injuries and fatalities; these mainly linked to evacuating or escaping indoor venues (nightclubs) via capacity and egress issues, terror attacks & other event-specific triggers such as fire, structure collapse, weather. The highest death toll was seen at a music event (indoor nightclub fire and trampling) whilst the highest injury tolls were seen at the air crash, nightclub fire & structure collapse respectively.

At regional level, behavioural causes were responsible for the majority of incidents across types of events. Specifically, deviance (drugs, sexual attacks, violence and criminal damage as well as rule avoidance were prominent in incidents of this scale). Music and political incidents noted the most behavioural triggers. Also noteworthy when consulting the database is that all drug / riot issues were noted at outdoor events, but for sports, all incidents were recorded in stadiums. Political events saw the least fatalities and injuries at the regional level. When reviewing the database, crowd surges, crushes and the weather were most attributed to high no's of casualties. At this level, the number of injured was considerably higher than the number of fatalities in all cases across all genres; the three incidents with the highest injury tolls were linked to a fire inside the stands at a football match, a crowd surge / trampling after a music event, and a crowd crush at a cultural celebration on a bridge respectively.

For hallmark events, only three appeared in the database however, likely due to their scale, all were outdoor events and triggered by behavioural causes; two incidents (both sports events) exhibited negative crowd behaviours (rule / public safety guidance avoidance, fighting) and one exhibited positive behaviour in the way of empathy for others and compliance). Almost no injuries or fatalities were recorded at incidents of this scale.

At the major / mega event level, this scale of event was most heavily documented in the database, arguably suggesting that as scale increases, so too does event risk. The majority of incidents at this level occurred at outdoor events (for music and cultural events; for sports, the majority took place in stadiums). Specific incident and trigger types were observed to potentially be linked to certain types of events, namely:

- Moshing / headbanging behaviour at rock & outdoor festivals
- Drugs usage was associated with **EDM events**
- Crowd surges & crushes were observed at **rock, EDM, football, and cultural events**
- Terror attacks were mainly linked to **outdoor events** (6 outdoor vs 3 indoor) at **pop (in), country, horse racing, marathons, political (1 in), & cultural events (1 in)**
- Weather & fire triggers were mainly linked to **music events (pop, hiphop, mixed, country)** and **US football**
- Deviant behaviours (drugs use, rioting, sexual assault, pitch invasions, hostility and violence) were noted at **EDM, mixed, hiphop, and football events**
- Structural failings were observed at **mixed genre & country music events** as well as **football events**

Also at this major event level, approximately half of the music and sports incidents cited within the database recorded fatalities and injuries. Of these, sports events recorded higher death tolls (terror attack, crowd surge, & crush respectively), whilst both music and sports incidents recorded high no's of injured; for music events these were due to terror attacks and a crowd crush respectively) and for sports, these were due to a structural collapse, crowd surge /trampling and terror attack respectively.

By far the deadliest incidents occurred in Mecca, Saudi Arabia (the only two cited mega events) during a religious ceremony (crowd crush incidents during the Hajj annual pilgrimage event; one occurred as worshippers were egressing the site through a large tunnel that became over congested and triggered a crowd crush. The other was as two key routes to the Jamarat Bridge met causing critical density and a crowd crush. Extremely high numbers of injured (c.500 or more) were seen at several major music events (crowd crush,1, and terror attacks, 2) and sports events too (structural collapse, crowd surge /trampling and terror attack respectively).

Overall in terms of death tolls, indoor events were most impacted by high density, poor evacuation and egress issues leading to crushes, surges, trampling's and asphyxiation as well as terror attacks. Outdoor event fatalities were most impacted by poor capacity management leading to critical density, crushes and surges, and terror attacks. Examining the numbers of injured per incident, crowd crushes and surges featured heavily at both outdoor and indoor events of all scales; for outdoor events this often involved ingress or egress through a node however (i.e. tunnel or gate) or weather triggering crowds to run for cover. Structural collapses and terror attacks were also linked to high no's of injured in events of more than one scale. Finally, behavioural triggers also featured in incidents across events of all scales (predominantly links to sports and music events, though it should also be noted these event types occurred most frequently within the crowd incident database). **The observed most high-risk incident types and triggers overall were:**

- Indoors: **High density, poor evacuation and egress procedures** leading to **crushes, surges, trampling's and asphyxiation**
- Outdoors: **poor capacity management** leading to **critical density, crushes and surges**, as well as **terror attacks**
- **Crowd crushes and surges** featured heavily in number of injured attendees at **both indoor and outdoor events** for **events of all scales**
- Most frequently, this was linked to **ingress/egress through a node** or **weather triggering crowds to run for cover**. **Structural collapse and terror attacks** were also linked to higher number of injuries for events across more than one scale
- **Behavioural causes (deviant and expressive but unsafe behaviours such as moshing, pushing)** were featured heavily in documented incidents across all scales. These were most prevalent in certain types of music & sports events, though the database contained higher no's of music & sports incidents than other genres

A6, Table 3: Crowd Incident Database Headline Findings: Event scale, type, location and incident against incident analysis models

Event Scale	No.	Event Type (linked to scale)	Location (Indoor vs Outdoor)	FIST Force, Info, Space, Time Fruin 1993	Situation Awareness Endsley 1995	Incident Type (linked to event scale, type and location columns) Shaded = demonstration of some situation awareness	
Local Local to a town or city	12	5 music 2 sports 2 cultural events 2 business (indoor) 1 Political	All indoor Both indoor Both outdoor Both indoor Outdoor	Prevalence order		No Yes No Partial No	Nightclub (4). Crush, surge, trample (4) fire, egress (1) Football. Hostile crowd / crowd control (2). Local derbies. Air crash (1) Vehicle terror attack (1). Structural collapse, weather (1). Organiser error (1) Terror attack, lone wolf, bombing & shooting (1)
				F.I.S.T. F.S. S.T. I.S. S.T.	Space, time, force/info		
Regional	11	5 music (3 in, 2 out) 3 sports (in) 2 political (out) 1 culture (out)	More indoor All indoor Both outdoor Outdoor	F.I.S.T. I.S.T. F.S.T. F.I.S.T.	Space/time Force/info Partial Partial Yes No	Behaviour (5) Deviant (3: 2 drug, 1 sex); egress surge, structure (1) All stadiums (3). Weather (2). Fire (1) - rule avoidance / safety Protests / riots (2). Violence, looting, criminal damage, control Celebration on bridge (1). Crush, poor capacity / egress mgmt	
Hallmark (Place synonymous with name)	2	1 sports (out) 1 music (out)	Outdoor Outdoor	I.S. I.S.	Info/space Partial Yes	Behaviour (-) – rule avoidance, dense crowds, covid crisis (1) Behaviour (+) - showstop; ill crowd member, empathy (1)	
Major	41	21 music (15 out , 6 in) 16 sports (6 out, 10 in) 2 political (1 out, 1 in)	Majority out	F.I.S.T. F.I.S.T. I.S. F.I.S.	Space, information, force, time Partial Partial Partial Partial Partial Partial Partial Yes	Partial Partial Partial Partial Partial Partial Partial Yes	Rock: surge (2), crush (1), moshing (1) Hip Hop: riot (1), fire (1) Pop: weather (1) terror (1) EDM: Drug (2) crush (1) moshing (1) Mixed: weather (3), structure (1), sex assault (1), moshing (1) Indie: density (1) Country: structure (1), weather (1), terror (1) Football: crush (4), surge (3), deviance (2 – hostile, revelry), structure, terror (1) Horse racing: deviance (fighting), terror (1) Marathon: terror (2). US Football: weather (1) Both terror (2): party conference, military ceremony, bombings
			Majority in	F.S. F.I.S. I.S.T.			
			No difference	I.S.T.			
Mega	2	2 culture (2 out) 2 culture (2 out)	Outdoor Outdoor	F.I.S.T. F.S.T	Partial No	Terror (2 – vehicle, bombing) Ceremonies (military, celebration). Crush, contraflow bottleneck, trampling (2).	

Headline Findings:

At the local level, nightclubs were the most common location for music incidents, typically linked to crushes, surges and trappings on egress. Sports events centred on hostility at derby-based football matches. Terror attacks were observed twice at this level, at political and cultural events. **Issues linked to event space were most prevalent at this level**, followed by time and then force and information jointly. Moreover, evidence of situation analysis was lacking at this scale of event compared with all others, which showed more awareness, planning and positive action was required to deal with the incidents recorded as they arose. **Music, cultural and political events in particular showed a lack of situational awareness at this level.**

At regional level, behavioural causes were responsible for the majority of incidents across types of events. Specifically, deviance (drugs, sexual attacks, violence and criminal damage as well as rule avoidance were prominent in incidents of this scale). Music and political incidents noted the most behavioural triggers. Also noteworthy when consulting the database is that all drug / riot issues were noted at outdoor events, but for sports, all incidents were recorded in stadiums. **Incidents linked to space and time were jointly prevalent at the regional level.** Only **the cultural event at this level showed a lack of situational awareness** as the incident took hold, with all other event types showing at least partial awareness in some of the documented incidents.

For hallmark events, only two appeared in the database however, likely due to their scale, both were outdoor events and triggered by behavioural causes; one incident exhibited negative crowd behaviours (rule / public safety guidance avoidance) and one exhibited positive behaviour in the way of empathy for others and compliance). **Incidents documented at the hallmark scale were linked to information and space. The music event showed full situational awareness** whilst the sport event demonstrated only partial awareness.

At the major event level, this scale of event was most heavily documented in the database, arguably suggesting that as scale increases, so too does event risk. The majority of incidents at this level occurred at outdoor events (for music and cultural events; for sports, the majority took place in stadiums). Specific incident and trigger types were observed to potentially be linked to certain types of events, namely:

- Moshing / headbanging behaviour at **rock & outdoor festivals**
- Drugs usage was associated with **EDM events**
- Crowd surges & crushes were observed at **rock, EDM, football, and cultural events**
- Terror attacks were mainly linked to **outdoor events** (6 out vs 3 in at **pop (in), country, horse racing, marathons, political (1 in), & cultural events (1 in)**)
- Weather & fire triggers were mainly linked to **music events (pop, hiphop, mixed, country)** and **US football**
- Deviant behaviours (drugs use, rioting, sexual assault, pitch invasions, hostility, violence) were noted at **EDM, mixed, hiphop, football & horse racing events**
- Structural failings were observed at **mixed genre & country music events** as well as **football events**

At this major level of event, **incidents were predominantly linked to event space, although information and force were also common.** Only partial situational awareness was evident at music events of this scale; **incidents where situational awareness was not observed primarily involved issues linked to crowd force and profile.** This was similar for sports events of this scale, though **football events showed awareness and management of crowd profile issues more strongly (i.e., control of hostility).** The terror attacks linked to the two political events at this scale showed greater awareness.

Only two mega events were documented in the database. At the mega event level, the incidents were both linked to *Force, Space and Time*. **Situational awareness was also lacking at these cultural mega events (which involved crowd crushes and trappings with extremely high loss of life during the Hajj annual pilgrimage).**

Overall

Incidents linked to event space were most common across event scales and types. The configuration, capacity, and traffic processing capabilities of assembly facilities determine degrees of crowding, and includes standing and seating areas, projected occupancies, and the practical working capacities of corridors, ramps, stairs, doors, escalators, and elevators (Fruin 1993). **Incidents where situational awareness was not observed primarily involved issues linked to crowd force and profile. These overall findings correlate with the most high-risk incident types and triggers identified in Table 2, Appendix 6 (Event scale and event type by incident, fatalities and injured) including:**

- Indoors: **High density, poor evacuation and egress procedures** leading to **crushes, surges, trampling's and asphyxiation**
- Outdoors: **poor capacity management** leading to **critical density, crushes and surges**, as well as **terror attacks**
- **Crowd crushes and surges** featured heavily in number of injured attendees at **both indoor and outdoor events for events of all scales**
- Most frequently, this was linked to **ingress/egress through a node** or **weather triggering crowds to run for cover**. **Structural collapse and terror attacks** were also linked to higher number of injuries for events across more than one scale
- **Behavioural causes (deviant and expressive but unsafe behaviours such as moshing, pushing)** were featured heavily in documented incidents across all scales. These were most prevalent in certain types of music & sports events, though the database contained higher no's of music & sports incidents than other genres

A6, Table 4: Crowd Incident Database Headline Findings: Incident association with crowd risk analysis factors

Incident association with RAMP risk analysis (Still 2013) (Assessment by incident)				Incident association with DIM-ICE risk analysis (Still 2013) (Assessment by incident)					
Routes (14)	Areas (41)	Movemt (18)	Profile (45)	Design (28)	Info (10)	Mgmt (45)	Ingress (8)	Circulation (41)	Egress (15)
Roads around outdoor event (8) Terror (5) Riots (2) Bottleneck (1)	In crowd at outdoor event – 20	Fleeing/ pushing (9)	Disregard for safety / rules (10)	Poor site & security measures (14) Of these, at: Ingress- 5 Site safety - Capacity-4 Egress-1	Poor decision- making / chain of command (4) Of these, 3 were delayed evac call.	(+) Show stop made (7) (+) Treatment for intoxication/ illness (5) Of these, first response-3 drug policies-2	High density congestion through entrance node (7)	Inside venue / stadium (14)	Evacuation ordered (6) Of these, Weather =3. Fire = 2. Bomb = 1.
	Indoor / enclosed venue event (14)	Peak ingress/ egress flow congestion (6)	Drugs (6) Moshing (4)	Structural collapse or near miss (6)	Poor staff safety comms (2)	(-) Over- capacity (6) (-) Criticism for failure to cancel (5) (-) Poor emergency response (5) (-) Heavy police control (5) (-) Questions of safety (5) (-) Unsafe ingress (4) (+) Audience arrests/bans (4)	Good drugs education strategy at entrance (2)	In dense crowds at outdoor event (14)	Fleeing in panic to escape (crush) – 4
Street entrance (3)	Front of stage (4)	Rushing stage / pitch (3)	Terror motive (10)	Safety issues at open unsecured outdoor events from attackers (12)	Poor event to emergency services comms (3)	(-) Criticism for failure to cancel (5) (-) Poor emergency response (5) (-) Heavy police control (5) (-) Questions of safety (5) (-) Unsafe ingress (4) (+) Audience arrests/bans (4)	Good showstop implentation (1)	During main event on-site: time rather than place (12)	Dense crowd exiting venue at same time (3)
Exit tunnels (2)	Ingress/ egress point (12)	Moshing / dancing (4)	Fighting / violence (4)	Barrier failure or near miss (2)	Good drugs education strategy (2)	(-) Poor emergency response (5) (-) Heavy police control (5) (-) Questions of safety (5) (-) Unsafe ingress (4) (+) Audience arrests/bans (4)	Terror attack at venue entrance (1)	Front of stage / pitch / focal point (6)	Failure to stop rival teams exiting together (clash) (2)
To/from public transport (2)	Of these, 2 incidents due to restricted capacity node / unsafe density	Excited jumping / celebration (1)	all sports – (3 Football, 1 horses)	Obscured exit (2)	Poor event / audience comms (1)	(-) Heavy police control (5) (-) Questions of safety (5) (-) Unsafe ingress (4) (+) Audience arrests/bans (4)	Crowd detained on entrance for safety due to weather (1)	Outsider attacking those enjoying event (6)	Obscured exit (1)
			Panic / fleeing (5)	Trip / slip hazard (2)	Poor victim support line comms (1)	(-) Questions of safety (5) (-) Unsafe ingress (4) (+) Audience arrests/bans (4)			Bomb attack on egress from event - 1.
			Riots/ protests (3)	Fire hazard (1)	Good showstop procedure (1)	(+) Audience arrests/bans (4)			
			Sex assault (2)						
			Performer involvemnt (2)						

			(1 pos, 1 neg)	Flood risk hazard (1)		(-) Unsafe egress (3)			
			Crowd illness (1)	Controversial provocative theming (1)		(-) Failure to protect guests (3)			
			Gang culture (1)			(+) Crowd contained for safety (2)			
			Missiles (1)			(+) Security action (1)			
						(+) Sound emergency plan (1)			
						(-) Transport delay impact on crowd congestion (1)			
						(-) Safety review needed (1)			

Headline Findings: Most prevalent incident traits

Routes: roads around outdoor event. Especially in terror attacks but also linked to riots and contraflow, bottlenecks.

