

University of Southern Queensland

Behavioural risk at outdoor music festivals

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Certification of Dissertation

I certify that the ideas, experimental work, results, analyses and conclusions reported in this dissertation are entirely my own effort, except where otherwise acknowledged. I also certify that the work is original and has not been previously submitted for any other award, except where otherwise acknowledged.

.....
Signature of candidate

.....
Date

Endorsement

.....
Signature of Supervisor

.....
Date

Acknowledgements

“One’s destination is never a place,
but a new way of seeing things.”

Henry Miller (1891 – 1980)

An outcome such as this dissertation is never the sole result of individual endeavour, but is rather accomplished through the cumulative influences of many experiences and colleagues, acquaintances and individuals who pass through our lives. While these are too numerous to list (or even remember for that matter) in this instance, I would nonetheless like to acknowledge and thank everyone who has traversed my life path over the years, for without them I would not be who I am today. There are, however, a number of people who deserve singling out for special mention.

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Sumus quod sumus

Opus artificem probat

Abstract

“Safety is not an intellectual exercise to keep us in work.
It is a matter of life and death.
It is the sum of our contributions to safety management
that determines whether the people we work with live or die”

Sir Brian Appleton, after Piper Alpha (1988)

Outdoor music festivals are increasingly common events on the summer entertainment landscape for youth in many countries around the world. Evidence indicates that attendance is associated with an increased risk of injury and death. Crowds are the principal hazard that needs to be dealt with, and without effective management, can become a significant problem with serious consequences. A considerable proportion of the safety risks associated with outdoor music festivals can be attributed to anti-social, irrational and unsafe behaviour by patrons. Encouragement of such behaviour has, to some extent, been a deliberate strategy on the part of music promoters and press agents, resulting in patrons attending music events becoming more aggressive and violent.

While there is endorsement in the literature for a risk management approach, risk assessments for music festivals and mass gatherings generally tend to deal with the traditional hazards and risks, without taking into account the dynamics of the crowd or those factors that influence its behaviour. Influences on crowd behaviour are little understood and generally ignored, leaving a significant source of risk at this type of event unaccounted for. When managing risks at outdoor music festivals it is important, therefore, to understand the nature of the crowd demographic attending the event and the factors that impact on and shape the behaviour of the crowd.

A number of attempts have been made to develop an appropriate method for assessing crowd safety at mass gatherings. While these approaches provide traditional (albeit contextualised) and contemporary approaches, none address the issue of behavioural risk. This dissertation outlines a model which draws together the various influences on individual behaviour which, mediated by theories of social psychology are translated into collective crowd behaviour and uses the model to ground the development of an instrument to monitor and assess behavioural risk at outdoor music festivals.

Publications

The following presentations of a number of findings from the research conducted for this study have been made and published in the following proceedings and publications:

Raineri, A (2014) Monitoring and assessing behavioural risk at outdoor music festivals – A model and instrument to facilitate the assessment of crowd safety at outdoor music festivals, Paper presented to the 1st Annual CQU Transport and Safety Sciences Conference, October, Rockhampton.

Raineri, A (2013a) Outline of the development of a model to facilitate the assessment of crowd safety at outdoor music festivals, Paper presented to the Safety Institute of Australia *Safety in Action 2013, Brisbane Safety Show*, June, Brisbane.

Raineri, A (2013b) Contextualising risk assessment – incorporating the psychosocial dimension in assessing crowd safety risks at outdoor music festivals, Paper presented to the Safety Institute of Australia *Visions Conference 2013*, October, Cairns.

Raineri, A (2013c) A model to facilitate the development of an appropriate risk assessment methodology and instrument for crowd safety at outdoor music festivals, Paper presented to *SAFE 2013, the 5th International Conference on Safety and Security Engineering*, Rome, Italy, September. In *Safety and Security Engineering V*, Wessex Institute of Technology: WIT.

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CHAPTER 1

INTRODUCTION

‘Begin at the beginning,’ the King said gravely,
‘and go on till you come to the end; then stop.’
Lewis Carroll, Alice in Wonderland (1865)

Chapter Outline

1. Introduction
2. The issue under investigation
3. Aims and objectives of the study
4. Formulating the research questions
5. The dissertation framework and format
6. Outline of the dissertation
7. Summary

1. Introduction

Outdoor music festivals are increasingly common events on the summer entertainment landscape for youth in many countries around the world. These events are usually held in large public facilities such as parks, stadia or show grounds. Attendances range from some 450 000 people at the largest single event in Canada, *Toronto Rocks* (Feldman et al. 2004) to a few thousand people at smaller events such as the *Valley Fiesta* and *Laneway Festival* in Brisbane, Australia.¹ There is considerable variation in the type, size and duration of these festivals. Examples of single-day events include *Soundwave* and the *Big Day Out* in Australia, while the *Woodford Folk Festival*, *Splendour in the Grass* and *BluesFest* in Australia, the *Glastonbury Festival* in the UK and the *Roskilde Festival* in Denmark are held over a number of days. In Australia, the major festivals such as *Big Day Out*, *Soundwave* and *Future Music* hold events in each major capital city. Music styles vary, and include world music, country, folk, pop, heavy metal, punk and combinations of all these genres.

¹ Outdoor music festivals are a sub-set of mass gatherings worldwide, the capacity of which varies widely, with reports of some having as many as 2 million people in attendance (Costa 2002:482).

Evidence (Dickie 1993; EMA 1999; DoH 2004, p. 76; Earl, Parker & Capra 2005; CMS 2000:1, 2001a:1 and 2002; Hughes 2005; Hughes and Lee 2006) indicates that attendance at outdoor music festivals is associated with an increased risk of injury and, in extreme cases, death. A considerable proportion of crowd-related risks are attributed to irrational and high-risk behaviour by patrons, especially in the general admission or standing-room-only areas in front of stages, or ‘mosh pits’² (Milsten, Seaman, Liu, Bissell & Maguire 2003). Statistics indicate that ingress and egress are also problematic phases of an event. The likelihood of problems in crowds is also increased by disruptions to movement flows and reactions to perceived risk or competitive rushes.

Awareness of these risks was highlighted in Australia by the death of a patron from a crowd crush in the mosh pit at the annual *Big Day Out* event in Sydney in 2001. The young girl died from compressive asphyxia in a crowd crush as patrons pressed against the stage barrier during a performance by the American band, *Limp Bizkit*. This fatality occurred soon after a similar crowd crush incident at the *Roskilde Festival* in Denmark in 2000 in which 5 patrons were killed during a performance by the American band *Pearl Jam*.

Following these incidents, the author was engaged by the promoters of the *Big Day Out*, the biggest outdoor music festival in Australia, to implement operational compliance measures to ensure the risk of injury to workers and patrons was controlled during preparation (‘build’³ and ‘bump in/bump out’⁴) and at the event itself⁵. In accordance with developments overseas, as part of new and improved safety measures, the promoters banned dangerous activity such as crowd surfing⁶ and stage diving⁷ and introduced a second (or ‘D’) barrier⁸ in front of stages to assist in controlling patron numbers in mosh pits.

² A mosh pit is the area immediately in front of a stage, normally extending out some 30 metres or so.

³ This phase involves the erection and subsequent dismantling of temporary structures such as stages and marquees and the preparation of all other necessary infrastructure for the event.

⁴ This is the phase when production crews outfit the stages with sound, lighting and special effects equipment.

⁵ The author has been retained by the *Big Day Out* Festival each year since then and by the *Soundwave Festival* since 2008. The author has also undertaken similar assignments for the Brisbane *Livid Festival* (2001-04), *Valley Fiesta* (2002-04) and Queensland *Schoolies Week* (2004).

⁶ Crowd surfing has been described as ‘another recent phenomenon related to the activities of the mosh pit where someone will jump from the stage into the audience and is carried over the heads of the group’. Alexander J. Drago, Assumption of Risk in the Arena: On the Field and In the Mosh Pit, What Protection Does It Afford?, 13 *Ent. & Sports L.* 3 (1995). Individuals hoist themselves above head height of the crowd and then surf (or roll) around supported by the crowd, normally towards the stage.

⁷ Stage diving is ‘the act of diving into the crowd from the stage by the fans and/or band members. The idea is for the crowd to catch the individual and body pass them toward the sound board’. See *About, Stage Diving*, at <http://www.teenmusic.about.com/library/glossary/bldef-stagediving.htm> (last visited Oct. 16 2001).

⁸ This is a barrier shaped like the letter D, which allows a controlled flow of patrons into the mosh pit area.

These developments, which are considered to be current industry best practice, have flowed through to other festivals, both in Australia and internationally, to the point where they are 'de rigueur' at the majority of outdoor music festivals. Although effective to a large extent, these represent *single loop* solutions⁹ and it soon became apparent that the one factor with the greatest potential for serious injury and death, namely the behaviour of the crowd itself, was little understood and largely neglected in event planning.

Initial research led the author to develop a paper which was presented at the Safety Institute of Australia's annual *Visions Conference* in 2004 (Raineri 2004) and to co-author an article in the *Australian Journal of Occupational Health and Safety* in 2005 (Raineri & Earl 2005). These papers, which are contained in Appendices 11 and 12 of the Learning Portfolio (Appendix A), reflect the beginning of a continuing interest in, and almost singular obsession for, developing an appropriately contextualised method to monitor and assess crowd-related safety risks and assist promoters and organisers to plan proactively for safe concerts.

Sections 1 and 2 of this chapter introduce the topic which is the subject matter of the study and briefly outline the issue to be resolved; namely, how to improve planning for, and monitoring and assessing behavioural risk at outdoor music festivals. While festival promoters and venue owners and/operators generally adopt a risk management approach to planning, evidence suggests that current efforts are insufficient due mainly to a lack of understanding of the influences on crowd behaviour and a lack of appreciation of the risks involved. Sections 3 and 4 set out the aims and objectives of the study, which are to develop an appropriate method to monitor and assess behavioural risks at outdoor music festivals. Research questions are developed which are aligned to and further these aims and objectives. Section 5 then sets out an explanation of the dissertation framework and format and its rationale, section 6 outlines the content of each chapter and section 7 provides a summary of the matters covered in this chapter.