Areas: In dense crowds at outdoor events, enclosed indoor venues and at ingress/egress points.

Movement: Fleeing /pushing of fellow audience members and during peak ingress and egress flow congestion.

Profile: Disregard for safety/rules, and crowd as potential offenders (terror attacks). Also rushing/pushing, drugs use, panic/ fleeing, fighting/ violence (incidents of this nature were all linked to sports, predominantly football)

Design: Poor security measures (mainly ingress, site safety, and capacity). Exposure to risk of attack at open unsecured outdoor events. Structural collapse.

Info: Poor decision making (mostly delayed evacuation calls). Also, poor event to emergency services & inter-staff comms. On a positive note, good drugs education strategies were mentioned twice.

Management (Positives). Cancellations and show stops made, onsite treatment for intoxication / illness (good first response) and audience arrests / bans.

Management (Negatives). Most commonly noted were over-capacity events, criticism for failure to cancel, poor emergency responses, questioned event safety, and heavy-handed police control. Also documented for several incidents each were unsafe ingress and egress processes and a failure to protect guests.

Ingress: High density congestion through entrance node was most prevalent. Also noteworthy is observation of good drugs education strategies at the ingress point.

Circulation: Equally most prevalent were incidents occurring inside a venue (indoors events) and in dense crowds at outdoor events. Incidents that occurred during the event schedule on-site (in terms of timing) were also frequently observed.

Egress: Evacuations were the most prevalent type of egress incident noted (mainly for weather and fire causes). Also noteworthy are incidents linked to fleeing in panic / fear to escape, and dense crowds exiting venue at the same time (peak egress flow congestion).

Appendix 7: Qualitative database incident findings by event profile type

A7.1 Music event incident profile

Examination of incident data linked to music events specifically identified a range associated behaviours. Several common behaviours identified for this profile linked to heightened emotions, namely panic, fear and fleeing, excitement, and audience empathy. The physical behavioural actions of rushing and pushing and moshing were also closely linked to this type of event, suggested that crowds of this nature tend to be energetic. A series of behaviours linked to deviance and criminality were also associated with the music event incident profile, whereby drugs and intoxication, riots disorder and vandalism and sexual assaults were more frequently observed. Furthermore, performer influence was found to be linked to music event incidents where the performer's actions were observed to positively influence crowd behaviour in some cases but also to trigger more negative or unsafe crowd emotions, actions and behaviours that escalated the incidents in others.

Common incident triggers linked to music event incidents included structural failings (specifically, temporary structure, platform floor and barrier railing collapses). Temporary structural failings observed were almost always linked to extreme weather incidents such as storms and high winds. Issues linked to capacity management (i.e., critical density, crowd crushes, crowd surges, trampling incidents and poor capacity management) were extremely common for music events and examples of this were observed in incidents of all scales. Moreover, other external factors that were linked to music incidents and noted more frequently included fires (natural and human-error causes), terror attacks or threats, and entertainment timing issues (including sets being cut short and late starts, leading to disorder). In summary, analysis of the range of incidents linked to music events found that the most common incident triggers were connected to issues with crowd force, crowd space or crowd profile.

Regarding venue scales and traits, music incidents were most commonly linked to major outdoor events, often triggered by extreme weather or critical density. That said, numerous incidents were observed at the regional and local scale as well, yet all those linked to the regional scale were seen at Electronic Dance Music (EDM) events. Building on the discussion of sub-types, some unique patterns emerged in relation to certain types of music events, as follows:

- Hip-hop and urban events were connected to the use of heavy crowd control strategies
- Rock, metal and indie events were connected closely with the show-stop incidents observed
- EDM events were closely linked to drug usage, intoxication, fatalities and drug testing facilities

At the local scale, incidents were all observed at indoor venues (nightclubs) and linked to panic, fear and fleeing, performer error, high density, evacuation and ingress/egress issues or a combination of these. Show-stops were observed for crowd crush, surges, illness and disorder incidents, primarily in relation to major scale events. Deviant and expressive behavioural traits were common across all scales of event and those of an indoor and outdoor nature, suggesting strong links between the music attendee profile and exhibition of deviant or expressive behaviour. Terror events were observed at several music events though scale was irrelevant.

Communication (staff to audience, staff to staff and event to loved ones), crowd control (dispersal, segregation and containment), first response strategies (on-site treatment and medical centres) were most commonly observed in relation to incident management for music events. Also noted on more than one occasion was surveillance techniques for off-site threat detection, orderly evacuation procedures and collaboration between the security detail and emergency services.

Finally with regard to music events, a series of contributory factors linked to organiser error were observed that were arguably likely to have impacted on the severity of the incidents observed. These were: blocked thoroughfares and ingress or egress points, slow response and overly risk-averse decision-making (in ordering event evacuation or sending emergency services to site), procedural issues (i.e., lapsed permits, non-adherence to safety procedures), absence of key resources (i.e., fire extinguishers, loudspeakers) and unhelpful police or security.

A7.2 Sports event incident profile

A distinct set of behavioural traits were observed in sports event incidents. Findings linked to behaviour were specifically found to be related to football-related incidents primarily. In terms of physical behavioural actions, rushing and pushing and excitement (leading to pitch invasions) were common. The players were found in a number of cases to have influenced the crowds' excitable reactions, which then led to incidents such as pitch invasions, or crowd surges and collapse. A strong social identity was noted in relation to crowd behaviour at sports events notably manifesting as fighting and rivalry among attendees and disorder linked to mob or gang behaviour. Whilst not as commonly observed, these traits were noted in relation to crowds attending horse racing events as well as among fans at football matches.

Incidents linked to critical density (crushes, surges) and venues being overcapacity (specifically linked to overseas sports events) were the most common triggers for sports event incidents. Linked to these aspects were the permanent structural failings and barrier or railing collapses that were also quite frequently observed triggers underpinning some of the sports event incidents documented. Other themes that were less frequently identified were extreme weather (storms and high winds), but this was mainly for overseas sports events, terror attacks or the threat of them and fire in the stands as a result of human error.

Regarding event scale and venue traits, incidents were found to be linked to issues associated with crowd force, crowd space and crowd profile, with critical density, crowd surges and structural collapse most commonly documented and extreme weather and terror attacks also observed. Incidents were predominantly linked to outdoor sports events or those in stadiums (major scale). For outdoors events, extreme weather and critical density were the main factors involved in incidents observed. For indoor events, the key incident triggers were high density, poor evacuation and ingress or egress issues. Also noteworthy for indoor events is that very high numbers of injuries and fatalities were observed as the scale of event increased. Some unique traits were found to be more likely noted in relation to specific types of sports events too, namely:

- Local sports grounds venues (almost exclusively football) documented hostility between supporters, especially for football derby matches.

- Football and horse racing events were seemingly connected to heavy crowd control tactics and fighting and rivalry.
- Deviant and disorderly thrill-seeking behaviour was strongly connected to football matches document over other types of sports events. This behaviour was also noted in relation to several horse racing events too, however.
- Though not as commonly documented, weather and fire related incidents were observed mainly at US sports events.
- The structural failings that were noted were almost exclusively linked to football events, and event scale was not found to be significant.

Crowd control (dispersal, segregation and containment), strategies linked to evacuations (orderly evacuation and identification of evacuation points), communication (staff to audience and staff to staff), batch processing at ingress (hold and release) and first response strategies (on-site treatment and medical centres) were most commonly observed in relation to incident management for sports events. Also noted on more than one occasion each was security and emergency services collaboration, surveillance techniques for off-site threat detection, and site safety checks.

Several failings that could be attributed to organiser error were observed for sports events that were arguably likely to have impacted on the severity of the incidents observed. These were similar to those noted for music events, though arguably more targeted errors linked management of issues arising from critical crowd density. Blocked thoroughfares and ingress or egress points was by observed in the majority of organiser errors noted, followed by slow response and overly risk-averse decision-making (in ordering event evacuation or sending emergency services to site), procedural issues (non-adherence to safety procedures and being overcapacity), and unhelpful police or security that were also quite commonly documented within the crowd incident database.

A7.3 Cultural and religious event incident profile

It should be noted prior to the discussion of findings in relation to cultural and religious event incidents that whilst there was sufficient data documented in relation to this type of event to explore trends in associated characteristics, they were not as frequently documented in relation to crowd incidents experienced as the music and sports event types. Moreover, for analysis purposes, protests and political events were included within the cultural and religious events category due to the underpinning cultural motives connected to them.

There was a strong theme evident within data for incidents connected to this event type around the presence of a strong social identity among attendees of this type of event and the influence and impact this had on the way in which associated incidents unfolded. Specifically in relation to protest and religious events, attendees exhibited a strong association with a cause, either through pilgrimage or attendance of ceremonies with religious purposes, or to voice views or concerns in relation to specific issues (primarily race-related issues). Attendance of both types of events was initially peaceful and well-meaning. Incidents outcomes that were documented for this event type seemingly developed in one of two ways: First, the volume of attendees who gathered for the event resulted in issues of critical density that were exacerbated by behavioural aspects such as pushing and panic (predominantly seen in relation to events with a religious

purpose). Second, motivations of social identity for a specific cause (i.e., race-related protests) gathered momentum and media attention to move from a peaceful protest event to an incident of more widespread crowd disorder. Behavioural traits such as riots, disorder and vandalism and behavioural triggers including the cover of anonymity for disorder, opportunism, and authority interventions inflaming crowds in a heightened emotional state were all connected to cultural incidents of this nature.

The catalysts for the incidents that occurred were primarily linked to issues around critical density among crowds in attendance. These capacity management issues were linked to barrier and railing collapses in some instances and also surges, trampling incidents and crushes. Other incident triggers (although less commonly noted) included weather incidents and terror attacks on crowds at cultural and religious events.

Regarding venue and event scale traits, issues related to critical density (crushes, surges, structural failings, lack of situational awareness, unsafe pushing and evacuation or ingress / egress issues) were the most common and were documented at both indoor and outdoor events. Whilst few in comparison to density incidents, the majority of terror attacks observed were connected to cultural and religious events. Scale of event was less relevant here with terror incidents noted at the local and major scale. Relating specifically to terror attacks on cultural, religious and political events, these were all observed at outdoor events, connected to panic, fear and fleeing as well as shootings, bombings and vehicular attacks on the crowd. Protest events were observed at the regional and major scale linked to subcultural, racial and political motives and resulting in incidents of deviance and disorder linked to rioting, violence, criminal damage and rule avoidance.

As would be expected, the types of crowd management strategies observed correlated with the strong emphasis on specific types of incidents (protests, critical density incidents and terror attacks). With this in mind, first response and crisis management strategies were more frequently observed in relation to terror attacks experienced (onsite treatment, surveillance for terror threats, collaboration between security and emergency services and communication with loved ones). Moreover, strategies for managing and controlling crowds in a state of disorder were also more frequently observed (dispersal, segregation and containment techniques as well as staff to staff communication and security/emergency services collaboration).

What is noteworthy is that despite the most frequently documented incident triggers being linked to issues of critical density at cultural and religious events, capacity management strategies were not observed in relation to the incidents documented, suggesting (as noted previously) poor situational awareness for the severity of the congestion and density as the incidents unfolded. This is supported in the findings linked to organiser error, whereby failure to notice the impact of escalating density, overcrowding that resulted in crushing and critical density issues, poor site design in terms of bottlenecks and ingress/egress issues, and poor contraflow management were all evident.

Finally in relation to organiser errors observed for cultural and religious events were slow emergency responses (call to evacuate the site or to send emergency services in), poor crowd safety planning (i.e., non-adherence to safe standing zones) and poor building/ site safety tests. Though, it should be noted that these were not as prominent or were linked to specific event incidents (i.e., terror attacks).

Appendix 8: Descriptive audience safety perceptions survey findings

A8, Table 1: Attendee profile characteristics

Characteristic	Frequencies	Valid (%)	
Frequency of Attendance (N=512)			
⇒ Very frequently (once per month or more)	187	36.5	
⇒ Frequently (almost once per month)	118	23.0	
⇒ Occasionally (3-6 times per year)	172	33.6	
⇒ Infrequently (1-2 times per year)	28	5.5	
⇒ Rarely (less than once per year)	7	1.4	
Events Most Visited (N=512)			
⇒ Arts & Cultural	174	Adjusted (other) 175	% (including adjusted %) 34.2
⇒ Business	45	51	10.0
⇒ Family-focussed	109	109	21.3
⇒ Food & Drink Festivals	183	184	35.9
⇒ Music Events	432	433	84.6
⇒ Sports Events	211	212	41.6
⇒ Other* only others not pre-categorised were included	17*		
○ Arts	1		
○ Business	6		
○ Food / beer	1		
○ Music	1		
○ Sports	1		
Music Event Visitation (N=512)			
⇒ Classical	23	Adjusted (other) 23	% (including adjusted %) 4.5
⇒ Country	-	4	0.8
⇒ EDM (electronic dance music)	100	102	19.9
⇒ Folk	39	39	7.6
⇒ Hiphop / Urban	70	85	16.6
⇒ Jazz & Blues	-	7	1.4
⇒ Pop	131	131	25.6
⇒ Indie	151	151	29.5
⇒ Rock	322	384	75.0
⇒ World Music	-	4	0.8
⇒ Other	90		
○ EDM – Drum and Base	1		
○ EDM – Funk / Breakbeat	1		
○ Jazz & Blues – Jazz	5		
○ Jazz & Blues – Blues	2		
○ Urban – Dancehall / reggae	4		
○ Urban - Grime	2		
○ Urban – Motown / soul	2		
○ Urban – Ska	2		
○ Urban – Rap	1		
○ Urban – R&B (Rhythm & Blues)	1		
○ Urban - Funk	1		
○ Rock - Alternative	2		
○ Rock - Metal	50	55.6% of 'other' answers	9.8% of total dataset
○ Rock – Pop Punk	5		
○ Rock – Punk	5		
○ Country	4		
	4		

○ <i>World Music</i>			
Sports Event Visitation (N=512)			Adjusted (<i>other</i>)
			% (including <i>adjusted</i> %)
⇒ American Football	-	1	0.2
⇒ American Baseball	-	2	0.2
⇒ Angling	-	1	0.2
⇒ Archery	-	1	0.2
⇒ Athletics	16	17	3.3
⇒ Basketball	-	1	0.2
⇒ Boxing / Mixed martial arts / wrestling	16	17	3.3
⇒ Cheerleading competitions	-	1	0.2
⇒ Cricket	39	39	7.6
⇒ Cycling	-	1	0.2
⇒ Darts	-	2	0.4
⇒ Football	152	153	29.9
⇒ Golf	11	11	2.1
⇒ Gymnastics	-	1	0.2
⇒ Hockey	-	2	0.4
⇒ Ice hockey	-	8	1.6
⇒ Ice skating	-	1	0.2
⇒ Motorsports (and car shows)	24	25	4.9
⇒ Racing (dogs) / Dog show eventing	0	1	0.2
⇒ Racing (horse) / Equestrian eventing	33	35	6.8
⇒ Roller derby	-	1	0.2
⇒ Rugby (union or league)	57	57	11.1
⇒ Swimming	9	9	1.8
⇒ Tennis	25	25	4.9
⇒ Other* only those not pre-categorised are included	31		
○ <u>American football</u>	1		
○ <u>American baseball</u>	2		
○ <u>Angling</u>	1		
○ <u>Archery</u>	1		
○ <u>Athletics</u>	1		
○ <u>Basketball</u>	1		
○ <u>Car shows</u>	1		
○ <u>Cheerleading comps</u>	1		
○ <u>Cycling</u>	1		
○ <u>Darts</u>	1		
○ <u>Equestrian (some pre-listed as horse racing)</u>	1		
○ <u>Football (local league)</u>	3		
○ <u>Gymnastics</u>	1		
○ <u>Dog show competitions</u>	1		
○ <u>Hockey</u>	1		
○ <u>Ice Hockey</u>	2		
○ <u>Ice Skating</u>	8		
○ <u>Mixed martial arts (already listed as boxing)</u>	1		
○ <u>Roller derby</u>	1		
○ <u>Wrestling</u>	1		
	1		
Most recently visited (N=512). Open.			
⇒ See findings, Chapter 8			
Size of event most frequently attended (N=509)	Frequencies	Valid (%)	

⇒ Small intimate venues (indoor or outdoor)	129	29.3
⇒ Large city-based indoor venues	115	22.6
⇒ Large city-based outdoor events	43	8.4
⇒ Outdoor festivals	103	20.2
⇒ Outdoor street events	13	2.6
⇒ Arenas and stadiums	106	20.8
Aspects that most motivate attendance (N=512)		% (including adjusted %)
⇒ Awareness raising / demonstration for a cause	11	2.1
⇒ Camaraderie	149	29.1
⇒ Educational value	13	2.5
⇒ Entertainment appeal of artists	326	63.7
⇒ Escapism	194	37.9
⇒ Festive / fun atmosphere	226	44.1
⇒ Networking	17	3.3
⇒ Novelty / uniqueness	21	4.1
⇒ Prestige / status	15	2.9
⇒ Rest and relaxation	34	6.6
⇒ Socialising with friends	231	45.1
⇒ Socialising with family	76	14.8
⇒ Supporting a team / act / individual	166	32.4
Membership of fan clubs, forums, event social media group (N=508)	<i>Frequencies</i>	Valid (%)
⇒ Yes	382	75.2
⇒ No	126	24.8

A8, Table 2: The event environment and site

Characteristic	Frequencies	Valid (%)
Behaviours associated with events attended (N=512)		
⇒ Aggression / violence	27	5.3
⇒ Calm / relaxed atmosphere	120	23.4
⇒ Camaraderie	329	64.3
⇒ Disorderly behaviour	22	4.3
⇒ Emotionally charged atmosphere	210	41.0
⇒ Happy, excited crowds	434	84.8
⇒ Intoxication	207	40.4
⇒ Orderly behaviour	62	12.1
⇒ Physically expressive behaviour	218	42.6
⇒ Pushing / impatience	40	7.8
⇒ Tense atmosphere	53	10.4
⇒ Tightly packed / dense crowds	208	40.6
Perceived factors that contribute to crowd incidents (N=512)		
⇒ Activity type (drinking / drug use, queuing, waiting)	266	Valid (%) 52.0
⇒ Audience behaviour (boredom, dancing, aggression)	215	42.0
⇒ Environmental factors (weather, heat)	123	24.0
⇒ Event venue (access, hygiene, size, layout)	55	10.7
⇒ Event type (duration, people attending, in/outdoor)	51	10
⇒ Event type (duration, people attending, in/outdoor)	171	33.4
⇒ Lack of space (congestion, crushes and surges)	83	16.2
⇒ Organiser or site set up failings	56	10.9
⇒ Performer behaviour (encouragement of behaviours)	52	10.2
⇒ Timing issues (late starts, no-shows, long waits)	24	4.7
⇒ Real / fear of threat to safety	72	14.1
⇒ Never experienced an issue		
Important factors in event attendance		
⇒ See findings chapter 8 for a descriptive comparison		
Organisational / design features and behavioural influence (N=512)		
	113	Valid (%) 22.1
⇒ Signage, furnishings and facilities	55	10.7
⇒ Lighting, sound and colour	189	36.9
⇒ Barriers, gates, queueing and waiting systems	91	17.8
⇒ Theme: line-up, timings, entertainment, performer	104	20.3
⇒ Staff to audience communication	241	47.1
⇒ No influence on behaviour		
Types of behavioural influence (N=332). Open.		
⇒ See findings chapter 8		
Common event hazards experienced at events (N=512)		
⇒ Bottlenecks and congestion	348	Valid (%) 68.0
⇒ Car parks and vehicular traffic	217	42.4
⇒ Confusing layouts	176	34.4
⇒ Dark or dimly lit areas	142	27.7
⇒ Electrical hubs and no-go areas	26	5.1
⇒ Lack of visible or appropriate exits	69	13.5
⇒ Obstructed sightlines	128	25.0

⇒ Open air site with no clear boundaries	33	6.4
⇒ Overcrowding and density	270	52.7
⇒ Poor clarity of or insufficient signage	98	19.1
⇒ Temperature issues	247	48.2
⇒ Temporary structure issues	54	10.5
⇒ Weather	300	58.6
⇒ Uneven ground	195	38.1
⇒ No hazards experienced	26	5.1

A8, Table 3: Crowd management strategies

Characteristic	Frequencies	Valid (%)	
<i>Most helpful audience communication methods (N=512)</i>			
⇒ Verbal			
⇒ informing about event layout and timings onsite	229	44.7	
⇒ notification of necessary changes ahead of event	206	40.2	
⇒ provision of live updates as they occur	355	69.3	
⇒ Non-verbal			
⇒ informing about event layout and timings onsite	140	27.3	
⇒ notification of necessary changes ahead of event	70	13.7	
⇒ provision of live updates as they occur	101	19.7	
⇒ Written			
⇒ informing about event layout and timings onsite	340	66.4	
⇒ notification of necessary changes ahead of event	207	40.4	
⇒ provision of live updates as they occur	134	26.2	
⇒ Visual and audio			
⇒ informing about event layout and timings onsite	317	61.9	
⇒ notification of necessary changes ahead of event	243	47.5	
⇒ provision of live updates as they occur	379	74.0	
⇒ Digital			
⇒ informing about event layout and timings onsite	299	58.4	
⇒ notification of necessary changes ahead of event	400	78.1	
⇒ provision of live updates as they occur	284	55.5	
<i>Effectiveness of crowd management techniques (N=512)</i>			
⇒ See findings, Chapter 8 for descriptive comparison			
<i>Factors linked to crowd safety incidents experienced (N=512)</i>			
⇒ The arrival process (on way to venue)	75	14.6	
⇒ The entry / admission process (prior to start)	122	23.8	
⇒ Inside the event itself (whilst it was taking place)	182	35.5	
⇒ The exit process (at the end as people were leaving)	152	25.7	
⇒ The exit process (outside venue on the way home)	90	17.6	
⇒ Overcrowding and congestion	162	31.6	
⇒ Never experienced a crowd safety incident	171	33.4	
<i>Locations inside venue where the incident occurred (N=181)</i>			
		Adjusted (other)	% (including adjusted %)
⇒ All parts of the venue	-	5	2.8
⇒ Bar area	12	-	6.8
⇒ Campsite	-	7	4.0
⇒ Main event area / stage(s)	103	109	61.6
⇒ Queues (i.e. facilities, ingress / egress)	22	27	15.3
⇒ The foyer (i.e. turnstiles and gates)	5	8	4.5
⇒ Within the stands / seating area	-	9	5.1
⇒ Other	39		21.5
○ <i>All parts of the venue</i>	5		
○ <i>Campsite</i>	7		
○ <i>Main event area / stage</i>	6		
○ <i>Queuing</i>	5		
○ <i>Turnstiles / gates (ingress or egress)</i>	3		
○ <i>Within the stands / seating area</i>	9		

○ Responses linked to offsite were removed	4	
Perceptions of how well the incident was dealt with (N=329)		Valid (%)
⇒ Extremely well	66	20.1
⇒ Adequately	174	52.9
⇒ Extremely poorly	89	27.1

A8, Table 4: Feeling safe at events

Characteristic	Frequencies	Valid (%)	
Behaviours associated with events attended (N=512)			
⇒ Cheering, chanting, singing	488	95.3	
⇒ Avoidance of following instructions when needed	161	31.4	
⇒ Avoidance of following rules of the event / venue	210	41.0	
⇒ Fear and panic	95	18.6	
⇒ Fighting and / or physical violence	239	46.7	
⇒ Friendly crowd mood	450	87.9	
⇒ Group 'herd' behaviour	347	67.8	
⇒ Helpful crowd members	384	75.0	
⇒ Pushing and impatience	324	63.3	
⇒ Intoxication (alcohol)	433	84.6	
⇒ Intoxication (drugs)	285	55.7	
⇒ Premeditated (organised) theft	85	16.6	
⇒ Premeditated (organised) violence	52	10.2	
⇒ Rivalry	126	24.6	
⇒ Rowdiness and boisterousness	360	70.3	
⇒ Rushing or running	248	48.4	
⇒ Sale of drugs	134	26.2	
⇒ Sexual promiscuity	100	19.5	
⇒ Sexual assault	64	11.9	
⇒ Theft (opportunistic)	112	21.9	
⇒ Verbal aggression / verbal abuse	219	42.8	
⇒ I have never experienced any of these behaviours	2	0.4	
Personal safety statement most affiliated with (N=512)			
⇒ I feel extremely uncomfortable in overcrowded conditions at events and will seek to find less crowded areas	67	13.1	42.8 (neg)
⇒ I feel uncomfortable in overcrowded conditions at events but accept it as a consequence of events I choose to attend	152	29.7	
⇒ I am neither comfortable nor uncomfortable in overcrowded conditions at events and thus it does not impact on my experience	105	20.5	36.7 (pos)
⇒ I feel comfortable in overcrowded conditions at events and view it as part of the event's atmosphere	141	27.5	
⇒ I feel extremely comfortable in crowded conditions at events (i.e. front of stage) and actively seek them out as an integral part of my event experience	47	9.2	
Descriptive data – Personal safety statement (scale):			
Mean: 2.90			
Range: 4			
Minimum: 1 (neg statements) / Maximum: 5 (pos statements)			
Std deviation: 1.207			
Range (1 s.d.): 1.69-4.11 (skewed to more negative statements)			
Skewness: 0.058 approximately symmetric distribution.			

<i>Influence of Covid-19 on attitudes towards crowded spaces (N=511)</i>	Frequencies	Valid (%)	Cum (%)
⇒ Yes	202	39.5	<i>69.6 - said 'yes' or 'unsure'</i>
⇒ No	155	30.3	
⇒ Unsure	154	30.1	
<i>Influences on attitudes and decisions to attend events in future</i>	Frequencies	Valid (%)	
⇒ Covid-19 and social distancing measures ((N=512)	123	24.0	
⇒ Positive influence / would attend	215	42.0	
⇒ No influence	174	34.0	
⇒ Negative influence / would not attend			
⇒ Coverage of recent crimes (N=509)	45	8.8	
⇒ Positive influence / would attend	379	74.5	
⇒ No influence	85	16.7	
⇒ Negative influence / would not attend			
⇒ Coverage of recent terror attacks (N=509)	43	8.4	
⇒ Positive influence / would attend	318	62.5	
⇒ No influence	148	29.1	
⇒ Negative influence / would not attend			
⇒ Crowds - i.e. congestion, queues, lack of space (N=509)	65	12.8	
⇒ Positive influence / would attend	323	63.1	
⇒ No influence	121	23.6	
⇒ Negative influence / would not attend			
⇒ Fellow audience members - behaviour, mood (N=508)	161	31.7	
⇒ Positive influence / would attend	295	58.3	
⇒ No influence	51	10.0	
⇒ Negative influence / would not attend			
⇒ Heightened security measures (N=511)	238	46.6	
⇒ Positive influence / would attend	229	44.8	
⇒ No influence	44	8.6	
⇒ Negative influence / would not attend			
⇒ Lack of info / visibility of security, police presence (N=511)	33	6.5	
⇒ Positive influence / would attend	333	65.2	
⇒ No influence	145	28.4	
⇒ Negative influence / would not attend			
⇒ Media portrayal of past events / area (N=508)	88	17.3	
⇒ Positive influence / would attend	371	73.0	
⇒ No influence	49	9.6	
⇒ Negative influence / would not attend			
⇒ More visible emergency services / procedures (N=509)	254	49.9	
⇒ Positive influence / would attend	238	46.8	
⇒ No influence	17	3.3	
⇒ Negative influence / would not attend			
⇒ Press releases & public comms via social media (N=510)			

<ul style="list-style-type: none"> ⇒ Positive influence / would attend ⇒ No influence ⇒ Negative influence / would not attend 	228	44.7	
	267	52.4	
	15	2.9	
⇒ Updated health and safety info on website (N=510)			
⇒ Positive influence / would attend	235	46.1	
⇒ No influence	265	52.0	
⇒ Negative influence / would not attend	10	2.0	
⇒ Word of mouth / online reviews for event / area (N=508)			
⇒ Positive influence / would attend	243	47.8	
⇒ No influence	250	49.2	
⇒ Negative influence / would not attend	15	3.0	
Descriptive data – Comparison			
See Chapter 8 for comparison of all factors of influence			
Extent of Covid-19 influence on perceived event safety (N=512)			
	Frequencies	Valid (%)	Cum (%)
⇒ 1 – No influence	62	12.1	
⇒ 2	19	3.7	
⇒ 3	38	7.4	39.3
⇒ 4	23	4.5	
⇒ 5	59	11.5	
⇒ 6	60	11.5	
⇒ 7	75	14.6	
⇒ 8	71	13.9	60.7
⇒ 9	23	4.5	
⇒ 10 – Strong influence	82	16.0	
Descriptive data – Covid-19 influence on perceived event safety			
Mean: 6.02			
Range: 9			
Minimum : 1 / Maximum: 10			
Std deviation: 2.875			
Range (1 s.d.): 3.33-8.90 (skewed towards stronger influence)			
Skewness: -0.326 (check this against definition)			
Prioritised measures to encourage event attendance (N=512)			
⇒ (thematic analysis)			