⁹ Argyris and Schön (1978, p. 2) suggest that where something goes wrong, a starting point for many people is to look for another strategy that will address and work within the governing variables. In other words, given our chosen goals, values, plans and rules are operationalised rather than questioned. According to Argyris and Schön (1974), this is *single-loop learning*.

2. The issue under investigation

Minimising adverse health and safety impacts at outdoor music festivals is important to the delivery of successful events. Studies by the UK Consumers' Association (1993, 1995) and official inquiries into the King's Cross fire (Fennell 1998), Hong Kong disaster (Bokhary 1993) and Hillsborough disaster (Lord Justice Taylor 1989, 1990) all identified inadequate planning as a major contributory factor to inadequacies in crowd safety at mass gatherings. Wertheimer has suggested (1993, 2000a, 2001, 2002) that the majority of deaths and injuries that have occurred at festivals could be linked back to poor event planning. He comments that while incidents at concert events have changed over time, in his view the one issue that remains consistent is that '...too many concert promoters and facility managers act as though they are operating in the Wild West – free to call the shots and make the rules up as they go' (1993, p. 1). Wertheimer further endorsed these sentiments with similar comments in 2 subsequent reports on crowd safety some 10 years later (2003a and 2003b), indicating that he considered little had changed over that time.

In addition, considerable variations and inconsistencies in event planning have been reported (Arbon 2004, p. 210; EMA 1999, p. xiii). Many event organisers rely too heavily on previous experience when planning their events (Au et al. 1993). This method is often ill-structured, piecemeal and ad hoc (Au et al. 1993) and could explain deficiencies in specialist areas such as risk management (Weir 2002) and emergency planning and response (Davis 1998; EMA 1999; Wertheimer 1993). Past disasters and a number of studies (e.g. Au et al. 1993; Harvey 1993) have shown that this approach to crowd safety planning is inadequate.

The published literature in the area of crowd-related safety risks at outdoor music festivals, although limited, strongly suggests that enhancing event management, particularly event planning, will result in considerably improved safety outcomes (see, for example, EMA 1999, p. xiii; HSE 1996, p.6; FEMA 2003). Martin (2003) suggests that even moderate but diligent planning is enough to provide noticeable increases in safety for patrons attending outdoor music festivals.

The importance of planning is also well acknowledged by many other commentators (see, for example, Malhotra 1987; Committee on Public Safety and Crowd Control 1990; Home Office and Scottish Office 1990; Health and Safety Commission et al. 1993; Wanless & Stanton 1994; Au & Carey 1994). In its report to the City of Cincinnati in Ohio, USA, the

City of Cincinnati Task Force on Crowd Control and Safety (1980) explicitly recommended that the city should require crowd management plans for events attracting 2000 people or more.

There are a number of examples of the association between event planning and safety outcomes. For example, Pretell (1997) reported that poor organisation led to five deaths at an event when an open auditorium with a capacity of 20 000 was filled with 100 000 people. Similarly, there was a death, 140 injuries and environmental damage to Brighton Beach, England, when 250 000 people attended an event where 60 000 people were expected (Hill 2003). A lack of emergency response contributed to 53 deaths while people were attempting to escape from a hailstorm at one event (Wertheimer 2000). Upton (1995) reviewed an incident where three patrons were killed and found that there had been insufficient consideration of crowd dynamics, contingency planning, systems design, crowd management, communication, and command and control procedures. In particular, there was no risk assessment undertaken as part of the event planning process (Upton 1995, p. 6). In their analysis of the Love Parade crowd disaster in 2010 in Duisberg, Germany, at which 21 people died and 500 were injured, Helbing and Mukerji (2011) show how inadequate planning at a 'greenfield' site was a major cause of the incident. Organisers and authorities failed to recognise and appreciate the risks of streaming a large mass of people through a single entry and exit point.

An effective planning system for health and safety requires an organisation to control risks and react quickly to changing demands (HSE 1997a). Hislop (1999) maintains that the underlying cause of most 'safety-related losses' is the 'absence of a systematic process to identify and mitigate workplace hazards and unsafe work practices'. In order to control risks, it is necessary to identify and assess the risks in the first place. In order to react to changing demands, planning and risk assessment should not be based on past experience alone but should also predict what problems could arise.

2.1 Planning based on a risk management approach

Consequently, there is considerable endorsement in the literature for a risk management approach to event planning for outdoor music festivals (Department of Health [DoH] 2004; Emergency Management Australia [EMA] 1999; Federal Emergency Management Association [FEMA] 2003; Health and Safety Executive [HSE] 1999). Risk management:

...involves managing to achieve an appropriate balance between realising opportunities for gains while minimising losses. It is an integral part of good management practice and an essential element of good corporate governance. (Foreword to the *Australian/New Zealand Standard for Risk Management AS/NZS 4360:2004*).

It is an activity that seeks to eliminate, reduce and generally control pure risks¹⁰, enhance benefits and avoid speculative risks¹¹ (Waring & Glendon 1998). The strength of risk management is that it provides a systematic approach to the identification of hazards and the management of risks. It is a well-established method currently applied in many contexts. Experience has shown that it is an invaluable aid to decision-making and provides a credible solution to the problem of insufficient planning.

Risk has been conceptualised and defined in a number of ways. Kirchsteiger (2005, p. 34) defines risk as the ‘possibility that technological activities or natural events lead to consequences that affect what humans value’. The (former) Australian/New Zealand Standard for Risk Management, *AS/NZS 4360:2004* defined a risk as ‘...the possibility of something happening that impacts on your objectives. It is the chance to either make a gain or a loss’. The revised risk management standard, *AS/NZS/ISO 31000:2009* defines risk even more broadly as ‘the effect of uncertainty on objectives (whether positive or negative)’. Health and safety analysts, however, generally understand risk as a measure of the probability and the severity of loss or injury (Kinchin 1982; Whipple 1986)¹². Dunster (1985) refers to it as the probability of a specified adverse event or consequence, and the Royal Society Study Group on Risk (1983 and 1992) also defined risk as ‘the probability that a particular adverse event occurs during a stated period of time, or results from a particular challenge’.

¹⁰ Pure risks are those associated with hazards such as health, safety, environment and security. These risks can be eliminated, reduced or controlled - ultimate success results in zero exposure and no harm can result.

¹¹ Speculative risks, on the other hand, are associated with business, finance, investment, human resources, IT strategy and politics, and success is always relative to that of the economy as a whole, the market sector, competitors and the power attributes of others.

¹² Even the former Australia/New Zealand Standard for Risk Management (*AS/NZS 4360:2004*) acknowledged that ‘[risk] is measured in terms of likelihood and consequence’.

In the health and safety context, risks arise from hazards, and a hazard can be thought of as something that has the potential to cause harm, such as an item, a substance, an activity, a process or an adverse event (HSE 1992; WorkCover 2001, p. 137). The British Medical Association (BMA) (1987) defines a hazard as ‘a set of circumstances which may cause harmful consequences’. The Australian WHS *How to Manage Work Health and Safety Risks Code of Practice 2011* (p. 5) defines a hazard as ‘a situation or thing that has the potential to harm a person. Hazards at work may include noisy machinery, a moving forklift, chemicals, electricity, working at heights, a repetitive job, bullying and violence at work’, and risk in this context as ‘...the possibility that harm (death, injury or illness) might occur when exposed to a hazard’.

Managing risk involves identifying hazards and evaluating the likelihood that harm will occur and its severity (or the extent of the risk) (HSC 1992). Based on this principle, the HSE (1994 and 1998) developed an approach for risk management comprising the following five steps:

- Look for hazards
- Decide who might be harmed and how
- Evaluate the risks and decide whether existing precautions are adequate or if more should be done
- Record the findings
- Review the assessment from time to time and revise it if necessary.

Clear risk identification and assessment and subsequent risk minimisation actions are fundamental for effective safety risk management (Kirchsteiger 2005). In ideal risk management, a prioritisation process is followed whereby the risks with the greatest loss and the greatest probability of occurring are handled first, and risks with lower probability of occurrence and lower loss are handled in descending order. In practice, the process can be very difficult, and balancing between risks with a high probability of occurrence but lower loss versus a risk with high loss but lower probability of occurrence can often be mishandled. The *Australian/New Zealand Standard for Risk Management AS/NZS 4360:1999* (now updated and superseded by *AS/NZS/ISO 31000:2009 Risk management – Principles and guidelines*) is recommended for the assessment of crowd safety by Tatrai (2001), an Australian event and crowd management specialist, who argues that its robust process and good guidance notes make it an ideal choice.

Risk assessment is the central component of risk management. Essentially, it is a systematic and structured way to identify hazards and evaluate their risks. It is a proactive approach that enables planners and decision makers to examine the overall situation (rather than narrowly focusing on specific issues alone), to determine what problems could arise and to put them into perspective so that efforts and resources can be applied to those problems that require more attention. Risk assessment is a process that enables people to seek answers to the following questions:

- What are the hazards?
- How likely is it that people will be harmed?
- What harm could occur and how many people might be affected?

The idea of a risk assessment is that by answering these questions, people will have a better understanding of the safety problems. They will then be in a better position to make more informed and more rational decisions. By providing a more rational basis for decision-making, a systematic risk assessment can help to improve planning.

At a formal level, risk assessment adopts an analytical approach to uncertainty through a rationalistic methodology. Approaches fall into two categories – quantitative risk assessment (QRA) and qualitative risk assessments. Quantitative Risk Assessment (QRA) techniques estimate risks numerically on a scale from zero (i.e. impossible) to one (i.e. certain) of the degree of confidence in the occurrence of an (adverse) event. They are used especially in situations where there is insufficient risk data. Often, these estimates represent no more than a complex set of expert judgements based on various factors, such as failure rate of engineering system components, obtained through repeated tests and past statistics. This type of approach is used mainly in the nuclear (HSE 1992a), railway (HSE 1994c) and other high hazard industries.