Appendix 9: Comprehensive record of all chi-square associations found

A9, Table 1: Associations found between independent variables and categorical environment, site and crowd management variables*

Categorical environment, site and crowd management variables by all independent variables										Associations Summary
	Age	Gender	Residence	Occupation	Visit Frequency	Event Type (Table x)	Music (Table x)	Sports (Table x)	Event Scale	
Contribution to crowd incidents: activity type	More likely than expected			More likely than expected						Factor for younger groups (<24, 25-32), those in FT education or (lesser extent) at home with children
Contribution to crowd incidents: factors beyond control									More likely than expected	Issue - small venues, outdoor festivals ; less for arenas, large city (in)
Contribution to crowd incidents: event venue		More likely than expected								Females were more likely to rate as a contributing factor.
Contribution to crowd incidents: event type										
Contribution to crowd incidents: lack of space		More likely than expected		More likely than expected						More likely for Females and those in FT education
Contribution to crowd incidents: organiser / site failings	More likely than expected				More likely than expected					Factor for those between 25 and 45 , and frequent attenders .
Contribution to crowd incidents: timing issues										Factor for those who are employed / self-employed
Contribution to crowd incidents: no issues experienced				More likely than expected					More likely than expected	More likely for those who are unemployed / redundant / at home with children, outdoor festivals , and arena goers; not city venues
Site design behavioural influence: signs, furnishings, etc					More likely than expected					More influential for those who visit events frequently .
Site design behavioural influence: lighting, sound, colour		More likely than expected								More influential among males rather than females
Site design behavioural influence: barriers, gates, queues		More likely than expected								More influential among males rather than females
Site design behavioural influence: lineup, performers			More likely than expected	More likely than expected					More likely than expected	Influence- employed / in FT education in London & SE, NW Yorks & Humber, large indoor venues, festivals ; not small venues, arenas
Site design behavioural influence: staff-to-crowd comms		More likely than expected								More influential among males rather than females
Site design behavioural influence: no influence		More likely than expected								Female behaviour less likely to be influenced than males
Hazards experienced: bottlenecks	More likely than expected	More likely than expected		More likely than expected	More likely than expected					More likely for all over 25 (not <24), males, employed or self-employed, who visit events very frequently or frequently .
Hazards experienced: car parks / contact with traffic			More likely than expected							Factor for densely populated areas (N. East / West, S. East, W. Midlands Rest of UK & other). Exception of London
Hazards experienced: confusing layouts			More likely than expected							Factor for densely populated areas (N. East / West, S. East, W. Midlands Rest of UK & other). Exception of London
Hazards experienced: dark or dimly lit areas										
Hazards experienced: electrical hubs / no-go areas										
Hazards experienced: lack of visible, fit-for-purpose exits										
Hazards experienced: obstructed sightlines					More likely than expected					More likely among those who visit events very frequently or frequently .
Hazards experienced: open air sites no boundaries		More likely than expected								More likely among females rather than males

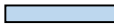


























































Hazards experienced: overcrowding/dense audiences																				More likely among females, frequent / very frequent visitors and employed or in FT education
Hazards experienced: poor clarity of signage																				
Hazards experienced: temperature issues																				Common: Affect females, frequent visitors, indoor venues (small / city); 25-32 age grp , mostly in N.E, S.E, S.W, Yorks & Humber
Hazards experienced: temporary structures																				
Hazards experienced: the weather																				Common: Likely to affect females, outdoor festivals, ages 25-45 , those in the S.E, SW or Rest of UK & Other
Hazards experienced: uneven ground																				
Hazards experienced: no hazards experienced																				More likely for outdoor street event, arena goers over others and for those who attend very frequently, or infrequently / rarely
Most helpful comms: Verbal, layout and timings																				
Most helpful comms: Verbal, changes pre event																				More likely for younger age groups (40 and under)
Most helpful comms: Verbal, updates during event																				More likely for those employed / self-employed, indoor venues (small, city); less for outdoor events and the retired / in FT education
Most helpful comm: Non-verbal layout/timings																				More likely for younger attendees (<24, 25-32), in FT education
Most helpful comms: Non-verbal, changes pre event																				More likely for younger attendees (<24, 25-32) in FT education, frequent, occasional or rare visitors
Most helpful comms: Non-verbal, updates during event																				
Most helpful comms: Written, layout and timings																				More likely for those aged 25-45 and indoor venues (small, city);
Most helpful comms: Written, changes pre event																				More likely for younger attendees (predominantly 25-32, also <24)
Most helpful comms: Written, updates during event																				More likely for 25-32s, females, large city venues, outdoor nat events
Most helpful comms: Visual / audio, layout and timings																				More likely for employed / self-employed, females , those in South (S.E., S.W., London)
Most helpful comms: Visual / audio, changes pre event																				
Most helpful comms: Visual /audio, updates during event																				More likely for all under 45, females , densely populated areas (N. E / N.W, S.E, S.W, E. Mids, W. Mids). Exception of London
Most helpful comms: Digital, layout and timings																				More likely for females ,
Most helpful comms: Digital, changes pre event																				More likely for employed / self-employed, all under 45, females, at large city venues;
Most helpful comms: Digital, updates during event																				More likely for all under 45, female, in FT education or unemployed
Effectiveness of CM techniques: Alcohol policies																				Rates as ineffective for very frequent and frequent attendees but effective for less regular attenders (occasional, infrequent, rare)
Effectiveness of CM techniques: Search policies																				Effective for females , not males, in FT education or unemployed, large indoor / arenas; small / outdoor events ; less so for employed
Effectiveness of CM techniques: Communication																				Importance generally increases with increasing scale of venue.
Effectiveness of CM techniques: Congestion avoidance																				
Effectiveness of CM techniques: Crowd dispersal																				Effectiveness linked to older age groups (all aged 33 and over)
Effectiveness of CM techniques: Crowd monitoring																				Effectiveness linked to occasional visitors, at large city venues, stadiums ; not small venues, or very frequent / frequent attendees

Effectiveness of CM techniques: Drug policies	■				■						Seen as ineffective by those 26 & under and very frequent / frequent attenders; not so less regular attenders (occasional, infrequent, rare)
Effectiveness of CM techniques: Emergency situations											
Effectiveness of CM techniques: Security and law											
Safety incidents experienced: Arrival process to venue		■			■					■	Noted for males, very frequent attenders and venues attracting largest crowds- national events
Safety incidents experienced: Entry / admission to site		■			■						Noted for males , and very frequent attenders
Safety incidents experienced: The event (inside)											
Safety incidents experienced: Exit process - leaving venue		■									Noted for males only.
Safety incidents experienced: Exit process - way home		■								■	Noted as an issue for males , at large city venues and stadiums
Safety incidents experienced: Overcrowding / congestion					■						Noted as an issue for very frequent and frequent attenders
Safety incidents experienced: Never experienced one		■			■						Females and occasional, infrequent or rare attendees more likely than males and frequent attenders to not have experienced incident
Location inside event where incident occurred		■									Females near stage / in main area, males in queues
How well the incident was dealt with					■						Poor (unemployed / redundant / at home with children, employed), to adequate (in FT education)
Prioritised measures: Banning alcohol drugs											
Prioritised measures: capacity management		■								■	Prioritised by females , venues attracting largest crowds- nat. events
Prioritised measures: careful opening & comms										■	Only prioritised by venues attracting largest crowds- national events
Prioritised measures: enhanced cleaning / hygiene		■			■						Prioritised by females , and occasional visitors primarily.
Prioritised measures: events as they were before	■	■									Prioritised by males , aged and 24 & under and 33-45
Prioritised measures: low infection rates										■	Only prioritised by small venue attendees and arena-goers
Prioritised measures: management of overcrowding											
Prioritised measures: enforced wearing of masks											
Prioritised measures: postponement until 'safe'											
Prioritised measures: social distancing				■							Prioritised for those in W. Mids (most likely), S.W. & Yorks & Humber
Prioritised measures: testing											
Prioritised measures: vaccine											
Prioritised measures: venues											
Prioritised measures: Unsure											

Chi-square test relationships between independent variables* and categorical environment, site and cm variables

*event type, music genre and sports genre associations are further broken down in tables A8.2 to A8.4 below.

A9, Table 2: Associations found between event type and categorical environment, site and crowd management variables

Categorical environment, site and crowd management variables by event types	Arts & Cultural	Business	Family-Friendly	Food Festivals	Music	Sports	Associations Summary
<p>  Less likely than expected / negative statement  More likely than expected  Ambivalent / polarised </p>							
Contribution to crowd incidents: activity type							Music attendees more likely to consider activity type as an incident contributor
Contribution to crowd incidents: factors beyond control							More likely than expected to be attributed to arts events but less likely to sports
Contribution to crowd incidents: event venue							Business and food festivals more likely to cite venue as an incident contributor
Contribution to crowd incidents: event type							
Contribution to crowd incidents: lack of space							Lack of space a contributing incident factor for food festivals but not sport events
Contribution to crowd incidents: organiser / site failings							Arts events more likely to cite organiser / site failings as an incident contributor
Contribution to crowd incidents: timing issues							No positive associations. Sports less likely to regard timing issues as a contributor
Contribution to crowd incidents: no issues experienced							
Site design behavioural influence: signs, furnishings, etc							Likely influencing factor for arts , business and food events
Site design behavioural influence: lighting, sound, colour							Likely influencing factor for arts , business and music events
Site design behavioural influence: barriers, gates, queues							Likely influencing factor for arts , music and sports events
Site design behavioural influence: lineup, performers							Likely influencing factor for arts , food and music events; not a sports influencer
Site design behavioural influence: staff-to-crowd comms							Likely influencing factor for arts , business and sports events
Site design behavioural influence: no influence							Influences: arts (5) , business (3) , music (3) , food (2) , sports (2) ; FF no associations
Hazards experienced: bottlenecks							Experienced more than expected by music and sports attendees
Hazards experienced: car parks / contact with traffic							Only significantly associated with those who attend family-friendly events
Hazards experienced: confusing layouts							Experienced more than expected by arts and food event attendees
Hazards experienced: dark or dimly lit areas							More common: Experienced more than expected by arts , food and music crowds
Hazards experienced: electrical hubs / no-go areas							Experienced more than expected by arts and food event attendees
Hazards experienced: lack of visible, fit-for-purpose exits							More common: Experienced more than expected by arts , business , food crowds
Hazards experienced: obstructed sightlines							Experienced more than expected by arts and food event attendees
Hazards experienced: open air sites no boundaries							Only significantly associated with those who attend family-friendly events
Hazards experienced: overcrowding/dense audiences							More common: Experienced more than expected by arts , food and music crowds
Hazards experienced: poor clarity of signage							Only significantly associated with those who attend arts events
Hazards experienced: temperature issues							Only associated with those who attend music events; not a hazard for sports
Hazards experienced: temporary structures							Experienced more than expected by arts and food event attendees
Hazards experienced: the weather							Experienced more than expected by food and music attendees; not so for sports
Hazards experienced: uneven ground							
Hazards experienced: no hazards experienced							
Most helpful comms: Verbal, layout and timings							
Most helpful comms: Verbal, changes pre event							Only significantly associated with those who attend music events

Most helpful comms: Verbal, updates during event						
Most helpful comm: Non-verbal layout/timings						
Most helpful comms: Non-verbal, changes pre event						
Most helpful comms: Non-verbal, updates during event						Only more likely than expected among those who attend family-friendly events
Most helpful comms: Written, layout and timings						Only favoured by those who attend music events; less likely so for sports
Most helpful comms: Written, changes pre event						Favoured more than expected by arts and business attendees
Most helpful comms: Written, updates during event						Most common: Significantly associated with arts, food and music attendees
Most helpful comms: Visual / audio, layout and timings						Favoured more than expected by food and music attendees
Most helpful comms: Visual / audio, changes pre event						Only significantly associated with those who attend music events
Most helpful comms: Visual /audio, updates during event						Only favoured by those who attend music events; less likely so for sports
Most helpful comms: Digital, layout and timings						Favoured more than expected by arts and music groups; less likely so for sports
Most helpful comms: Digital, changes pre event						Favoured more than expected by arts and music groups; less likely so for sports
Most helpful comms: Digital, updates during event						Only favoured by those who attend music events; less likely so for sports
Effectiveness of CM techniques: Alcohol policies						Polarised views regarding effectiveness (food and music attendees)
Effectiveness of CM techniques: Search policies						Polarised views regarding effectiveness (music attendees)
Effectiveness of CM techniques: Communication						Those who attend family-friendly events found communication to be effective
Effectiveness of CM techniques: Congestion avoidance						Polarised views regarding effectiveness (business attendees)
Effectiveness of CM techniques: Crowd dispersal						Those who attend food festivals events found crowd dispersal to be effective
Effectiveness of CM techniques: Crowd monitoring						
Effectiveness of CM techniques: Drug policies						
Effectiveness of CM techniques: Emergency situations						Found effective by business and family-friendly groups; less likely so for sports
Effectiveness of CM techniques: Security and law						Those who attend family-friendly events found security and law to be effective
Safety incidents experienced: Arrival process to venue						Sports attendees associated with experiencing incidents on the way to venue
Safety incidents experienced: Entry / admission to site						Sports attendees associated with experiencing ingress to venue incidents
Safety incidents experienced: The event (inside)						Business, music attendees associated with experiencing incidents inside venue
Safety incidents experienced: Exit process - leaving venue						FF, sports attendees associated with experiencing egress incidents leaving venue
Safety incidents experienced: Exit process - way home						Sports attendees associated with experiencing egress incidents on the way home
Safety incidents experienced: Overcrowding / congestion						Music attendees associated with experiencing overcrowding incidents
Safety incidents experienced: Never experienced one						Music and sports groups more likely to have experienced safety incidents
Location inside event where incident occurred						Music attendees more likely experienced incidents in stage and main event area
How well the incident was dealt with						Sports attendees associated with incidents being dealt with inadequately / poorly
Prioritised measures: Banning alcohol drugs						
Prioritised measures: capacity management						
Prioritised measures: careful opening & comms						Arts audiences less likely than expected to prioritise careful opening / comms
Prioritised measures: enhanced cleaning / hygiene						Music attendees prioritised enhanced cleaning and hygiene more than expected
Prioritised measures: events as they were before						
Prioritised measures: low infection rates						
Prioritised measures: management of overcrowding						FF attendees prioritised management of overcrowding more than expected
Prioritised measures: enforced wearing of masks						
Prioritised measures: postponement until 'safe'						FF attendees prioritised postponement until safe more than expected

Prioritised measures: social distancing								Arts and cultural attendees prioritised social distancing more than expected
Prioritised measures: testing								Sports attendees less likely than expected to prioritise testing measures
Prioritised measures: vaccine								
Prioritised measures: venues								
Prioritised measures: Unsure								

Chi-square test relationships by event type

A9, Table 3: Associations found between music genre and categorical environment, site and crowd management variables