In qualitative risk assessment, probabilities and risks are expressed as a rating and in terms of ranking rather than as numbers. Since the introduction of the *Management of Health and Safety at Work Regulations 1992* in the UK, qualitative risk assessment has become more widely used in the health and safety field. It has even been applied to high hazard industries, where QRA is traditionally used, for ‘lower hazard’ aspects of their operations.

2.2 Identified weaknesses in risk assessment for crowd safety

In 1993 the UK Health and Safety Executive (HSE) highlighted the issue of crowd safety at public entertainment venues (Graham 1993) by publishing a report (Au et al. 1993) that recommended a qualitative approach to risk assessment. The report suggested that a numerical figure could be applied to the likelihood of an accident occurring and the consequences, in terms of severity of injury, if it did. The resulting risk factor, established by multiplying the likelihood figure by the consequence figure, could then be interpreted as high, medium or low risk.

Commentators (e.g. Upton 2004; Still 2013, 2014) point to a number of shortcomings with this approach especially in assessing behavioural risks at mass gatherings and at music festivals in particular. The first relates to the nature of risk and its variable interpretation. In 1996, Toft published a critique of the limits of mathematical modelling of disasters, in which he argued that individuals create their own sets of criteria against which risk is interpreted. In other words, individuals perceive risk subjectively and, therefore, differently¹³. He notes (1966, p.101) that:

Risks perceived by a given society or individual are not objective but subjective, consequently the whole notion of an unbiased objective approach to quantitative risk assessment is undermined. For, if the assessment of risks is subjective (ie: the probability and magnitude of risk only exists in the mind of the beholder), then it is not possible for anyone to take objective measurements of a risk as one would a physical phenomenon.

Awarding a numerical figure, therefore, becomes the personal opinion of the assessor rather than a scientific system of measurement. Another assessor might have a different opinion and, therefore, award a different number to the same activity. An added complication is the fact that an assessor may introduce any form of numbering they choose as there is no mandatory requirement to use the recommended system. Predictably, this can result in enormous confusion and complete misunderstanding by different persons of the risk assessment results.

¹³ For example, some people enjoy so-called dangerous sports while others regard them as high-risk actions bound to lead to serious injury or even death. This is not to imply that the participant in a high-risk sport is unaware of any associated risk; rather that they feel they are in control and, therefore, able to manage this risk.

Secondly, while risk assessment has been successfully applied in many workplaces, ranging from high hazard industrial plants to the office environment, its application to crowd safety is rare. Silvers (2005) suggests that this is due largely to a lack of specific guidance in the area:

...although communities of practice recognise the importance of risk management as a core competency, few event-specific resources exist to fully prepare and assist event organisers. There is a great deal of guidance on risk management available; not, however, adapted to the unique characteristics and conditions of planned special events...

This lack of guidance may well be attributable to a lack of understanding of the influences on crowd behaviour and a lack of appreciation of the risks involved. A study by Au et al. (1993) suggests that the level of appreciation that public venue owners have of crowd safety risks is often affected by:

- whether or not there were disasters or major incidents that took place in similar venues
- experience of the venues (i.e. were there any significant problems, injuries and near misses in the past)
- whether the venue owners and/or operators perceive visitor numbers as 'excessive'
- the level of public/media attention the venue tends to attract.

The study by Au et al. (1993) also found that there was a difference in understanding and degree of appreciation towards crowd safety across the management hierarchy in most venues. It found that operational staff, who have to deal with crowds regularly, tend to appreciate the potential dangers more than senior management. With smaller incidents and instances of near misses not recorded or brought to their attention, senior managers may form the belief that since crowd safety problems have never happened before, they will not happen in the future. Where small incidents are recorded, there is still a danger of senior management dismissing them as something that is a natural and unavoidable consequence of operations. The Kings Cross Station disaster in 1987 in London was caused by an escalator fire. The subsequent inquiry by Fennell (1988) revealed that escalator fires had occurred in other underground stations before. This was a hazard that was known to London Underground but the company's management failed to appreciate the risk of crowd panic and did not take any actions that could have prevented the disaster.

Another reason for the lack of appreciation of crowd safety risks stems from a preoccupation with other issues, resulting in a particular mindset developing as a result. For example, it was reported that at the time of the Hillsborough Football Stadium disaster in 1989 in the UK, the police were more concerned about public order than public safety (Lord Justice Taylor 1990). The police apparently had their mind set on crowd disorder and football hooliganism and, as a consequence, failed to identify overcrowding as a potential problem (Lord Justice Taylor 1990). As a result, the initial exodus from the overcrowded stands was seen as a pitch invasion by the senior officers in the control room.

Risk assessments for music festivals and mass gatherings generally tend to deal with the traditional hazards and risks found at most workplaces, without taking into account the dynamics of the crowd or those factors that influence its behaviour. Upton (2004, 2008) suggests that while it is possible to measure some risk using a traditional model (such as space, pedestrian speed and flow, the integrity of buildings and temporary structures, tolerance levels, venue design, staff training and communications), a purely quantitative approach is insufficient to predict human behaviour. Even though the physical hazards and risks associated with staging an outdoor music festival are usually well managed¹⁴, influences on crowd behaviour are little understood and generally ignored, leaving a significant source of risk at this type of event unaccounted for. As Upton (1999, pp.3-4) notes:

A common practice is to appoint a safety officer or health and safety co-ordinator to music events. They tend to look at trip hazards and steps and so forth. But the crowd itself is a mystery to them. If a risk assessment on an event is just based on the floor and the surrounding structures, then the most important question of all has not been answered: Who is looking after the crowd?

Current methods, therefore, have been inconsistent (Arbon 2004) and often ineffective (EMA 1999) and, as a consequence, the quality of risk assessments at outdoor music festivals, both in Australia and internationally, has been heavily criticised (Weir 2002; Upton 1999, 2004, 2008; Wertheimer 1993).

¹⁴ Even this is questionable, though, in light of a number of stage collapses at live music events around the world in the last 2-3 years: see Event Safe Alliance website www.eventsafetyalliance.org.au.

2.3 Suggestions for improvement

Insufficient attention to the way that people behave in a crowd, and the relationship between behaviour and systems design, are major factors in crowd disasters (Sime 1993). Since human emotions are at play here, understanding and accounting for the variables that can influence the psychology of a crowd, and the extremes of behaviour that can result, become equally as important as understanding the laws of dynamics.

Without understanding crowds and crowd behaviour, Berlonghi (1995) argued that we are left with random attempts at crowd control and crowd management which may result in serious losses of life, health, property and money. He emphasised that those involved in crowd management and crowd control must foresee the nature of the crowd that will be in attendance, and must be able to observe the behaviour of a crowd while an event is taking place and make timely decisions for effective action. Problems can arise if we do not foresee and prepare for a variety of crowd situations. Upton (2004a) suggests that a risk assessment relating to crowd safety at a contemporary concert event that is based solely on quantitative measurements is fundamentally flawed, and advocates for the inclusion of a qualitative dimension which allows promoters and venue owners and/or operators to ‘...predict the changing psychology of the crowd behaviour during the stages of ingress, attendance and egress’ (p. 7).

Research on crowd behaviour in Australia, the UK, the US and Denmark indicates that in addition to physical factors linked to the venue itself (such as overcrowding, inadequate emergency planning, hot, humid air temperature, ‘pinch’ points, under-staffed entry, exit, and/or ticketing points, security capacity and the use of general admission areas) and the environment (such as inclement weather, extremes of temperature and the availability of alcohol), behavioural and cultural factors influencing crowd safety include crowd size (particularly its density) and demographics, music genre, performer attitude, intoxication and crowd expressiveness. In planning for crowd safety management, both the HSE (1999, p. 7) and Upton (2004a, p. 4) have indicated that knowledge of the crowd demographics and behaviours is important for both design and operational features for outdoor music festivals. In addition, the HSE (1993) argues that event organisers and promoters should also be aware of the history of the performers selected and the types of audiences they attract.

The need to include a behavioural frame of reference in planning for outdoor music festivals can be traced back to the emergence of rock n' roll culture in the United States during the mid-1950s which, from the outset, was promoted as an anti-establishment youth culture that deliberately encouraged a demonstrative response from a crowd. Support for this argument can be found in the actions of a youth culture that now accepts irrationality in the form of moshing¹⁵, skanking¹⁶, pogoing¹⁷, crowd surfing¹⁸ and stage diving¹⁹ as normal cultural behaviour at this type of event. The crowd at an outdoor music festival accepts such activities as normal in spite of the fact that each has the potential to cause a lateral or dynamic surge, a crowd swirl²⁰, crowd collapse or localised high density, all of which have the distinct possibility of subjecting patrons to a dangerously high-pressure load (Upton 2004a).

The need for a more comprehensive approach is evidenced by continuing injuries and fatalities occurring at major mass-gathering events, including outdoor music festivals. In July 2010, 21 young people lost their lives at the *Love Parade Music Festival* in Duisburg, Germany, following a panic as crowds streamed through a single jammed, and clearly inadequate, entry tunnel. Later in 2010, 350 people lost their lives in Phnom Penh, Cambodia, on an island in a river, as a panic-stricken crowd, who had been celebrating the end of the rainy season, tried to flee over a bridge. Most recently, a New Year's Eve 2014 stampede in Shanghai left 36 people dead. In each of these instances, little or no prior planning, and little or no understanding of crowd dynamics and behaviour, was evident.

¹⁵ One person defined moshing as 'a form of "dancing" in which concert-goers hurl their bodies against each other'. Kimball Perry, Metallica, Man Settle Moshing Injury Lawsuit, *Cincinnati Post*, Nov. 2, 1999, 1999 WL 21783092. Similarly, others have described moshing as 'anarchic dancing during which music fans often forcefully thrust themselves into one another', Maureen Krislov, Rock in a Hard Place: Determining Mosh Pit Liability at Concerts, *Ent. L. & Fin.*, Dec. 1995, at 3, and as 'demolition dancing', Bill Douthat, Concert Dangers Draw Lawsuits, *Palm Beach Post*, July 17, 2000, 2000 WL 24028557. It is sometimes referred to as 'slam dancing'.

¹⁶ This is where crowd members dance around in a circle similar to a tribal dance, and can be a prelude to moshing or crowd surfing.

¹⁷ This is the act of jumping up and down in the one place.

¹⁸ This is when individuals are hoisted up over the crowd and passed to the front of the stage.

¹⁹ This is when performers or members of the public dive off the stage and into the crowd.

²⁰ This is where crowd members run in a circular motion drawing more patrons in, thereby causing a whirlpool effect.

3. Aims and objectives of the study

In 2008 the Civil Contingencies Secretariat of the UK Cabinet Office, as part of its civil protection literature and guidance program, commissioned the Socio-Technical Centre at the University of Leeds to undertake a project to examine existing academic research and practitioner views on crowd management. The extensive five-volume report (Challenger & Clegg 2009) is the first to draw together both practitioner and academic knowledge and expertise to produce a single, comprehensive guidance source.

The report provides a comprehensive set of good practice guidelines for crowd events and management and for emergency situations and evacuations. It also provides guidelines for simulating crowd behaviours as a useful tool to aid event preparation. In addition, it identifies a number of significant gaps in the research, and recommends (Challenger & Clegg 2009, Second Report, p. 96) that one clear priority for further research is:

to develop a rigorous risk assessment tool that can be used by all those involved with planning for and managing events and circumstances involving crowds. The aim would be to develop and deploy a new tool that would enable its users to identify systematically the risks involved with differing crowd events.

In addition, the report recommends (Challenger & Clegg 2009, Second Report, p.96) that:

It is important that the risk assessment tool is developed with the help of its potential users, to ensure it is both user friendly and fully meets their various needs.

The study reported in this dissertation responds to this call to address the research and practice gap by developing a contextualised and user-friendly method to monitor and assess behavioural risk at outdoor music festivals that integrates behavioural and psychosocial factors with the ‘hard’ laws of dynamics. In particular, the aims and objectives of the study are:

- (i) to show how risk assessment can best be applied to crowd safety
- (ii) to investigate and explore, through the identification of relevant hazards and risk factors, how crowd safety risk assessment can be improved
- (iii) to determine whether such a method, which takes into account the specific nature of crowd safety risks, will affect the approach taken by crowd safety assessors, thereby leading to improved planning for outdoor music festivals.

4. Formulating the research questions

Outdoor music festivals are usually held in large public venues such as parks, stadia or showgrounds. A public venue is a place where members of the public are admitted and where crowds of people can gather. It may open regularly, occasionally or on a one-off basis only, and it may be open to any members of the public or to invited guests only (i.e. fee paying or non-fee paying). A public venue could be in a privately-owned property or on public land. It could be indoor or outdoor, purpose-built or adopted, fixed or transient. There are many types of public event venues, ranging from relatively small places such as clubs, hotels and function halls to major venues such as exhibition halls, stadiums, leisure parks, fairgrounds, etc. Safety problems exist in public venues just as they exist in other places.

However, common sense suggests that the higher the number of people gathering in one place, the bigger the problem is likely to be. A loose cable across the floor, for example, presents a tripping hazard regardless of whether this takes place at home, in the workplace or in a public venue environment. But in a public venue, more people are likely to walk past it and, therefore, more people could trip over it. Therefore, general safety hazards such as these often present a bigger problem in a public venue than in other places. The busier the venue is, the bigger the problem is likely to be.

In addition, the gathering of large crowds in public venues presents safety problems that are not normally encountered in other places. Excessive crowding, for example, is one such problem that could arise purely from the presence of a large high-density crowd. It can affect the safety of individuals, as individuals could get pushed or crushed against a gate, or the crowd as a whole could be affected – crushing, people getting trampled, and/or a pile-up of people occurring. Moreover, members of the public are less subject to the disciplines that would be expected of a trained workforce.

A catalogue of past disasters and inadequacies (see Chapter 4) shows that failure to ensure crowd safety can result in significant problems that threaten the safety and well-being of visitors to public venues and events. In the UK, the Hillsborough disaster in 1989 highlighted to the public the dangers of overcrowding. Its inquiry, and the prosecutions that followed, also brought to the attention of many venue owners and their managers the importance of ensuring crowd safety.

Although the football industry in the UK (especially the higher division clubs) has since applied many of the Taylor recommendations and made efforts to improve crowd safety on the ground, crowd safety provisions in many venues remained inadequate some years after Hillsborough, as highlighted by the findings of two studies commissioned by the UK Consumers' Association. The first study was carried out between 1990 and 1991 (Consumers' Association 1992; Harvey 1993), the second in 1994 (Consumers' Association 1995). In both cases, crowd safety inspections of a number of indoor and outdoor public venues throughout the UK were carried out by safety experts. In the second study, preplanning was also discussed with management in order to judge the level of consultation that had taken place before the event. A total of 19 venues were covered in the studies, including concerts, matches, motor racing, shows and firework displays.

Although on the whole the studies found a good standard of safety at many of the venues, a catalogue of problems was revealed, including:

- inadequate means of escape, blocked emergency routes and locked escape doors
- poor maintenance of some constructions
- building design pre-dating modern standards
- too much reliance on good stewarding or policing to prevent crowd safety problems
- inadequate separation of vehicles and pedestrians
- dangerous crowd bottle-necks and obstructions
- serious deficiencies in electrical safety, fire safety provisions and marquee layout.

The findings of the Consumers' Association studies were particularly critical of one-off events held at sites not normally used for that purpose. In some venues, the inspections revealed what the study reports describe as 'serious shortcomings' and 'instances where safety lacks could have cost lives'.

4.1 Improving crowd safety

Crowd safety problems are different in many ways to those found in other industries and workplaces. Consequently, the conventional methods of problem identification and assessment via testing, performance review and/or failure data are not always suitable. The fundamental difficulty is that there are no reliable ways to test and validate any crowd safety plans and provisions before implementation.

Conventionally, the development of products or services is aided by testing and a continuous process of analysis, revision and re-analysis. For example, in medical research, a new drug can be tested through laboratory analyses, animal experiments and, eventually, trials involving human subjects. In the motor industry, crash tests can be used to test the safety features of their vehicles under different collision scenarios and identify areas for improvement. In engineering, new designs can be evaluated through testing the key components and by conducting trials on the entire system under actual or simulated conditions. In all these cases, once the products or services are launched, their performance can be monitored and information on failures, accidents and mishaps can be collected. This data can then be fed back for improving the products and for future research and development. But none of these approaches can be applied to assessing crowd safety (particularly for one-off events) because of two main reasons.

Firstly, there are little or no means of properly testing crowd safety. Field trials are often expensive to run, disruptive to venue operations if actual visitors are involved and, more importantly, could expose the participants to dangers and unacceptable risks. Occasionally, when the enforcing authorities require public venues to carry out field trials to ensure that safety provisions are adequate, the trials are usually carried out in the quieter hours of the venue operations (e.g. late night) and sometimes use volunteers. While they may be useful exercises for staff training and rehearsal purposes, this arrangement is insufficient as the sole means of testing. This is because the visitor types (and their behaviour) could be different and the numbers involved could be much higher in real-life situations. Also, such trials are usually carried out for the purpose of testing evacuation arrangements and other aspects of crowd safety, such as overcrowding, remain untested. Computer simulations are available for crowd modelling and could, in theory, be used as a testing tool. However, they too are restricted to emergency evacuations only and they have been criticised for failing to take sufficient account of human behaviour (e.g. Sime 1991).

Secondly, the scope for learning from past mistakes and failures is limited. Serious crowd safety accidents are relatively rare in comparison to, say, road accidents or accidents in the workplace, but the consequences are often far more severe. For minor incidents, mishaps and near misses, there has been little effort by public venues to record, collect and collate such information. This is partly due to the reluctance of public venue owners to publish their information. Recorded failure data concerning crowd safety is, therefore, limited. This lack of failure data and information poses a number of problems for both music and event promoters and venue owners/operators and researchers. Firstly, there are insufficient data for venues to analyse the performance of their crowd safety plans and identify areas for improvements. Also, because of their potentially severe consequences, crowd safety accidents should not be allowed to occur in the first place. This means that venue owners would have to address any crowd safety problems without proper data and the opportunity to learn from serious past mistakes.

These reasons also help to explain why the traditional approach that relies so heavily on the experience of individuals has not been very successful for crowd safety planning. If crowd safety plans and provisions cannot be properly tested and validated in the same way as in other contexts, then it becomes even more important that planners and assessors must try to get it right the first time when deciding how to ensure crowd safety in their venues.

However, crowd safety, though very different from most other contexts, is not unique. The high hazard industries (e.g. nuclear and chemical industries) have a similar problem in that they too experience infrequent but severe accidents and, hence, they also cannot rely solely on learning from such accidents. Compared to crowd safety, however, the high hazard industries have devoted much more effort to the research and development of appropriate risk assessment methodologies to assist and support the decision-making process.

Also, in the high hazard industries, the behaviour of the systems, the substances they handle and the operations involved are all more predictable, better understood and can be clearly defined. Furthermore, risk assessments in the high hazard industries are often carried out by specialist safety engineers. These differences could have significant impacts on the kind of risk assessments that can be employed. What is suitable to safety engineers in the high hazard industries may be unsuitable for public venue managers.