Categorical environment, site and crowd management variables by music genres								Association Summary	
	Classical	EDM	Folk	Hip-hop & Urban	Indie	Metal	Pop		Rock
Contribution to crowd incidents: activity type									
Contribution to crowd incidents: factors beyond control									
Contribution to crowd incidents: event venue									
Contribution to crowd incidents: event type		More likely than expected		More likely than expected					Associated as a contributor by EDM and hip-hop groups
Contribution to crowd incidents: lack of space					More likely than expected				Associated as a contributor by Indie attendees
Contribution to crowd incidents: organiser / site failings									
Contribution to crowd incidents: timing issues									
Contribution to crowd incidents: no issues experienced					Less likely than expected				Indie attendees less likely to have experienced no issues than expected
Site design behavioural influence: signs, furnishings, etc		More likely than expected				Less likely than expected			More likely to influence EDM attendees; less likely for metal attendees
Site design behavioural influence: lighting, sound, colour		More likely than expected		More likely than expected	More likely than expected	Less likely than expected			Influencer for EDM , Hip-Hop and Indie audiences; not metal
Site design behavioural influence: barriers, gates, queue			More likely than expected						Influencer for folk attendees only
Site design behavioural influence: lineup, performers				More likely than expected	More likely than expected				More likely to influence hip-hop and Indie attendees
Site design behavioural influence: staff-to-crowd comms									
Site design behavioural influence: no influence		Less likely than expected	Less likely than expected	Less likely than expected		More likely than expected		More likely than expected	More metal , rock attendees than expected were not influenced in this way
Hazards experienced: bottlenecks					More likely than expected			More likely than expected	Hip-hop and rock attendees more likely to have experienced bottlenecks
Hazards experienced: car parks / contact with traffic							More likely than expected		Only pop attendees were more likely to have experienced car park issues
Hazards experienced: confusing layouts		More likely than expected	More likely than expected						EDM and folk genres more likely to have experienced confusing layouts.
Hazards experienced: dark or dimly lit areas		More likely than expected			More likely than expected				EDM and Indie more likely to have experienced dark / dim areas.
Hazards experienced: electrical hubs / no-go areas									
Hazards experienced: lack of visible, fit-for-purpose exits		More likely than expected			More likely than expected				EDM and Indie more likely to have experienced lack of visible exits
Hazards experienced: obstructed sightlines					More likely than expected				Only Indie attendees more likely to have experienced obstructed sightlines
Hazards experienced: open air sites no boundaries									
Hazards experienced: overcrowding/dense audiences		More likely than expected		More likely than expected	More likely than expected				COMMON : Issue for EDM , Hip-hop and Indie audiences
Hazards experienced: poor clarity of signage		More likely than expected			More likely than expected		More likely than expected		COMMON : EDM , Indie , pop more likely to have experienced poor signage
Hazards experienced: temperature issues					More likely than expected			More likely than expected	Indie and rock crowds more likely to have experienced temperature issues
Hazards experienced: temporary structures		More likely than expected			More likely than expected				EDM and Indie more likely to have experienced temporary structure issues
Hazards experienced: the weather			More likely than expected						Experienced by more folk and rock attendees than expected.
Hazards experienced: uneven ground								More likely than expected	Only rock audiences more likely to have experiences uneven ground issues.
Hazards experienced: no hazards experienced									
Most helpful comms: Verbal, layout and timings							More likely than expected		Only stated as helpful by pop audiences.
Most helpful comms: Verbal, changes pre event				More likely than expected					Only stated as helpful by hip-hop audiences.

Prioritised measures: testing										
Prioritised measures: vaccine										
Prioritised measures: venues										
Prioritised measures: Unsure										

Chi-square test relationships by music genre

A9, Table 4: Associations found between sports genre and categorical environment, site and crowd management variables

Categorical environment, site and crowd management variables by sports genres	Sports Genres									Association Summary
	Athletics	Boxing /Ring Sport	Cricket	Football	Golf	Motorsports	Horse Racing/Equest.	Rugby League/Union	Tennis	
Contribution to crowd incidents: activity type										Tennis attendees less likely to see activity type as a contributor
Contribution to crowd incidents: factors beyond control										Football attendees less likely to see activity type as a contributor
Contribution to crowd incidents: event venue										
Contribution to crowd incidents: event type										
Contribution to crowd incidents: lack of space										Football attendees less likely to see lack of space as a contributor
Contribution to crowd incidents: organiser / site failings										
Contribution to crowd incidents: timing issues										Football attendees less likely to see timing issues as a contributor
Contribution to crowd incidents: no issues experienced										
Site design behavioural influence: signs, furnishings, etc										More likely to influence Motorsports attendees than expected only
Site design behavioural influence: lighting, sound, colour										
Site design behavioural influence: barriers, gates, queues										Key Influencer: for cricket, football, motorsports, rugby attendees
Site design behavioural influence: lineup, performers										Less likely to influence football attendees than expected
Site design behavioural influence: staff-to-crowd comms										Influencer for cricket and football audiences
Site design behavioural influence: no influence										Less athletics, motorsports attendees claimed no influence
Hazards experienced: bottlenecks										Football attendees more likely to have experienced bottlenecks
Hazards experienced: car parks / contact with traffic										
Hazards experienced: confusing layouts										
Hazards experienced: dark or dimly lit areas										Horse racing less likely to have experienced dark / dim areas.
Hazards experienced: electrical hubs / no-go areas										
Hazards experienced: lack of visible, fit-for-purpose exits										
Hazards experienced: obstructed sightlines										Cricket and football more likely to experience obstructed sightlines
Hazards experienced: open air sites no boundaries										
Hazards experienced: overcrowding/dense audiences										Less likely to be an issue for horse racing audiences than expected
Hazards experienced: poor clarity of signage										
Hazards experienced: temperature issues										Cricket and football less likely to have experienced temp. issues
Hazards experienced: temporary structures										
Hazards experienced: the weather										Experienced by less Cricket and football attendees than expected.
Hazards experienced: uneven ground										Horse racing audiences less likely to experience uneven ground
Hazards experienced: no hazards experienced										
Most helpful comms: Verbal, layout and timings										
Most helpful comms: Verbal, changes pre event										

Prioritised measures: testing											Football attendees less likely to prioritise testing measures
Prioritised measures: vaccine											
Prioritised measures: venues											
Prioritised measures: Unsure											

Chi-square test relationships by sports genre

A9, Table 5: Associations found between independent variables and categorical behavioural profile variables*

Categorical behavioural profile variables by all independent variables	Independent Variables									Association Summary
	Age	Gender	Residence	Occupation	Visit Frequency	Event Type (Table x)	Music Genre (Table x)	Sports Genre (Table x)	Event Scale	
Attendance motivators: awareness raising										
Attendance motivators: camaraderie										Motivator for older attendees (mostly >46, plus 33-45), those in SE, SW, Rest of UK, who are employed, unemployed or retired ; not so for those in FT education
Attendance motivators: educational value										Motivator for females rather than males.
Attendance motivators: entertainment offered										Common: Motivator - females, frequent attenders, small & indoor city venues, outdoor festivals, under 40s ; some significance for occasional / infrequent too
Attendance motivators: Escape from pressures										Motivator for younger ages (<33), less regular attenders (occasional, infrequent, rare), at indoor city venues , plus outdoor festivals
Attendance motivators: fun atmospheres										Common: Motivator for females, employed or in FT education, those <46, city venues (in), outdoor national events
Attendance motivators: networking / business										
Attendance motivators: novelty / uniqueness										
Attendance motivators: prestige / status										Motivator for infrequent event attenders.
Attendance motivators: rest & relaxation										Motivator predominantly for oldest age group (46 plus)
Attendance motivators: socialising with friends										Motivator for younger age groups (24 & Under, 25-32)
Attendance motivators: socialising with family										
Attendance motivators: supporting a team										Common: Motivator for males, very frequent attenders, more likely retired at outdoor larger city events
Fan club member										Most likely for older ages (27-40,41+), regular attenders (very frequent, frequent), either employed or retired , visiting small venues, outdoor festivals
Associated behaviours: aggression / violence										More likely among males, very frequent attenders , at arenas and stadiums ,
Associated behaviours: calm atmosphere										Most likely among females , and those who visit small venues, outdoor festivals
Associated behaviours: camaraderie										Most likely among older age groups (33 and over), regular attenders (very frequent, frequent), either employed or retired
Associated behaviours: disorderly behaviour										
Associated behaviours: emotional atmosphere										Most likely males, v. frequent attenders , at large outdoor city venues, stadiums
Associated behaviours: happy / excited crowd										Most likely among those who visit outdoor festivals and arenas and stadiums
Associated behaviours: intoxication										Most likely among the employed / self-employed or those in FT education
Associated behaviours: orderly behaviour										Most likely among older age groups (33 years and over, but especially >46)

Associated behaviours: physically expressive	■	■	■	■	■					Most common: Most likely in small or city-based indoor venues, aged <33, female, frequent attenders, employed or unemployed, in Midlands (W & E), NE, SE, Yorks & Humber
Associated behaviours: pushing / impatience	■	■								Mostly linked to female, younger audiences (<33), esp 25-32
Associated behaviours: tense atmosphere		■			■					Most likely among males, very frequent attenders, at large outdoor city venues, and stadiums
Associated behaviours: packed / dense crowd										Most likely in small or city-based indoor venues, or stadiums and arenas
Contribution to incidents: crowd behaviour										Most likely in city-based indoor/outdoor venues, and arenas
Contribution to incidents: performer behaviour	■									Factor for younger age groups (especially 25-32 years)
Contribution to incidents: fear / threat to safety										
Importance: the crowd										
Importance: socialising with like-minded people	■									Important for older ages (33-45 and 46+, 27-40); not for youngest groups
Importance: event and surroundings					■					Important for frequent attenders. Marginally less so for moderate, infrequent .
Importance: the weather		■			■					Important for females, moderate or infrequent attendees but not for males or frequent attenders
Importance: event staff, law, crowd relationship	■	■			■					Important for females, 27+, moderate attenders, at city venues (in/out), outdoor events ; not <27, small/arenas, males, frequent attenders .
Importance: clear directions and signage	■	■			■					Important for females (not males), aged 45 and under , and those who visit frequently or occasionally ; unimportant for very frequent attenders .
Importance: organised movement of crowds	■	■								Important for females (not males) at city venues (indoor), outdoor festivals ; and for older grps >25
Importance: space to move freely		■								Important for females but not males
Importance: handling of emergency situations		■								Important for females but not males
Behaviours experienced: cheering, chanting singing					■					Most likely at small venues or arenas, for very frequent attenders
Behaviours experienced: instruction avoidance		■		■	■					Most likely among employed / self-employed, males, very frequent or frequent attenders
Behaviours experienced: rule avoidance		■			■					Most likely among males and very frequent or frequent attenders
Behaviours experienced: fear and panic										No significant associations for this variable
Behaviours experienced: fighting / physical violence		■			■					Most likely among males, very frequent or frequent attenders, in arenas / stadia
Behaviours experienced: friendly crowd mood	■	■	■	■	■					Most common: More likely for females, regular attenders (frequent / v. frequent), older grps (>33), employed at smaller or indoor city venues and those in SW (lesser extent- W. Mids, Yorks & Humber)
Behaviours experienced: group 'herd' behaviour	■	■	■		■					Common: More likely among males, regular attenders (v. frequent, frequent), those aged <46, in SE, E Mids, ne, nw, Yorks & Humber, Rest of UK & other
Behaviours experienced: helpful crowd members	■		■		■					Common: More likely - older ages (27+), frequent attenders, at indoor city venues, outdoor festivals, in SW, W. Mids, Yorks & Humber, plus (lesser extent) E. Mids, SE
Behaviours experienced: pushing and impatience					■					More likely among frequent attenders

Behaviours experienced: intoxication (alcohol)										More likely among males, regular attenders (v. frequent, frequent). in SE , plus (lesser extent) E. Mids, NW, Yorks & Humber
Behaviours experienced: intoxication (drugs)										Common: More likely for 27-40s, frequent attenders, employed / self-employed , at small or city venues (in), outdoor festivals
Behaviours experienced: premeditated theft										No significant associations for this variable
Behaviours experienced: premeditated violence										Most likely males, v. frequent attenders , at large outdoor city venues, stadiums
Behaviours experienced: rivalry										V. Common: Most likely among males, v. frequent attenders, 46+, retired at large outdoor city venues, stadiums ; not so - FT education, home with children
Behaviours experienced: rowdiness, boisterousness										Common: Most likely in SE (lesser extent – Midlands, Yorks & Humber, Rest of UK & Other), employed, regular attenders (very frequent, frequent), at small or city-based indoor venues
Behaviours experienced: rushing or running										Common: More likely aged <46, frequent or occasional attenders , at small, indoor city venues, outdoor festivals , in South and Rest of UK / Other
Behaviours experienced: sale of drugs										Common: More likely – under 40s, frequent attenders , those in FT education , at small, or city venues (in), outdoor festivals ,
Behaviours experienced: sexual assault										Common: More likely for female, younger grps (<33), frequent attenders , at small, indoor city venues ,
Behaviours experienced: sexual promiscuity										Common: likely younger grps (<46) , frequent attenders , at small, city venues (in), outdoor festivals ,
Behaviours experienced: theft (opportunistic)										Most likely at large city venues (indoor or out) and arenas, stadiums
Behaviours experienced: verbal aggression / abuse										Most likely for males, regular attenders (v. frequent, frequent), at small venues, large indoor venues, arenas
Behaviours experienced: none of the above										
Personal safety in crowds at events										Common: more comfortable if younger <25, male, frequent attenders , at large national venues
Covid-19 impact on attitude change - crowded spaces										Female attitudes to crowds more likely to be influenced than males . Very frequent attenders more likely not to be influenced; all others mostly unsure
Attendance influencers: Covid-19 / social distancing										
Attendance influencers: coverage of recent crimes										Positive for youngest grp (<25) , in FT education ; no influence for other ages, negative for unemployed / retired and those in FT education (polarised views)
Attendance influencers: coverage of terror attacks										Predominantly negative for those in the South, under 33, moderate and infrequent attenders, in FT education ; no influence for 34+, frequent attenders those in the Mids, North or Rest of UK & Other, employed or self-employed . Only those in FT education stated positive influence (polarised)
Attendance influencers: crowds and likely congestion										Positive - outdoor fests, arenas ; Under 26s , negative - small, city venues (out) and infrequent visitors . No influence for frequent attenders .
Attendance influencers: crowd behaviour/mood										
Attendance influencers: heightened security process										Positive for females, mod and infrequent attenders , those in E England, The Midlands, SW . negative for males , those in London, NE, SE, Rest of UK & Other . No influence on the North, or frequent attenders .