4.2 The research questions

Essentially risk assessment is about two things. First, it establishes what could go wrong or what problems may arise so that precautionary measures can be incorporated into the safety plan. Secondly, it indicates how significant these problems are (i.e. their risks) in order to ensure that important problems are addressed and resources are efficiently deployed.

Hence, the specific research questions that need to be looked at in this study are as follows:

- (i) How best to assist public venue owners to identify potential safety problems, bearing in mind the wide-ranging outcomes due to human behaviour?
- (ii) How to evaluate the risks given that there are no relevant failure data to support the evaluation process?
- (iii) How to ensure that the risk assessment method for crowd safety is suitable and can be used by assessors as easily and efficiently as possible?

4.2.1 Research question 1 – Hazard Identification

Different contexts involve different operations and different task activities are conducted under different operating conditions. These differences, in turn, cause different hazards. So the hazards in, say, the nuclear industry are not the same as those in manufacturing industries. The hazards in road travel are not the same as those in rail or air travel. Equally, the kinds of hazards found in a factory will be different from those in an office, or in a laboratory or a building site or in a mine. By the same token, crowd safety and public venue operations are also likely to present a set of hazards that are different from those in other industries and workplaces. Therefore, one of the key tasks for this research project is to establish what kind of hazards can arise in public venues and then to determine how best to account for them in risk assessment.

The relative unpredictability of crowd safety hazards can be a problem. Essentially, managing a public venue is about ‘processing’ a large number of visitors. The ‘human factors’ are important contributory factors to safety. Yet, human beings are much less predictable in terms of behaviour than engineering components and the substances/materials used in industry. Where there is a significant human involvement, human behaviour in the workplace is often much restricted by rules, work procedures and the tasks people have to carry out. There are no such restrictions in public venues.

There are also other factors affecting crowd safety, such as venue design and undesirable external circumstances. Consequently, the outcomes in terms of crowd safety hazards could be wide-ranging. Because of these factors, different hazards could arise in different venues at different times. The challenge, therefore, is to establish a suitable way to deal with these wide-ranging and less-definable behavioural factors, and other factors, in order to assist owners of different venues to account for hazards that are specific to their operations.

4.2.2 Research question 2 – Risk Evaluation

Risk evaluation essentially means making judgements about the possibility of an undesirable or adverse outcome(s) for a given hazard. Validating such judgements is always a problem. In many other areas where risk assessment is applied, judgements concerning the possibility of adverse events are made on the basis of failure rate/probability data of engineering components. The data is generated through experiments, trials and testing. But, as previously discussed, there are no such data available for crowd safety. The main basis for evaluation is the operational knowledge and experience of individual assessors. This is exacerbated by the rarity of accidents and the enormity of consequences, which gives little opportunity for the assessors to review and revise their judgements.

Realistically, given that there is no usable failure data and that there is little or no real prospect of getting it in the near future, it can be argued that operational knowledge and experience is probably the most valid basis feasible for passing judgements. However, the danger is that if knowledge and experience are used casually in an unstructured and ad hoc manner, risk evaluation could become merely an expression of personal opinions. There is also the danger that judgements could be unduly influenced by political factors, ‘hot issues’ of the day, etc. What needs to be achieved in the research is to establish a way to minimise such dangers and make the judgement of possibilities less subjective and less ad hoc.

There is always an element of subjectivity in risk evaluation, even where reliable failure data is available so a key problem is how to ensure the reliability and validity of the judgements.

The problem is even worse when there is no failure data on which to base the evaluation.

Finding a means to ensure better reliability and validity in risk evaluation is also an important issue in the investigation.

4.2.3 Research question 3 – User Requirements

Even though the risk assessment principles are the same, the methods of assessment can vary depending on the applications. In some cases, a simple and loosely-structured risk assessment is deemed suitable. In other cases, detailed probabilistic assessments using sophisticated risk quantification techniques are required. What method is suitable for a particular application and how sophisticated it needs to be depends only partly on being able to satisfy the hazard identification and risk evaluation needs described above.

It is important to recognise that assessors must be able to use the method efficiently if risk assessment is to be effective in supporting decision-making. A mismatch between what is required by the methods and what is achievable could render the assessment method unsuitable and seriously undermine its effectiveness. Part of the research is therefore to look into these factors to establish what the assessors' needs (or user requirements) are in terms of assessing crowd safety risks and how the assessment method could help to best address these needs. It is also worth noting that risk assessment and the subsequent risk management decision-making can be affected by an array of social and political factors such as public risk perception, the public's attitude towards specific industries (e.g. the nuclear and railway industries) and public tolerance of different types of risks. These matters do not, however, form part of the present study.

4.3 Aligning the research questions to the aims and objectives of the study

Having formulated the research questions, it is now possible to align these with the aims and objectives of the study as outlined in Table 1.1.

Table 1.1: Aligning the research questions to the aims and objectives of the study

Aims/Objectives	Research Questions
To show how risk assessment can best be applied to crowd safety.	What is the best way for music promoters and public venue owners/operators to identify potential crowd safety problems, bearing in mind the wide-ranging outcomes due to human behaviour?
To investigate and explore, through the identification of relevant hazards and risk factors, how risk assessment for crowd safety can be improved.	What hazards can arise in public venues, how do they differ from problems elsewhere and how to evaluate the risks given that there is no relevant failure data to support the evaluation process?
To determine whether a method which takes into account the specific nature of crowd safety risks will affect the approach taken by crowd safety assessors, thereby leading to improved planning for outdoor music festivals.	How to ensure that the risk assessment method for crowd safety is suitable and can be used by assessors as efficiently and effectively as possible?

5. The dissertation framework and format

In considering an appropriate format for this dissertation, the author was not particularly attracted by the conventional ‘five chapter’ PhD thesis model outlined by Perry (2000), but was rather seeking a dissertation format that reflected the balance between the academic and the professional. The work of Williams (2004), Zuber-Skerrit (2007) and Scott (2004) reflects both the context and approaches of worker-researchers in professional doctorates and gave the author the confidence to move away from a traditional format and to structure the dissertation in a way that would most appropriately reflect the nature of work-based planning, development and implementation.

While the considerations around the dissertation framework and format were informed fundamentally by the structure and requirements of the USQ Professional Studies program, the overall framing of this dissertation has been developed as a reflection of the actual process followed by the author as a practitioner researcher from the commencement of the doctoral learning journey through to completion. The study was conducted in a number of phases/projects which align with the overall research design framework (see Chapter 3) resulting in a generally chronological alignment of the framework as outlined in Table 1.2.

Table 1.2: Alignment of the dissertation to the requirements of the professional studies program

DPS _t Requirement	Unit value	Subject	Reporting (thesis)
Fundamentals of Professional Studies A (Portfolio)	2	WRP9000	Chapter 1: Introduction
Fundamentals of Professional Studies B (Learning Plan)	2	WRP9001	Chapter 2: Theoretical approach to the study Chapter 3: Planning and methodology
RPL Credits	10		
Phase 1 (Context evaluation)	10	WRP9002 Work Based Research Project	Chapter 4: Scope and context of the problem
Phase 2 (Input evaluation)			Chapter 5: Monitoring and assessing behavioural risk
Phase 3 (Product and Process evaluation)			Chapter 6: Validating the method
Conclusion	N/A	N/A	Chapter 7: Conclusion, recommendations, learning, contributions to knowledge, practice and personal professional development
TOTAL	24		

The dissertation takes an explication approach. In a discussion of the Doctor of Management by Explication offered by the Senior Executive Action Learning (SEAL) program to associates of the International Management Centres Association, Zuber-Skerrit (2007) endorses a DET (doctoral explication thesis) approach, noting that for ‘...senior managers with a great deal of lived experience, knowledge and wisdom, producing a DET is more meaningful, challenging and enjoyable’ (p. 35) than undertaking traditional academic research for a PhD.

The structure of the dissertation also mirrors the ‘rich modelling’ layout suggested by Williams (2004). In essence, he proposes an early phase, middle phase and final phase, which he ‘bookends’ with an introduction and finishes with a discussion. Williams’ phases are reflected in this dissertation by the CIPP framework adopted as the research design framework for planning and implementing the study (see Chapter 3). The ‘rich modelling’ aspect of the approach is outlined in Table 1.3.

Table 1.3: ‘Rich modelling’ layout of the dissertation

Introduction			Chapter 1
Theoretical approach to the study			Chapter 2
Planning and methodology			Chapter 3
Early phase			
Planning	Context evaluation (‘What are we going to do?’)	<ul style="list-style-type: none"> Outline of the problem, background, effects, implications + suggested ‘fix’ Literature review (background) Survey of promoters to verify the current existence and extent of the problem 	Chapter 4
Middle phase			
Planning	Input evaluation (‘How are we going to do it?’)	<ul style="list-style-type: none"> Literature review (existing approaches) Develop conceptual model of influences on crowd behaviour Develop methodology/instrument 	Chapter 5
Final phase			
Implementation	Product evaluation (‘Did we do it as planned?’) Process evaluation (‘Did we achieve the planned outcomes?’)	<ul style="list-style-type: none"> Validation of the methodology 	Chapter 6
Conclusion			<ul style="list-style-type: none"> Conclusion, recommendations, learning, contribution to knowledge, practice and personal professional development Chapter 7

In addition, the dissertation adopts what Scott (2004) outlines as the ‘portfolio’ format for professional doctorates. He described particular advantages for this format, including that it provides a means by which a number of different pieces of work with different styles and intended for different audiences, can be collected together for assessment purposes. Scott (2004) notes that a commentary may also be included in the portfolio and that such commentary may be chronological, autobiographical, conceptual or developmental and the structure of the ‘portfolio therefore allows a greater possibility of work being submitted for assessment which embraces both academic and workplace concerns...’ (p. 151).

As a further development of the portfolio format of dissertations, Williams (2004) describes and gives several examples of the incorporation of artefacts into the body of doctoral theses. These artefacts may be attached or embedded into the text and may be complete documents or extracts. The author has chosen to include some as attachments (in an attempt not to detract the reader too much from the text of the dissertation), while including several in the text of the dissertation. The artefacts contained in this dissertation were written generally in the order presented during the life of the study and throughout the doctoral learning journey.

The framework and format have been developed by building on and synthesising these perspectives into a dissertation that synergises the elements of explication, rich modelling and portfolio approaches. This is seen as the most effective way of aligning the outcomes with the research efforts, and also best represents the value and academic and professional contribution of this dissertation. From a personal and professional perspective, this approach has allowed the author to bring together all work undertaken as a single integrated representation of the ‘whole’, while recognising the interconnectivity and value of its numerous elements.

The work and learning associated with the design and development of this particular dissertation format, and also that required to construct the critical commentary which links and binds the portfolio of artefacts to professional practice, academic and organisational knowledge and personal learning, has added an additional (albeit unexpected) dimension to the author’s original learning expectations and aspirations. This outcome is supported by Cherry’s (1999) assertion that this dimension of the dissertation writing process is more than just a representation of the project delivery and results – it is a learning experience in its own right.

6. Outline of the dissertation

Chapter 1 introduces the issue to be investigated in this study. Crowds at events like outdoor music festivals are the principal hazard that needs to be dealt with and, without effective management, can become a significant problem with serious consequences. In particular, influences on crowd behaviour are little understood and generally ignored. Commentators agree that insufficient attention to the way that people behave in a crowd and the relationship between behaviour and systems design are major factors in crowd disasters. Success in crowd management includes being aware of all risks, undertaking effective risk assessment and following up with appropriate management systems. The generalised traditional risk assessment process, of itself, is insufficient to provide an adequate predictive and monitoring method in the case of crowd-related safety risks.

Chapter 2 situates the study within the framework of the USQ Professional Studies program and the *work-based learning* approach which characterises it. After exploring the various elements of *work-based learning*, the chapter outlines and advances *activity theory* as a suitable operational tool and theoretical construct for *work-based learning* and, consequently, the study. In particular, the notion of *expansive learning*, with its use of contradictions as a springboard for learning and change, provides a useful frame of reference for the study.

Chapter 3 sets out the initial component activities of the USQ Professional Studies program, the selection of a research design framework and the methodological approach to the study. The first requirement of the program was the development of a Learning Portfolio, which chronicles past formal learning and experience, provides an early formulation of the issue to be investigated and makes the case for recognition of any relevant prior learning. The second was the development of a Learning Plan, which identifies suitable work-based projects to be undertaken to achieve the aims and objectives of the study as well an appropriate methodological approach.

In order to guide and organise the study, Guba and Stufflebeam's (1970) Context, Input, Process, Product (CIPP) evaluation model was chosen as the research design framework. It provides a comprehensive framework to facilitate an integrated and critical review of planning, conduct and reporting outcomes of a project. Moreover, the CIPP model resonates and aligns neatly with the overall theoretical approach of activity theory and expansive learning.

The CIPP model posits that the type of change sought to be implemented through the study should be evaluated using qualitative research methods which are heuristic, exploratory and developmental. The chapter examines these approaches, and discusses methods that support validity and reliability of findings in the context of insider research. The chapter then comments on the inquiry methods chosen for the study, which consist essentially of various literature reviews and surveys. Finally, the chapter outlines possible project constraints. These relate essentially to the difficulty of data collection in what is a relatively new subject area, and the limited scope for evaluation and verification of the outcomes of the study.

Chapter 4 outlines the scope of the issue under investigation. The magnitude and nature of safety incidents at outdoor music festivals are examined and the physical causes of injury and death outlined. Causes essentially relate to the movement of people in high density environments. The chapter then goes on to consider the two types of behavioural triggers that cause this type of movement, viz. a flight response or a craze, and notes that it is this latter type of behaviour which is predominant at outdoor music festivals and has generally been neglected in event planning. The chapter examines patron motivation for attending outdoor music festivals, patron behaviour, the influence of contemporary youth culture on behaviour, and the risk management responsibilities of concert and festival promoters. Finally, the chapter sets out the results of a survey undertaken to determine whether, and to what extent, the issues and problems outlined by the literature continue to exist in current practice.

Chapter 5 outlines current responses to the issue, centring largely on better planning for events. Guidance material which forms the basis for planning considerations is general in nature, and specific guidance on assessing crowd-related safety risks is virtually non-existent. The chapter reviews a number of attempts that have been made over the past 20 years or so to develop approaches for assessing crowd safety at mass gatherings. While a number of these are useful from an overall perspective, contemporary research in the area of mass gathering emergency response holds the greatest promise for the integration of relevant factors into a method that can be used to monitor and assess behavioural risk at mass gathering events. The chapter concludes with the articulation by the author of a model which considers various processes and theories from the social psychology literature in explaining the transformation of individual into collective behaviour at these events, and the development of a method to monitor and assess behavioural risk.

Chapter 6 sets out the results of attempting to validate the method via a product and process evaluation using the Kirkpatrick (1977, 1998) *Four Level Training Evaluation Model*. Since the intervention consisted of a training workshop, this was an appropriate evaluation approach. After reviewing the literature on evaluation, and outlining and justifying the selected evaluation approach and data collection method, the chapter reports and analyses the results of a survey administered to the workshop participants to determine whether exposure to, and training in the use of, the new method effected a change in awareness and proposed future behaviour of potential assessors. In addition, the survey sought to determine whether the method is user-friendly.

Chapter 7 commences by re-stating the issue under investigation and the aims and objectives of the study. It then sets out a brief summary of the study before outlining its implications for the broader theoretical domains on which it has relied. The chapter then articulates how the study has contributed to the development of new knowledge, enhanced practice and the author's personal professional development and situates the study. The chapter situates the study in the broader disciplines of safety science and event studies before noting that the outcomes of the study contribute significantly and innovatively to the nascent fields of crowd science and resilience engineering. Finally, the chapter outlines the limitations of the study and recommendations for further research.

7. Summary

Evidence indicates that attending outdoor music festivals carries a risk of injury and, in extreme cases, even death. Commentators note that improving event management, particularly event planning, will result in considerably-improved safety outcomes. There is significant endorsement in the literature for a risk management approach to event planning. The traditional risk assessment process is a well-established method currently applied in many other contexts. Experience has shown it to be an invaluable aid to decision-making and provides a credible solution to the problem of insufficient planning.

However, the quality of risk assessments at outdoor music festivals, both in Australia and internationally, has been heavily criticised. There are significant differences in the nature of risks associated with these events and the traditional contexts where risk assessment is used. In addition to factors associated with the venue itself and the environment, factors influencing the behaviour of the crowd at these events are equally as important. Risk assessments for these events concentrate on the physical risks and largely ignore the risk associated with the dynamics of human movement and behaviour. Evidence indicates that insufficient attention to the way people behave in a crowd and the relationship between behaviour and systems are major factors in crowd disasters. Consequently, risk assessments for outdoor music festivals need to incorporate a psychosocial dimension.

The purpose of the study is to develop a contextualised method for crowd-related safety risk assessment at outdoor music festivals which incorporates a psychosocial dimension with the traditional elements of such an assessment. The study explores crowd safety planning and decision-making, and investigates how the application of risk assessment can provide support for decision-making in crowd safety management.

The outcomes of the study are not reported in a traditional PhD format, but rather reflect the actual process adopted in conducting the study as a number of projects, or, in a number of phases. In addition, the dissertation adopts explication, rich modelling and portfolio approaches in its presentation. This is seen as the most effective way of aligning the outcomes with the research efforts and also best represents the value and academic and professional contributions of this dissertation.

CHAPTER 2

THEORETICAL APPROACH TO THE STUDY

‘Experience without theory is blind, but
theory without experience is mere intellectual play’
Immanuel Kant (1724 – 1804)

Chapter Outline

1. Introduction
2. The USQ Professional Studies program
3. Work-based learning
4. A theoretical approach for work-based learning
5. Activity theory
6. Expansive learning
7. Conclusion

1. Introduction

The opportunity to further this project in a rigorous and academic manner presented itself in the form of the Doctor of Professional Studies (DPSt) program at the University of Southern Queensland (USQ). ‘Professional studies’ is a term used to classify academic programs which are applied or interdisciplinary in focus, taking the learner or candidate and his or her work context as the starting-point, rather than a professional or academic discipline.

Professional studies combines theory and practice-based professional learning, focusing on bodies of knowledge that are aligned with multi-disciplinary practice environments, rather than more traditional single-discipline focused academic studies. Participants combine research design and analysis of work-based project observations in order to culminate in enhanced skills and knowledge that meet the requisite doctoral academic qualification standards and superior professional practice.

This chapter situates the study within the *work-based learning* approach which underpins and characterises the USQ program. Elements of work-based learning include thinking and reflecting on work practices, reviewing and learning from experience, problem-solving within a working environment and the acquisition of meta-competence – learning to learn. After exploring the various characteristics of *work-based learning*, the chapter advances *activity theory* as a suitable theoretical construct for *work-based learning* and, consequently, for the

study. Because the theoretical foundations of learning at work are grounded on constructivism, and the epistemic assumptions of constructive learning are different from those of traditional instruction, classical methods of analysis are inappropriate for work-based learning environments. *Activity theory* understands learning not as the internalisation of discrete information or skills by individuals, but rather as expanding social and intellectual involvement over time with other people and the tools available in their culture. In particular, the notion of *expansive learning*, with its use of contradictions as a springboard for learning and change, provides a useful frame of reference for the study.

2. The USQ Professional Studies program

The Professional Studies program at USQ is designed to recognise and develop individual professionalism at the highest level. It is a work-based professional doctorate directed at providing an opportunity for participants to acquire a systemic and critical understanding of a substantial and complex body of knowledge at the frontier of their area of professional practice. With research and structured learning as defining characteristics of the program, graduates emerge with the knowledge and skills to demonstrate autonomy, authoritative judgement, adaptability and responsiveness in their professional practice. The program is designed, therefore, to create original knowledge for professional use through research and development projects undertaken during the program.