Attendance influencers: lack of security / police									
Attendance influencers: media portrayal - past events	■			■					Positive – younger ages (<33) in FT education; no influence 33 & over, employed and unemployed ; Negative – in FT education and unemployed (both groups showed polarised views)
Attendance influencers: more visible security / police		■			■				Positive – females, city indoor venues, arenas ; mod and infrequent attenders. Negative – males, small, outdoor festivals . No influence on frequent attenders .
Attendance influencers: visible emergency processes		■			■				Positive – females, mod and infrequent attenders . negative / no influence – males , and no influence on frequent attenders .
Attendance influencers: press releases, public comms									No significant associations for this variable
Attendance influencers: updated H&S website info		■							Positive influence on females , negative / no influence for males
Attendance influencers: WOM / online reviews									No significant associations for this variable
Covid-19 influence on safety for future attendance	■	■			■				Female, oldest age (>46), mod or infrequent attenders most highly influenced; youngest <25, males, frequent attenders least influenced

Chi-square test relationships between independent variables* and categorical behavioural profile variables
 *event type, music genre and sports genre associations are further broken down in tables A8.6 to A8.8 below.

A9, Table 6: Associations found between event type and categorical behavioural profile variables

Categorical behavioural profile variables by event type	Arts & Cultural	Business	Family-Friendly	Food Festivals	Music	Sports	Association Summary
Attendance motivators: awareness raising							
Attendance motivators: camaraderie							Less likely seen as an incident contributor for arts and business attendees
Attendance motivators: educational value							
Attendance motivators: entertainment offered							COMMON: More likely – arts, food and music. Less likely – sports.
Attendance motivators: Escape from pressures							More likely –food festivals. Less likely – business and sports.
Attendance motivators: fun atmospheres							More likely – family-friendly and music. Less likely – sports.
Attendance motivators: networking / business							More likely – arts and cultural events
Attendance motivators: novelty / uniqueness							More likely – arts and cultural events
Attendance motivators: prestige / status							Less likely – food festivals.
Attendance motivators: rest & relaxation							
Attendance motivators: socialising with friends							Less likely – family-friendly
Attendance motivators: socialising with family							More likely – family-friendly
Attendance motivators: supporting a team							More likely – sports. Less likely – arts, family-friendly, food and music
Fan club member							More likely for music attendees
Associated behaviours: aggression / violence							More likely for sports attendees
Associated behaviours: calm atmosphere							COMMON: More likely – arts, business, family-friendly, food. Less – music, sport
Associated behaviours: camaraderie							More likely for sports attendees
Associated behaviours: disorderly behaviour							More likely for sports attendees
Associated behaviours: emotional atmosphere							More likely for sports attendees. Less likely – arts. Family-friendly, food, music
Associated behaviours: happy / excited crowd							More likely for music attendees
Associated behaviours: intoxication							More likely for music attendees
Associated behaviours: orderly behaviour							
Associated behaviours: physically expressive							More likely – music . Less likely – family-friendly.
Associated behaviours: pushing / impatience							More likely – food, music . Less likely – arts and cultural.
Associated behaviours: tense atmosphere							More likely – sports . Less likely – arts, food and music events.
Associated behaviours: packed / dense crowd							More likely for music attendees

Contribution to incidents: crowd behaviour						Less likely – arts and cultural events
Contribution to incidents: performer behaviour						
Contribution to incidents: fear / threat to safety						
Importance: the crowd						
Importance: socialising with like-minded people						High importance for music attendees
Importance: event and surroundings						High importance for music attendees, but low for sports
Importance: the weather						High importance – business, family, food attendees. Ambivalence - music, sport
Importance: event staff, law, crowd relationship						Higher than expected importance for business, music event attendees
Importance: clear directions and signage						Higher importance for business, family, food attendees. Low for sports
Importance: organised movement of crowds						High importance for business, family, food, music attendees, but low for sports
Importance: space to move freely						High importance for family-friendly attendees, but low for sports
Importance: handling of emergency situations						Higher than expected importance for family-friendly attendees
Behaviours experienced: cheering, chanting singing						Family-friendly and food crowds less likely to experience this
Behaviours experienced: avoidance of following instructions						Sports more likely not to follow instruction
Behaviours experienced: avoidance of following rules						Sports more likely not to follow rules
Behaviours experienced: fear and panic						Music attendees more likely to experience fear and panic
Behaviours experienced: fighting and / or physical violence						Fighting / physical violence more likely for music, sports attendees
Behaviours experienced: friendly crowd mood						Music attendees more likely to experience friendly crowd mood
Behaviours experienced: group 'herd' behaviour						Music attendees more likely to experience group 'herd' behaviour
Behaviours experienced: helpful crowd members						Music attendees more likely to experience helpful crowd members
Behaviours experienced: pushing and impatience						Food festival attendees more likely to experience pushing and impatience
Behaviours experienced: intoxication (alcohol)						Music attendees more likely to experience intoxication (alcohol); less so for arts
Behaviours experienced: intoxication (drugs)						Music attendees more likely to experience intoxication (drugs); less so for sports
Behaviours experienced: premeditated organised theft						Music attendees more likely to experience organised theft; less so for sports
Behaviours experienced: premeditated organised violence						Sports attendees more likely to experience premeditated organised violence
Behaviours experienced: rivalry						Sports more likely to experience rivalry; less so for arts, food and music
Behaviours experienced: rowdiness and boisterousness						Music more likely to experience rowdiness; less so for arts, business and family
Behaviours experienced: rushing or running						Music more likely to experience rushing or running
Behaviours experienced: sale of drugs						Music attendees more likely to experience sale of drugs; less so for sports
Behaviours experienced: sexual assault						Music attendees more likely to experience sexual assault; less so for sports
Behaviours experienced: sexual promiscuity						Music attendees more likely to experience sexual promiscuity; less so for sports
Behaviours experienced: theft (opportunistic)						Music attendees more likely to experience opportunistic theft
Behaviours experienced: verbal aggression / abuse						Sports more likely to experience verbal aggression; less so for family and food
Behaviours experienced: none of the above						

Personal safety in crowds at events						Arts and food crowds less likely to feel safe or comfortable in crowded spaces
Covid-19 impact on attitude change towards crowded spaces						Arts and food crowds more likely to change their attitude to crowded spaces too
Attendance influencers: Covid-19 / social distancing measures						Positive influence on family-friendly groups, negative influence on food crowds.
Attendance influencers: coverage of recent crimes						No influence on music groups, negative influence on business attendees.
Attendance influencers: coverage of recent terror attacks						Negative influence on food festival attendees.
Attendance influencers: crowds and likely congestion						Negative influence on arts attendees.
Attendance influencers: likely audience behaviour / crowd mood						Positive influence on food and music attendees
Attendance influencers: heightened security measures						Positive influence on family-friendly and food attendees; no influence on sports
Attendance influencers: lack of 'visible' security / police presence						Negative influence on arts, business, family-friendly and food attendees.
Attendance influencers: media portrayal of past events						Positive influence on food festival attendees.
Attendance influencers: more visible security / police presence						Negative influence on arts attendees; positive for business, family and food grps
Attendance influencers: more visible emergency procedures						Positive influence on family-friendly attendees.
Attendance influencers: press releases and public comms						Positive influence on food festival and music attendees.
Attendance influencers: updated health & safety info on website						Positive influence on arts and food festival attendees; no influence on sports .
Attendance influencers: Word of mouth / online reviews						Positive influence on arts, food festival, music and sports attendees.
Covid-19 influence on perceived safety for future attendance						Strong influence on arts, family-friendly and food festival attendees.

Chi-square test relationships between event type and categorical behavioural profile variables

A9, Table 7: Associations found between music genre and categorical behavioural profile variables

Categorical behavioural profile variables by music genre	Music Genre								Association Summary
	Classical	EDM	Folk	Hip-hop & Urban	Indie	Metal	Pop	Rock	
Attendance motivators: awareness raising									
Attendance motivators: camaraderie		Less likely	More likely	Less likely			Less likely		More likely – folk attendees. Less likely – EDM, Hip-hop and pop.
Attendance motivators: educational value									
Attendance motivators: entertainment offered			More likely		More likely			More likely	More likely – EDM, Hip-hop, rock attendees
Attendance motivators: Escape from pressures	Less likely			Less likely	Less likely				Less likely – Classical, Hip-hop and indie.
Attendance motivators: fun atmospheres		More likely		More likely			More likely	More likely	More likely – EDM, Hip-hop, pop, rock attendees.
Attendance motivators: networking / business									
Attendance motivators: novelty / uniqueness								Less likely	Less likely – rock attendees.
Attendance motivators: prestige / status								Less likely	Less likely – rock attendees.
Attendance motivators: rest & relaxation								Less likely	Less likely – rock attendees.
Attendance motivators: socialising with friends	Less likely					More likely			More likely – metal attendees. Less likely – classical.
Attendance motivators: socialising with family							More likely	Less likely	More likely – pop attendees. Less likely – rock.
Attendance motivators: supporting a team		Less likely		Less likely					Less likely – EDM and hip-hop attendees.
Fan club member				Less likely		More likely		More likely	Rock, metal attendees more likely members of fan clubs; hip-hop less so
Associated behaviours: aggression / violence									
Associated behaviours: calm atmosphere						Less likely		Less likely	Less likely – metal and rock attendees.
Associated behaviours: camaraderie				Less likely	More likely			More likely	More likely – indie and rock attendees. Less likely – hip-hop/urban.
Associated behaviours: disorderly behaviour									
Associated behaviours: emotional atmosphere		Less likely							Less likely – EDM attendees.
Associated behaviours: happy / excited crowd								More likely	More likely – rock attendees.
Associated behaviours: intoxication		More likely						More likely	More likely – EDM and rock attendees.
Associated behaviours: orderly behaviour		Less likely				Less likely		Less likely	Less likely – EDM, metal and rock attendees.
Associated behaviours: physically expressive				Less likely		More likely	Less likely	More likely	Rock and metal attendees associate with physically expressive behaviours
Associated behaviours: pushing / impatience								More likely	Rock attendees associate with physically expressive behaviours
Associated behaviours: tense atmosphere						Less likely		Less likely	Less likely – metal and rock attendees.
Associated behaviours: packed / dense crowd	Less likely					More likely		More likely	Rock and metal attendees more likely to associate; classical crowds, less so

Contribution to incidents: crowd behaviour										
Contribution to incidents: performer behaviour										
Contribution to incidents: fear / threat to safety										
Importance: the crowd										The crowd holds low importance for pop attendees
Importance: socialising with like-minded people										
Importance: event and surroundings										The event and surroundings hold high importance for rock attendees
Importance: the weather										The weather holds low importance for rock attendees
Importance: event staff, law, crowd relationship										Higher than expected importance for rock attendees
Importance: clear directions and signage										Higher than expected importance for rock attendees
Importance: organised movement of crowds										High importance for pop and rock attendees, but low for EDM and hip-hop
Importance: space to move freely										
Importance: handling of emergency situations										Higher than expected importance for rock attendees
Behaviours experienced: cheering, chanting singing										Indie and rock crowds more likely to experience cheering, chanting, singing
Behaviours experienced: avoidance of following instructions										Folk / indie more likely not to follow instruction; less so for rock / metal
Behaviours experienced: avoidance of following rules										More likely – Indie attendees; less likely for metal .
Behaviours experienced: fear and panic										COMMON: Folk, indie, pop, rock attendees more likely to experience this
Behaviours experienced: fighting and / or physical violence										More likely - Indie, rock attendees
Behaviours experienced: friendly crowd mood										Indie, rock more likely to encounter friendly crowd; less so for pop, hip-hop
Behaviours experienced: group 'herd' behaviour										More likely - Indie, rock attendees
Behaviours experienced: helpful crowd members										Indie, rock more likely to encounter helpful crowds; less so for hip-hop
Behaviours experienced: pushing and impatience										Indie, rock more likely to encounter pushing and impatience.
Behaviours experienced: intoxication (alcohol)										Indie, metal, rock more likely to encounter intoxication (Alcohol)
Behaviours experienced: intoxication (drugs)										More likely - EDM, Indie, rock ; less so for classical and pop audiences
Behaviours experienced: premeditated organised theft										More likely than expected to be encountered by rock audiences.
Behaviours experienced: premeditated organised violence										More likely than expected to be encountered by EDM audiences.
Behaviours experienced: rivalry										Less likely than expected among EDM, metal and rock audiences.
Behaviours experienced: rowdiness and boisterousness										More likely - Indie, metal, rock crowds; less so for classical, hip-hop, pop
Behaviours experienced: rushing or running										More likely - Indie, rock attendees
Behaviours experienced: sale of drugs										More likely - EDM, hip-hop, Indie crowds; less likely for classical audiences
Behaviours experienced: sexual assault										More likely – rock attendees; less so for pop audiences
Behaviours experienced: sexual promiscuity										More likely than expected to be encountered by EDM, hip-hop audiences.
Behaviours experienced: theft (opportunistic)										More likely - rock attendees; less likely for classical and pop audiences.
Behaviours experienced: verbal aggression / abuse										More likely - Indie, rock attendees
Behaviours experienced: none of the above										

Personal safety in crowds at events									Rock attendees more likely to feel uncomfortable but accepting of crowds
Covid-19 impact on attitude change towards crowded spaces									Rock more likely to feel unsure about attitude change to crowded spaces
Attendance influencers: Covid-19 / social distancing protocol									Predominantly positive influence on indie attendees
Attendance influencers: coverage of recent crimes									EDM attendees no influence; rock negatively influenced
Attendance influencers: coverage of recent terror attacks									EDM, hip-hop crowds – no influence; rock negatively influenced
Attendance influencers: crowds and likely congestion									Rock attendees more likely not to attend
Attendance influencers: likely crowd behaviour / mood									Predominantly positive influence on rock attendees
Attendance influencers: heightened security measures									EDM, hip-hop groups likely not to attend; rock not influenced
Attendance influencers: lack of security / police presence									EDM attendees not likely to be influenced; hip-hop negatively influenced
Attendance influencers: media portrayal of past events									
Attendance influencers: visible security / police presence									Predominantly positive influence on pop attendees
Attendance influencers: more visible emergency procedures									Predominantly positive influence on pop attendees
Attendance influencers: press releases and public comms									Positive influence on indie, pop and rock attendees
Attendance influencers: updated website health & safety info									
Attendance influencers: Word of mouth / online reviews									Predominantly positive influence on EDM, indie attendees but not hip-hop
Covid-19 influence on perceived safety for future attendance									Polarised views for rock crowds; greatest difference at strong influence end

Chi-square test relationships between music genre and categorical behavioural profile variables

A9, Table 8 Associations found between sports genres and categorical behavioural profile variables