Professional studies programs involving workplace-based learning approaches involve learning in authentic work contexts. In contrast to the sandwich program, work experience or practicum, where the university plays a central role in setting the curriculum, in completely workplace-based learning programs work is the curriculum which shapes the entire program of study (Boud 1997). The learning that occurs may be described as ‘informal’ (Marsick & Watkins 1990), emerging from the demands of work rather than pre-determined academic content. These programs are closely associated with notions of continuous professional development and life-long learning.

Formal education systems are playing an increasingly significant role in economic development, requiring states, institutions and nations to look at the ‘economics of knowledge’. Universities must reconsider their position in a growing knowledge-based information economy. According to Morrison (1995), higher education has to respond to social and economic change by focusing on ‘procedural learning’ exemplified by workplace-

based degree programs. Finger (1995) argues that universities must help people and organisations ‘learn their way out’ of the complex situations they encounter. This represents a more general transformation of understanding of what counts as knowledge — more performative than contemplative ways of knowing (Barnett 1997).

Wider society wants knowledge that is going to have demonstrable effects that will enhance productivity, improve economic competitiveness, and personal effectiveness representing a shift in focus on skills. Consumer demand is escalating for more operational and instrumental/pragmatic views of knowledge. Universities no longer have a monopoly on the generation of definitions of knowledge and must respond to a fundamental shift in how we seek to know the world, and our idea of what counts as knowledge and truth.

Corresponding with the shifts in the ways knowledge is constituted is developing contestation about who controls the curriculum. There is an increased focus on action and pragmatism, with an important underlying question of students now in education being ‘what can she do?’ as distinct from ‘what does she know?’ (Lyotard 1984). This is represented in concepts such as action learning in workplaces, experiential learning, and reflective practice which variously focus on ‘how to’ problem-solving activities and observable outcomes. Such major shifts in the roles and purposes of higher education are forcing universities to change, otherwise key aspects of their roles will be subsumed by other organisations including private commercial providers.

The aim of the USQ professional studies program is to provide experienced professionals with doctoral level research opportunities that will engage issues and develop original knowledge that is relevant and meaningful to their professional capabilities, help to build capacity in their practice environments / communities, and help to contribute to their self-awareness and intellectual independence. The program is therefore unique in that it provides direct benefits to both employees and organisations. Outcomes may include contributing to significant and measurable work-based projects that have a direct impact on identifying workplace issues, developing change initiatives, finding solutions to workplace problems, and shifts in organisational strategy.

3. What is work-based learning?

The term *work-based learning* is widely used throughout the literature, academia and industry to describe a multiplicity of approaches. Gray (2001) identifies ‘learning through work, learning for work and learning at work’ as three key approaches to work-based learning. Often the term is used interchangeably with *workplace learning*, or *practice-based learning*, which is described by Munro et al. (2011, p. 2) as ‘any learning that is work related and includes the perspectives of the employer, representing organisational needs, and workers, representing the needs of individuals’ (Ives et al. 2005). McManus (2007) and Peach and Cathcart (2013) suggest that *work-based learning* is a subset of workplace learning which brings together ‘universities and work organisations to create new learning opportunities in workplaces.’ (Boud & Solomon 2001, p. 4).

Whatever the interpretation, however, the common theme sees a departure from traditional forms of learning that are teacher-controlled. As *work-based learning* is centred around live projects and challenges individuals and their organisations, the creation of knowledge is shared and activities undertaken collectively. Armsby (2000, p.42) notes that:

In work based learning, research, development and reflective practice are located within a real social and work based community that gives them meaning rather than in a hypothetical or devised scenario. The focus is on ‘real’ research and development projects and reflection on ‘real’ pragmatic and applied activities is what makes work based learning meaningful to practitioner researchers.

This type of learning promotes discussion and the sharing of problems and the identification of sometimes imaginative and innovative solutions (Raelin 2000). Raelin (2000) maintains that elements of *work-based learning* include thinking and reflecting on work practices, reviewing and learning from experience, problem-solving within a working environment and the acquisition of meta-competence – learning to learn. He comments (2000, p.2) that:

Work based learning expressly merges theory with practice, knowledge with experience. It recognises that the workplace offers as many opportunities for learning as the classroom. Such learning, however, needs to be centred around reflection on work practices. Hence, it offers managers faced with the relentless pace of pervasive change an opportunity to overcome time pressures by reflecting upon and learning from the artistry of their action. It is no longer acceptable to offer the rationale ‘We don’t have a minute to think’. Managers can no longer react to change; they must anticipate and work with it. Reflection with others offers the key to competing successfully in the twenty-first century marketplace.

Flanagan et al (2000) describe *work-based learning* as a means for integrating university-level learning with learning from experience in the workplace, the bringing together of self-knowledge, expertise at work, and formal knowledge. It is a learning process rather than a teaching process, which encourages learners to take responsibility for their own learning and develops attitudes and skills towards lifelong learning (Chapman & Howkins 2003).

Lester (2004, p.7) contends that doctoral level work-based projects should act as a ‘vehicle for real world developments and for higher level professional capability’, and notes that a work-based project will need to:

[b]e adequate for the ‘swamps’, ‘messes’ and ‘wicked problems’ encountered by senior professionals in their practice situations. It may draw on technical and disciplinary knowledge, but it also needs to engage fully with the knowledge-in-use that thinking practitioners develop and use in the course of their work.

Underpinning *work-based learning* is a set of developmental philosophies that can be traced back at least as far as John Dewey’s work in the early part of the twentieth century (Dewey 1916). More specific influences come from reflective practice (Schön 1987), action learning (Revans 1980), and action research (Lewin 1946), and some of its variants, such as soft systems methodology (Checkland 1981) and participative enquiry (Reason & Rowan 1981), as well as ethnographic and insider researcher perspectives (Costley & Armsby 2007b).

Epistemologically this kind of learning draws on three traditions:

- (i) an action-based pragmatism that emphasises the interdependence of knowing and doing
- (ii) a constructivist and to some extent phenomenological perspective that sees the learner as making sense of situations from an individual and autonomous position
- (iii) an action research or praxis-oriented philosophy where there is a concern to create and learn from change through enquiry-driven processes.

Schön’s (1987) reflective spiral in which knowledge and practice inform and modify each other is very much in evidence in *work-based learning*, as is Revans’ (1980) idea of disciplinary knowledge being modified through the questioning insight that is gained from engaging with practical issues.

The work-based doctorate generally reflects the paradigm of negotiated *work-based learning* that has been developed in several principally British and Australian universities (Boud & Solomon 2001; Lester & Costley 2010), taking the concepts underpinning work-based, candidate-driven programs and developing them to the highest level of the qualification spectrum (Portwood & Thorne 2000). In summary this approach to higher education takes the learner or candidate and his or her work context as the starting-point, rather than a professional or academic discipline - in a sense the 'curriculum' is work itself (Boud 2001), and in the most-developed examples *work-based learning* sits in the university as a transdisciplinary field in its own right rather than as a mode of learning within a specific area of study (Costley & Armsby 2007a). In this tradition, the individual program, which can include relevant previous learning, modules and courses, independent study and most essentially forward-looking work-based activity, is generally negotiated through a learning agreement.

From an academic perspective, these principles point to a type of program that is candidate-driven, emerges from context-based concerns, effects professional development for the candidate, and uses an action-oriented research perspective to create practical development and change. This suggests developing to a point of epistemic maturity, where the practitioner is concerned with the most compelling and effective real-world 'maps' of situations and phenomena rather than with either purely theoretical or pragmatically simplified representations Kitchener and King (1981). At a practical level it will be concerned with working at and extending the leading edge of a professional or organisational field, with significant impacts in both the candidate's profession (or community of practice) and in terms of his or her personal professional development. There is also an implication that practice moves beyond a problem-solving, fitness-for-purpose level to a point where it has adequacy for the 'messes' or complex problematic situations described by Ackoff (1974) or the 'wicked problems' of Rittel and Webber (1984).

This approach presented itself as an eminently suitable and extremely attractive way of moving the study proposal forward. This dissertation has been developed and compiled to reflect the author's journey as a learner and very specifically as a work-based learner as this is understood in its contemporary context (Armsby 2000; Costley 2010; Garnett 2009; Garnett 2010; Lester 2004).

3.1 Work-based learning as contemporary education

The current focus on the workplace as a significant source of learning is consistent with contemporary developments in education. Jarvis, Holford and Griffin (2003) identify thirteen shifts in emphasis that have occurred in education over the past years. They define these shifts (pp.1-2) as:

- childhood to adult to lifelong
- the few to the many
- education and training to learning
- learning as a process to learning as an institutional phenomenon
- teacher-centred to student-centred
- liberal to vocational and human resource development
- theoretical to practical
- single discipline knowledge to multidisciplinary knowledge to integrated knowledge
- knowledge as truth to knowledge as relative/information/narrative/discourse
- rote learning to reflective learning
- welfare provision (needs) to market demand (wants)
- classical curriculum to romantic curriculum to program
- face to face to distance to e-learning.

These changes have not occurred in a social vacuum, but reflect the forces that are shaping, and have shaped, our society. These social forces reflect the balance of power in the world; they are global and are changing the way we think and live at an ever-increasing rate. This has led some theorists to claim that we have moved away from a modern society characterised by stability, confidence and progress into a post-modern world characterised by risk, illusion and ambiguity (Edwards 2000; Evans, Behrens & Kaluza 2000).