Categorical behavioural profile variables by sports genre	Sports Genre									Summary of Association
	Athletics	Boxing & Ring	Cricket	Football	Golf	Motorsports	Horse Racing/Equest.	Rugby League/Union	Tennis	
Attendance motivators: awareness raising										
Attendance motivators: camaraderie			More likely than expected / positive statement							More likely – cricket attendees
Attendance motivators: educational value										
Attendance motivators: entertainment offered			Less likely than expected / negative statement	Less likely than expected / negative statement						Less likely for cricket and football audiences.
Attendance motivators: Escape from pressures				Less likely than expected / negative statement			Less likely than expected / negative statement		Less likely than expected / negative statement	Less likely for football, horse racing / equestrian and tennis crowds
Attendance motivators: fun atmospheres			Less likely than expected / negative statement	Less likely than expected / negative statement						Less likely for cricket and football audiences.
Attendance motivators: networking / business										
Attendance motivators: novelty / uniqueness										
Attendance motivators: prestige / status										
Attendance motivators: rest & relaxation										
Attendance motivators: socialising with friends										
Attendance motivators: socialising with family										
Attendance motivators: supporting a team			More likely than expected / positive statement	More likely than expected / positive statement				More likely than expected / positive statement	More likely than expected / positive statement	More likely – cricket, football, rugby, tennis attendees
Fan club member				More likely than expected / positive statement						More likely for football attendees
Associated behaviours: aggression / violence				More likely than expected / positive statement						More likely for football attendees
Associated behaviours: calm atmosphere				Less likely than expected / negative statement						Less likely for football audiences.
Associated behaviours: camaraderie				More likely than expected / positive statement						More likely for football attendees
Associated behaviours: disorderly behaviour				More likely than expected / positive statement						More likely for football attendees
Associated behaviours: emotional atmosphere			More likely than expected / positive statement	More likely than expected / positive statement						More likely for football attendees
Associated behaviours: happy / excited crowd										
Associated behaviours: intoxication	Less likely than expected / negative statement		Less likely than expected / negative statement						Less likely than expected / negative statement	Less likely for athletics, cricket and tennis audiences.
Associated behaviours: orderly behaviour										
Associated behaviours: physically expressive	Less likely than expected / negative statement		Less likely than expected / negative statement	Less likely than expected / negative statement			Less likely than expected / negative statement		Less likely than expected / negative statement	Less likely for athletics, cricket, football, horse racing, tennis crowds
Associated behaviours: pushing / impatience										
Associated behaviours: tense atmosphere				More likely than expected / positive statement						More likely for football attendees
Associated behaviours: packed / dense crowd			Less likely than expected / negative statement				Less likely than expected / negative statement			Less likely for cricket and horse racing / equestrian audiences.
Contribution to incidents: crowd behaviour				More likely than expected / positive statement						More likely for football attendees
Contribution to incidents: performer behaviour										
Contribution to incidents: fear / threat to safety										
Importance: the crowd										
Importance: socialising with like-minded people				More likely than expected / positive statement						More positive side of neutral for football goers

Importance: event and surroundings											Ambivalence for football attendees
Importance: the weather											Less important overall for football (ambivalent) and cricket goers
Importance: event staff, law, crowd relationship											Less important than expected for football goers
Importance: clear directions and signage											Less important than expected for football goers
Importance: organised movement of crowds											Less important than expected for football goers
Importance: space to move freely											Less important for football goers; ambivalence for rugby attendees
Importance: handling of emergency situations											Less important than expected for football goers
Behaviours experienced: cheering, chanting singing											More likely for football attendees
Behaviours experienced: avoidance of following instructions											More likely for football attendees
Behaviours experienced: avoidance of following rules											More likely for football attendees
Behaviours experienced: fear and panic											
Behaviours experienced: fighting and / or physical violence											More likely for football , golf and rugby attendees
Behaviours experienced: friendly crowd mood											
Behaviours experienced: group 'herd' behaviour											More likely for football and rugby attendees
Behaviours experienced: helpful crowd members											
Behaviours experienced: pushing and impatience											More likely for football attendees; less likely for motorsports
Behaviours experienced: intoxication (alcohol)											More likely for football attendees
Behaviours experienced: intoxication (drugs)											Less likely for athletics , cricket , football , horse racing attendees.
Behaviours experienced: premeditated organised theft											Less likely for football and horse racing crowds
Behaviours experienced: premeditated organised violence											More likely for football and rugby attendees
Behaviours experienced: rivalry											More likely for cricket , football and rugby attendees
Behaviours experienced: rowdiness and boisterousness											More likely for rugby attendees; less likely for horse racing and tennis
Behaviours experienced: rushing or running											Less likely for cricket audiences
Behaviours experienced: sale of drugs											Less likely for cricket and football audiences
Behaviours experienced: sexual assault											Less likely for football and rugby audiences
Behaviours experienced: sexual promiscuity											Less likely for cricket and football audiences
Behaviours experienced: theft (opportunistic)											Less likely for football and horse racing / equestrian audiences
Behaviours experienced: verbal aggression / abuse											More likely for football and rugby attendees
Behaviours experienced: none of the above											
Personal safety in crowds at events											Football attendees more likely to feel comfortable in crowded spaces
Covid-19 impact on attitude change towards crowded spaces											Less likely to impact on football audiences
Attendance influencers: Covid-19 / social distance measures											No influence on football goers
Attendance influencers: coverage of recent crimes											No influence on football goers
Attendance influencers: coverage of recent terror attacks											No influence on football goers
Attendance influencers: crowds and likely congestion											No influence on football goers
Attendance influencers: likely crowd behaviour / mood											
Attendance influencers: heightened security measures											No influence on football goers
Attendance influencers: lack of security / police presence											No influence on cricket or football goers
Attendance influencers: media portrayal of past events											
Attendance influencers: more security / police presence											No influence on football , horse racing ; positive influence on athletics

Attendance influencers: more visible emergency procedures											
Attendance influencers: press releases and public comms											
Attendance influencers: updated H&S info on website											No influence on football goers; positive influence on golf attendees
Attendance influencers: Word of mouth / online reviews											No influence on football goers
Covid-19 influence on perceived safety for future attendance											No influence (weak end of scale) on football attendees

Chi-square test relationships between sports genre and categorical behavioural profile variables

Appendix 10: Synthesised significant findings (both research phases) by objective

Objective	Synthesised Ch 7& 8 Significant Findings	Achieved
<p>01 To create a database of historical crowd incidents at events to document their defining characteristics and outcomes for further analysis</p>	<ul style="list-style-type: none"> • Satisfied. • Crowd incident excel database and thematic framework analysis database of the crowd incident data stored for future reference. • Crowd incident excel database headline findings in Appendix 6, Tables 1-4. • Thematic framework analysis findings integrated throughout chapter 7. 	<p>Yes</p>
<p>02 To analyse audience behaviour at events and the influencing factors involved</p>	<p>Common Attendee Profile</p> <p>Females were more cautious, risk averse and compliant. Males were more negatively influenced by CM and reactive, yet carefree (x²).</p> <p>Attendees were predominantly aged 23-49 (68%). Over one third were aged 20-29 (38%). This may impact on perceptions and outlooks.</p> <p>Confidence in event attendance and safety is likely related to visit frequency. Frequent attenders cited experiencing the most hazards, yet very frequent attendees were less likely than expected to cite experiencing hazards at all. Perhaps an indication of tolerance and acceptance.</p> <p>Regarding scale, while most were frequently attended, small / intimate venues (local) were most frequently visited by event attendees and local scale events were strongly linked to crowd crushes and surges and egress issues in the incident database. Of the event types investigated, only music and sports events achieved sufficient responses to enable full sub-profiling analysis. These event type profiles exhibited specific attitudes, experiences and behaviours, affecting management styles. These are explored in Objective 7:</p> <ul style="list-style-type: none"> • 85% attend music events. Of these, 75% attend rock events and a further 10% attend metal events (Seen as different to rock). Indie (30%), pop (26%), EDM (20%) also common. • 42% attend sports events. Of these, 30% attend football matches (clear dominant sub-profile). Of the rest rugby, cricket, horse-racing, equestrian, motorsports, tennis notable • Being a member of a club or group was significant for metal and rock music, and football attendees, indicating a likely strong social identity. 	<p>Yes</p>

		<p>Motivations and Behaviours</p> <p>Of the top five visit motivations, four of these link to social identity socialising with friends, festive / fun atmosphere, supporting a team / act / individual (important to sports attendees), and camaraderie. Unique to music events was the entertainment and artist appeal. Three of the social identity motives (with the exception of festive atmospheres) also linked to retired attendees. Handling emergencies well was important among respondents to attendance motivations too.</p> <p>Positive behavioural traits experienced recorded highest frequencies of responses overall. Most common were: Cheering, chanting, singing, (linked to expressive, revellous crowds) Friendly crowd moods, Helpful crowd members (resonate with positive social identity and audience empathy)</p> <p>The most common unsafe behaviours noted within safety incidents and by attendees were as follows (in descending order of prevalence):</p> <ul style="list-style-type: none"> • Rushing, running, pushing, impatience • Social identity (emotionally charged, fighting and verbal aggression, group ‘herd’ behaviour, rivalry, riots and protesting) • Deviance, disorder and crime (intoxication, riots, vandalism, mobs, violence/physical abuse, sexual assault, rule/instruction avoidance) • Positive but unsafe behaviours (cheering, moshing, crowd surfing, excitement, emotionally charged, rowdiness / boisterousness) <p>NB intoxication (drugs or alcohol) and emotionally charged atmospheres are known behavioural incident triggers. NB: Some of the above are behavioural outcomes resulting from factors linked to incident triggers, hazards, site influences. Others are linked to the profile of the crowd in attendance (profiles). Some are both NB: Panic, fear, fleeing and / or escaping and performer influence were not significant to the audience survey respondents as experienced behaviours though found to be prevalent factors within the safety incident database. This is most likely due to lack of personal experience.</p>	
03	To identify the audience perspective in relation to CM and control at events	<p>Event env & site</p> <p>Over half of event attendees claimed not to be influenced by site design at all. However, of those who were: Barriers / gates / queuing, audience communication and signage were arguably detrimental to crowd safety. Long waits were seen to trigger frustration and rule avoidance, heavy / rude / aggressive control tactics were felt to trigger crowd trouble and poor layout creates confusion.</p>	Yes

Good site planning and good scheduling seen to be beneficial to safety, as respondents saw value of / compliance with site planning procedures and scheduling encouraged early and staggered attendance / better flow around site

CM Strategies

Handling emergencies, communication and search policies were felt to be most effective generally. Moreover, handling emergencies was important to importance for attendance. Bi—variate analysis shows this is reflective of the significant positive associations recorded for this variable among smaller attendee group types (business, family event and motorsports attendees). The opposite was found to be true of sports attendees, with the exception of motorsports.

Conversely, Drugs and alcohol policies were perceived least effective overall indicating these factors are a key issue for CM at events. Arguably this suggests that more must be done to enhance effectiveness of strategies used to manage drugs and alcohol issues onsite at events.

In terms of how experienced incidents were dealt with, 53% stated adequately, but 27% felt extremely poorly. This suggests potential differences between profiles and perceptions of incident resolution explored further through **Objective 7**. Very few positive responses were received overall, around how the incident was dealt with suggesting contradiction with handling of emergencies being cited as effective above.

Electronic comms was favoured overall (digital, visual / audio). Also (to supplement):

- verbal, mid-event
- written, layout/timing

NB: This suggests the use of apps for wayfinding / updates, e-boards, tannoys, website and social media comms strategies is crucial. Non-verbal methods were perceived least useful except for layout / timing updates as crowds must be able to 'see' the instruction provided via stewards.

Feeling safe

Crowding was not found to be a significant deterrent for the majority. 37% feel comfortable; most of these (28%) crowds as part of the atmosphere but 9% actively seek out crowded spaces to enhance experience. Generally, this links to concept of functional density and potential links to specific crowd profiles as well.

Positive attendance influences (stimuli) were predominantly linked to visibility of CM strategies (emergency procedures, heightened security, social distancing) and strong communication (WOM /online reviews, updated H&S

		<p>info on website, PR and social media comms). The range of findings linked to these strategies appeared to provide reassurance that would be most beneficial for encouraging attendance.</p> <p>Negative attendance influences (deterrents) were mainly linked to the C-19 impact and hesitance about general event safety / security indicating clear communication strategies are required to alleviate fear in addition to crowd spatial planning:</p> <ul style="list-style-type: none"> - poor social distancing and overcrowding - terror attack coverage and a lack of visible security <p>Space per attendee (social distancing) and communication of H&S measures are key for positive perceptions of personal safety related to the C-19 attitudinal impacts (24% & 47% respectively). These strategies appeared to provide reassurance that would encourage attendance.</p>	
04	<p>To determine common types of crowd safety incidents at events and explore patterns in their occurrence</p>	<p>Safety incidents were experienced by over two thirds of survey respondents with common locations linked to the main event area and overcrowding (music events), or the ingress and egress process (sports attendees). The majority (over half) felt they were only dealt with adequately at best, or extremely poorly (over one quarter). As noted within objective 7 findings, sports attendees (specifically football attendees) were positively associated with the perception that incidents were handled inadequately or extremely poorly.</p> <p>Incident Types: Crowd crushes and surges – Causes (catalysts)</p> <ol style="list-style-type: none"> 5. Surges and ‘tramlings’ (linked to pushing, rushing, ingress, egress, panic, fear, fleeing, over-excitement) 6. Crowd crushes (critical density – congestion, capacity, or behavioural – rushing, pushing. Occasionally error, poor procedures) 7. Density (congestion, full / overcapacity flow at peak times, ingress, egress points, general lack of space, bottlenecks, temperature issues) 8. Capacity management (poor capacity management planning, overcapacity in some overseas cases, critical spatial density at peak times. ALL capacity management issues triggered high risk-to-safety incidents – surges, trampling, crushes, structural collapses, fighting/disorder) <p>Incident Types: Crowd-specific – Common traits and catalysts (compiled from attendee experiences and incident observations)</p> <ol style="list-style-type: none"> 1. Event activity – drinking, drug use, queuing and waiting. 2. Disruptive crowd behaviour – boredom, deviance, aggression. 3. Physical crowd behaviour – expressive-but-unsafe behaviours such as moshing, dancing, pushing. <p>Incident Types: External factors – Common traits and catalysts</p>	Yes

		<p>4. Weather (by far most common in safety incidents observed, typically storms / high wind. Also noted as a hazard by attendees)</p> <p>5. Fire (causes - two of three cases due to malpractice)</p> <p>6. Timing Issues and long waits (catalyst for disruptive, reactive behaviours, rule avoidance)</p> <p>Incident Types: Structural failings – Common traits and catalysts</p> <p>5. Temporary structure collapse (most common but not recognised by attendees. Often caused by extreme weather, at major music events)</p> <p>6. Barrier / railing collapse (also prevalent, links to critical spatial density – crowd force and pressure)</p> <p>7. Permanent structure collapse (less cases observed, links to indoor events, sports grounds/stadia, football)</p> <p>Incident Types: Terror attacks – Common traits</p> <p>5. Bombings (most common, only method linked to UK)</p> <p>6. Off-site threat to crowds (cases linked to US, UK and European attacks)</p> <p>7. Shootings (cited in both US and European attacks)</p> <p>8. Vehicular attacks (linked to European attacks)</p> <p>Interestingly there was a low prevalence of triggers such as lack of sufficient exits and temporary structure failings as recognised hazards among attendees, yet both are key contributors in the qualitative findings (surges and crushes at egress and temporary structure failings) suggesting a lack of audience awareness around the potential risks of these hazards due to a lacking experience of these specific issues.</p> <p>Key issues and triggers by event scale: Crowd crushes, surges featured heavily in no. of injured attendees (indoor & outdoor events, all scales). Most often linked to ingress/egress through a node, weather triggering crowds to run for cover. Structural collapse and terror attacks also linked to higher no. of injuries for events across more than one scale. Behavioural causes (deviant plus expressive-but-unsafe behaviours such as moshing, pushing) featured heavily too in observed incidents across all event scales.</p>	
05	To identify common components in CM and event safety planning across a range of events	<p>Visible crowd management strategies implemented</p> <ul style="list-style-type: none"> • Emergency and first response: links to major outdoor music events, indoor sports stadiums, external threats (i.e., terrorism) or extreme weather, critical density or crowd surge / collapse incidents. Approaches included on-site treat centres, security / emergency services collaboration, orderly evacuation procedures, strong staff-to-crowd / staff-to-staff/ staff-to-loved ones communication • Crowd Control (police and security practice): predominantly major sports and music events but also events drawing crowds of BAME profile for hip-hop or racial protesting motives. Methods – dispersal techniques (i.e., pepper spray), segregation techniques (i.e., of home / away football crowds), police barricades or kettling to prevent access or for purposes of containment. 	Yes

- **Onsite safety measures:** mainly links to major scale and extreme weather incidents or health issues (i.e. drugs). Methods – onsite safety testing (i.e., drugs, temporary structures), batch processing of crowds (hold and release), identification of evacuation points, provision of health-based facilities (i.e., medical tent, hygiene stations), staff-to-staff / staff-to-audience communication, supporter segregation arrangements.
- **Show-stop implementation:** observed in music events (predominantly rock, metal or indie crowds) of a major or hallmark scale for reasons such as crowd surges, trampling incidents, disorder or illness. Methods – PA announcements, performer communication (to inform or get crowd to act)
- **Communication:** links to major music and sports events. Approaches were consistent in incident database and survey findings and were two-fold. 1) **messages to the crowd to guide behaviour** (i.e., way-finding apps, big screen messages / updates, PA announcements, front-facing staff to crowd in-person updates, online press releases, social media strategies and signage. 2) **messages to staff / event team to facilitate swift action** (i.e., radio message, non-verbal gestures / signals, control room updates)
- **Crowd control (drugs policy):** least frequently noted but cases linked to EDM events and festivals (regional and major scale). Approaches included drug testing facilities and info dissemination at larger events with a higher risk of attracting those associated with drug taking.

From the audience survey, barriers, gates, queuing and waiting systems (onsite safety measure) were found to be most influential according to over one third of respondents (36.9%), followed by signage, furnishing and facilities (22.1%) and staff to audience communication (20.3%), linked to onsite safety measures and communication above respectively. Moreover, **handling emergencies**, communication (especially digital or audio/visual, plus verbal mid-event and written for layout and timing reasons) and search policies were felt among audiences to be most effective in terms of CM strategies (linked to emergency and first response / show stop implementation above, communication and onsite safety measures respectively). Handling emergencies was important to attendance motivations too.

Drugs and alcohol policies were generally found to be the least effective CM strategies overall, which could be detrimental to event safety, despite this being observed as an evident theme within the crowd incident database. This sentiment was found to be significant for those Under 30 and music attendees.

Observed Organiser Errors in Incident Management

- **Mismanagement (negligence / poor decision making):** links to overcrowding, crowd crushes, critical density. Suggests failure to notice the escalation in seriousness of a dense crowd situation. More occasionally linked to non-adherence to public safety guidelines and practices.
- **Poor site safety:** cases included poor site design (bottleneck, ingress/egress node incidents), poor building safety tests, poor management of pedestrian flow / contraflow on site, poor crowd safety planning (i.e., health or risk of injury issue identification).

		<ul style="list-style-type: none"> • Slow emergency response (failure to act): Links to sports and music events. Delayed / no evacuation decision and crowds in ‘wrong place at wrong time’, or reticence to send emergency services to high risk-to-safety sites. • Poor CM / CC procedures: link to music incidents. Blocked ingress points were most common - resulting overcrowding seen as incident trigger. Also noted – absence of resources useful in emergencies (i.e. fire extinguisher), procedural issues (i.e. lapsed fire permit), risk-averse decision making. • Unhelpful policy / security: links to major sport and music events, critical density incidents, crowd disorder. Perceived in a negative light by crowds. • Lack of visible police / security: least frequently observed but seemingly connected to events of a major scale. No common themes. 	
06	To explore links between audience behaviour, event crises and efficacy of CM strategies	<p>Findings from the audience survey are amalgamated into the RAMP and DIM-ICE analysis conducted for the incident database in blue to show commonality:</p> <p>RAMP analysis findings:</p> <ul style="list-style-type: none"> • Routes. This aspect most commonly affected roads around outdoor events. Especially in terror attacks but also linked to riots and contraflow issues (due to dense crowds). • Areas. Incidents were noted in dense crowds at outdoor events, enclosed indoor venues and at ingress/egress points. • Movement. Issues were primarily linked to fleeing /pushing of fellow audience members and during peak ingress/egress flow congestion. • Profile. Primary profile characteristics seen to contribute to crowd incidents included disregard for safety/rules, and crowd as potential offenders (i.e. terror attacks). Also rushing/pushing, drugs use, panic/ fleeing, fighting/ violence (incidents of this nature were all linked to sports, and predominantly football). <p>Dense crowds consistent with survey findings – bottlenecks, overcrowding and temperature issues were recognised hazards by event attendees linked to critical density).</p> <p>DIM-ICE analysis findings:</p> <ul style="list-style-type: none"> • Design. Poor security measures (mainly ingress, site safety, and capacity) were most prevalent. Exposure to risk of attack at open unsecured outdoor events were also common as were structural collapse issues. • Information. Poor decision making (mostly delayed evacuation calls) was most prominent. Also evident was poor event to emergency services & inter-staff communications. On a positive note however, good drugs education strategies were mentioned twice. Contradictory to survey findings though were this was found to be least effective, significant for the Under 30s and music attendees. • Management. Positive management related factors included cancellations and show stops made, onsite treatment for intoxication / illness (good first response) and audience arrests / bans. Most frequently noted negative management issues (those in blue were associated with survey findings too) were over-capacity events, criticism 	Yes

		<p>for failure to cancel, poor emergency responses, questioned event safety, and heavy-handed police control. Also documented for several incidents each were unsafe ingress and egress processes and failure to protect guests.</p> <ul style="list-style-type: none"> • Ingress. High density congestion through entrance node was most prevalent. Consistent with survey findings – especially sports events. Also noteworthy is observation of good drugs education strategies at the ingress point. Contradictory to survey findings though where this was found to be least effective, significant for the Under 30s and music attendees. • Circulation. Equally most prevalent were incidents occurring inside a venue (indoors events) and in dense crowds at outdoor events. Incidents that occurred during the event schedule on-site (in terms of timing) were also frequently observed. Consistent with survey findings – mainly music events. • Egress. Evacuations were the most prevalent type of egress incident noted (mainly for weather and fire causes). Also noteworthy are incidents linked to fleeing in panic / fear to escape, and dense crowds exiting venue at the same time (peak egress flow congestion, insufficient exits). The last of these was consistent with survey findings – especially sports events. <p>Interestingly there was poor recognition of triggers such as lack of exits and temporary structures as hazards among attendees, yet these are both considered as contributory to incidents above. Arguably it points to a low audience awareness around the potential risks of these hazards due to a lacking personal experience of them.</p> <p>Positive attendance stimuli for feelings of safety among attendees were predominantly linked to visibility of CM strategies (emergency procedures, heightened security, social distancing) and strong communication (WOM /online reviews, updated H&S info on website, PR and social media comms). Incidentally, these aspects were identified through the DIM-ICE analysis as fail points within safety incidents observed.</p> <p>The attendance deterrents identified in objective 3 findings were mainly linked to hesitation about safety / security (terror attack coverage and lack of visible security) and poor social distancing and overcrowding (deterrents for one third and one quarter of respondents respectively). This shows an implied nervousness among respondents about attending when events opened back up again. Findings have also shown that lack of space, density and overcrowding issues are common hazards, triggers and safety incidents recorded. This highlights a strong argument for the emphasis on communication strategies to alleviate fear and crowd spatial strategies (capacity management, spatial planning and site design) as being crucial to feelings of safety related to event attendance.</p>	
07	To classify event risk based on crowd dynamics, as well as internal and	<p>Incident analysis evidence – Preliminary crowd safety incident findings</p> <p>Safety incidents linked to event space were most common across event scales and types. Incidents where situational awareness was not observed primarily involved issues linked to crowd force and profile, resonating with Fruin’s force of the crowd or the crowd pressure (including dynamic aspects such as pushing, rushing and other negative behaviours as documented in objective 2).</p>	Yes

<p>external environmental factors</p>	<p>These findings correlate with the most high-risk incident types and triggers:</p> <ul style="list-style-type: none"> • Indoors events issues & fatalities: High density, poor evacuation and egress procedures leading to crushes, surges, trampling's and asphyxiation (major scale football and local nightclub events) • Outdoors events issues & fatalities: poor capacity management leading to critical density, crushes, surges, and structural collapse, ingress and egress issues, as well as terror attacks • Crowd crushes and surges featured heavily in number of injured attendees at both indoor and outdoor events for events of all scales <ul style="list-style-type: none"> - Most frequently, this was linked to ingress/egress through a node or weather triggering crowds to rush/push for cover. Structural collapse and terror attacks were also linked to higher number of injuries for events across more than one scale • Extremely high no of injuries and fatalities (c.500 or more) were noted at the two cultural mega events (poor capacity management), plus certain types of major scale music (crowd crush, terror attacks) and sports events (structural collapse, crowd surge and terror attack). <ul style="list-style-type: none"> - Approximately half of the music and sports incidents cited recorded fatalities and injuries. • Sports events (aside from the two cultural mega events) recorded the highest death tolls. <p>Unique traits (all scales): Moshing / headbanging behaviour (rock & outdoor music festivals), drugs usage (EDM events), crowd surges & crushes (local scale nightclubs, plus rock, EDM, football, at the local, regional and major scales and cultural events at the regional, major and mega scale). Weather & fire triggers (pop, hiphop, rock, mixed, and country music events, plus football). Deviant behaviours including drugs use, rioting, sexual assault, pitch invasions, hostility and violence (EDM, mixed, hip-hop, football & horse racing events). Structural failings (mixed genre & country music events as well as football events).</p> <p>Incident Profiles by Event Type (Preliminary crowd safety incident findings)</p> <ul style="list-style-type: none"> • Music events: <ul style="list-style-type: none"> • Behaviours: heightened emotions (panic/fear/fleeing, excitement, empathy), physical/ energetic actions (rushing, pushing, moshing), deviance and criminality (drugs and intoxication, riots and disorder, vandalism, sexual assaults), performer influence (at times positive but also found to negatively influence crowd emotions, actions or behaviours to become unsafe and trigger incidents). Strong links for music event profile to expressive and / or deviant behaviours (common across all events scales). • Triggers / catalyts (mainly crowd force, space or profile): predominantly temporary structural failings due to weather primarily or critical density (staging, barriers, platforms, etc), poor capacity management (leading to critical density, crowd crushes, trampling), and external factors such as entertainment timing issues (leading to disorder). 	
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- **Venue scales and traits:** most commonly linked to major outdoor music events (triggered by weather or critical density). Numerous regional (solely linked to EDM events and drugs usage) and local scale incidents too (all nightclub incidents linked to high density, egress/evacuation issues, panic/fear/fleeing or performer error).
- **Sub-profile observations:** hip-hop and urban events (heavy crowd control strategies), rock, metal and indie events (show-stop incidents due to crowd crushes), EDM events (drugs usage, intoxication, fatalities and drug testing facilities)
- **Incident management:** communication, crowd control and emergency/first response strategies were most common. Most common errors were blocked thoroughfares, slow response and overly risk-averse decision-making. To a lesser extent, procedural issues and absence of key resources (i.e. loudspeakers, fire extinguishers – though these were not UK-based incidents) were noted too on several occasions each.
- **Sports events:**
 - **Behaviours:** primarily linked to football incidents. Physical behavioural actions (rushing, pushing, and excitement) were common. Players were influential on crowds (leading to pitch invasions, crowd surges, crowd collapse). Strong social identity manifesting as fighting and rivalry among attendees and gang/mob disorder (this identity was also noted for horse-racing events).
 - **Triggers / catalysts (mainly crowd force, space or profile):** incidents linked to critical density (crushes, surges) and venues being overcapacity (solely linked to overseas sports events) were most common. Permanent structural failings, barrier/railing collapses were closely linked to critical density incidents.
 - **Venue scales and traits:** predominantly linked to outdoor sports events (due to extreme weather and critical density) or major events in stadiums (due to high density, poor evacuation procedures or ingress/egress issues). Very high numbers of injuries and fatalities were observed as the scale of indoor sports event increased.
 - **Sub-profile observations:** local sports grounds (hostility between supporters, mainly football), football and horse-racing events (heavy crowd control tactics, fighting and rivalry, deviant and disorderly thrill-seeking behaviour), structural failings almost exclusive to football (event scale was irrelevant).
 - **Incident management:** crowd control, evacuation, communication, batch processing at ingress, and first response strategies were most commonly observed for sports events. Predominant organiser errors observed were linked to poor management of critical crowd density (blocked thoroughfares, ingress/egress routes, slow response and risk-averse decision making, procedural issues plus unhelpful police or security).
- **Cultural events (including protests and political events):**
 - **Behaviours:** strong social identity / association with a cause – religious (pilgrimage and ceremony attendance) and protest events (to voice concerns i.e. race-related). Initially peaceful and well-intentioned. Religious events affected by critical density (exacerbated by pushing and panic). Protests gathered momentum and media interest to move from peaceful protest to widespread disorder incidents (linked behaviours - riots, emotion, vandalism, cover of anonymity for disorder, opportunism and inflammatory authority intervention)

- **Triggers / catalysts (mainly crowd force, space or profile):** primarily linked to critical density among the crowds in attendance. These capacity management issues were linked to barrier and railing collapses, surges, crushes and trampling. Terror attacks were also noted
- **Venue scales and traits:** issues related to critical density were most commonly observed, for both indoor and outdoor events (i.e. crushes, surges, structural failings, lacking situational awareness, unsafe pushing, and evacuation, ingress/egress issues). Terror attacks were most frequently associated with cultural events (all outdoor).
- **Sub-profile observations:** Protests (regional and major scale) were most often linked to racial subcultural or political motives resulting in deviance and disorder (riots, violence, criminal damage, and rule avoidance). Mega-scale religious events lacked situational awareness of the severity of risk associated with the density, flow and pushing issues experienced (organiser and crowd perspectives).
- **Incident management:** most commonly observed were first response and crisis management strategies (terror attacks), and strategies for managing crowds in disorder (protests). For the cultural incidents linked to critical density, an absence of effective capacity and crowd management strategies was observed suggesting poor situational awareness and a failure to notice the impact of escalating density (severe congestion, escalating density, crushes, poor site design in terms of bottlenecks, contraflow and ingress/egress issues).

The emerging findings linked to event risk based on crowd dynamics and internal and external environment factors are evidenced above in 8.8 and taken forward to be considered in relation to the qualitative findings at the beginning of chapter 9 to contribute to a revised conceptual framework for discussion.

See Table 31, p170: Significant associated relationships and connections between user groups

See Table 36, p199: Initial indication of risk levels by profile / user group