Traditional theories of education in the modern era were underpinned by deeper social processes. That is, as Jarvis, Holford and Griffin (2003) maintain (at p. 18), education is designed to:

- maintain and reinforce social order and social cohesion because it encourages people to conform to prevailing norms and culture
- control and manage individuals' aspirations, so that they are 'fitted into' the social structure of employment, class or social status in ways that they accept
- reproduce the workforce necessary to an industrial or post-industrial society, with its various divisions of labour, skills, careers and so forth.

If one accepts that we have moved into the post-modern age, then the social conditions and processes which shape our lives are also rapidly changing. Jarvis, Holford and Griffin (2003, pp. 19-21) have identified the main changes as:

- globalisation
- demography
- work and the economy
- privatisation
- individualisation
- commodification
- translating policy into practice.

Theorists are still debating whether we have, in fact, moved into a post-modern era (Baudrillard 1994; Foucault 1986; Usher 1994), or whether we should regard contemporary developments as a late form of modernity (Giddens 1993). Baudrillard (1994) maintains that it is sufficient for us to recognise that rapid changes within our society mean that education is failing as a source of emancipation, in its belief in science (eg. Chernobyl) and in humanism (eg. the Holocaust).

As education's role of socialising is stripped away by our current conditions and its place in a system of shared universal beliefs (scientific, moral, religious and philosophical) is eroded, as knowledge becomes much more fragmentary and relativistic (Jarvis, Holford & Griffin p. 2), as the content moves to depending much more on individual tastes and styles (concomitant with our move to a market society), our discourse about education has changed. Learning has replaced education as the term used to denote the enhancement of our capabilities. Learning is a much more individualised term than education, and responsibility for their learning is being placed in the hands of individuals.

A simple (and simplistic) definition of learning is that it is the acquisition of knowledge. It is learning which creates intellectual property, capital and usable assets. However, it is also the process of learning which enables us to live and work in a changing society and to deal with the paradoxes, contradictions, ambiguity and uncertainty of our everyday lives. The process of learning may be described broadly as making sense of, or meaning from, our experiences. These experiences occur in a social, cognitive, physical and cultural context. What matters is how we interpret these experiences. Such interpretation is based largely on our social and cultural backgrounds and current contexts.

So learning becomes dependent on the social and cultural context. Learning is very closely linked to both culture and knowledge. ‘What’ and ‘how’ we learn are influenced by culture; but culture itself is a learned set of understandings and practices. This means that there is no universal theory of learning – just frameworks and guidelines for our practice. What counts as knowledge differs between cultural contexts, just as how we understand that knowledge differs. Like learning, culture is a complex phenomenon. When the two are in juxtaposition, a situation develops that Barnett (2002) calls supercomplexity; that is:

...a situation in which different frameworks present themselves, frameworks through which we understand the world and ourselves and our actions within it. In the contemporary era, such frameworks multiply and are often in conflict with each other.

This means that learning needs to go beyond simply the acquisition of information. Ryle (1949) first distinguished between ‘knowing that’ and ‘knowing how’. ‘Knowing that’ involves the accumulation of data, facts and information, whereas ‘knowing how’ is the ability to put this learned information into practice. Ryle (1949) argues that we learn ‘how’ by practice. Later, Bruner (1990, 1996) furthered the distinction and the scope of learning when he distinguished between ‘learning about’ and ‘learning to be’. Similarly, by activity and practice, we learn to be. The Delors report to UNESCO, which was the result of three years of world- wide consultation on learning, asserted that learning throughout our lives is based on four pillars – learning to know, learning to do, learning to live with others, and learning to be (Delors 1996). As Brown and Duguid argue (2002 p. 29):

...the same stream of information directed at different people doesn’t produce the same knowledge in each. If people are engaged in different practices, if they are learning to be different kinds of people, then they will respond to the information in different ways. Practice shapes assimilation.

Work based-learning is informal, experiential and situated and, along with the underpinning philosophies mentioned earlier, provides a pre-eminent framework which positions individuals to meet the learning challenges of a late-modern or post-modern world.

3.2 Informal learning

Formal learning can be understood as learning which is prescribed by some form of specification, be it syllabus, curriculum documentation or specified learning (or performance) outcomes. It is structured learning that takes place off the job and outside the working environment, typically in classroom-based educational settings (Marsick & Watkins 1990). Concomitantly, it might be assumed that informal, or non-formal, learning (Eraut 2000) is learning which occurs outside of these parameters. It is the type of learning often, though not exclusively, associated with workplaces. Eraut, Alderton, Cole and Senker (2002, p. 128) categorise the learning that occurs through work into three categories – (i) organised learning support, (ii) consultation and collaboration within the working group, and (iii) learning from people within the learning group.

Informal learning essentially encompasses that which is not formal learning according to Colley, Hodgkinson and Malcolm (2003). Dale and Bell (1991, p. 1) define it as that:

... which takes place in the work context, relates to an individual's performance of their job and/or their employability, and which is not formally organised into a programme or curriculum by the employer.

Marsick and Watkins (2001) note that informal learning 'will take place wherever people have the need, motivation and opportunity for learning' (p. 28), and define informal learning as learning that '...is usually intentional but not highly structured [and] includes self-directed learning, networking, coaching and mentoring, and performance planning that includes opportunities to review learning needs' (p. 28). Marsick and Watkins (1992) identify defining characteristics of informal learning (and its subset, incidental learning) as being experience based, non-routine and often tacit (1990, p. 15). They include such diverse notions as learning from experience, learning by doing, continuous learning for continuous improvement, accidental learning, self-managed learning or the learning organisation (Watkins & Marsick, 1992, p. 287).

However, it is not so simple to make the distinction as might be assumed. Table 2.1 (Bateson's levels of learning) shows that level 2 learning occurs because of, and at the same time as, level 1 learning. Yet what Bateson (1972) describes as the acquisition of the deep-seated rules and patterns of behaviour characteristic to the context itself is not specified in any syllabus or curriculum document.

Table 2.1: Bateson's levels of learning

Level	Description	Example
Level 1	Conditioning through the acquisition of responses deemed correct within a given context	Learning the correct answers and behaviours in a classroom
Level 2	Acquisition of the deep seated rules and patterns of behaviour characteristic to the context itself	Learning the 'hidden' curriculum of what it means to be a student
Level 3	Radical questioning of the sense and meaning of the context and the construction of a wider alternative context	Learning leading to change in organisational practices

The situation is further complicated by the distinction which some people make between non-formal and informal learning. Schuller and Field (2002, p. 83) define non-formal learning as 'learning which takes place during social interaction that is primarily undertaken for non-educational purposes'. This definition places non-formal learning as the antithesis of formal learning.

Vygotsky (1986) refers to unconscious learning, a concept first enunciated by Dewey (1971, p. 84) when he maintained that:

...participation of the individual in the social consciousness of the race...is constantly shaping the individual's powers, saturating his [sic] habits and arousing his feelings and emotions. Through this unconscious education, the individual gradually comes to share in the intelligent and moral resources which humanity has succeeded in getting together.

Rogers (2003, p. 25) uses the terms 'formalised learning' and 'acquisitional' learning to replace the terms formal and informal, and recognises that there are two generalised sites of learning which impact on these processes, ie. formal sites (institutions) and non-formal sites (non-institutional). That is, both acquisitional learning and formalised learning can take place in both formal and informal settings.

Finally, Down (2004) notes that there is a sense in which no learning is ever informal. It may take place in informal (ie. non-educational) settings, but it is the major part of our interaction with our social world and is part of our deliberate actions to better understand this world. Thus, informal learning covers learning which occurs within informal settings, learning which is unconsciously assimilated or learning which is incidental to other learning or activity. As Down (2004, p. 46) maintains, informal learning denotes any learning which is not planned or structured by others and is not systematic.

3.3 Experiential learning

While Jarvis, Holford and Griffin (2003) argue that the term ‘experiential learning’ has become ‘something of an ideology in education’ (2003, p. 53), it will be used throughout this dissertation as an equivalent term to learning through experience. This involves social, cognitive and emotional interactions with the contexts in which we live and learn (Boud, Keogh and Walter 1985b; Goleman 1998; Illeris 2003; Jarvis, Holford & Griffin 2003).

Miller and Boud (2000) define experience as ‘the totality of the ways in which humans sense the world and make sense of what they perceive’ (p. 8). Experience is individually interpreted although it is derived from external social, physical and emotional interactions. Marton and Booth (1997) point out that experiences ‘are descriptions of the internal relationship between persons and phenomena: ways in which a phenomena is experienced by persons’ (p. 122).

The learning which comes from experience ‘is the process which takes this experience and transforms it in ways which lead to new possibilities, which may involve changes in actions, ways of viewing the world, or relationships’ (Miller & Boud 2000, p. 8). These ways of making sense of the world and our lives within them are influenced by our individual biographies or ontogeny (socially derived ways of knowing) as well as the history of the context (Billet 2000, p. 29).

Some theorists of experiential learning argue that the experience may be primary or secondary (mediated), actual or recalled, real or artificial (Jarvis, Holford & Griffin 2003), pp. 55-56). However, others limit experiential learning to experiences in which the learner is actively involved. Tate (1992 p.127), for example, stressed her understanding of the first-hand nature of experiential learning when she commented that:

Experience of learning to me means that the learner is directly in touch with the realities which are being studied. It involves a direct encounter with the phenomenon being studied, not talking about it, not reading about it, not simply considering it or thinking about it but instead a direct encounter with the realities being studied.

Experiential learning is underpinned by five propositions (Boud, Cohen & Walker, 1993, p. 9-10), which can be summarised as follows:

- experience is the foundation of, and the stimulus for, learning
- learners actively construct their own experience
- learning is holistic
- learning is socially and culturally constructed
- learning is influenced by the socio-emotional context in which it occurs.

The theory of experiential learning was largely first developed by Kolb (1984, 2000) on the basis of a phenomenological approach, although Jarvis, Holford and Griffin (2003) point to written evidence of experiential learning about 2000 years ago (2003, p.57). Other authors, from different approaches to learning, use different terms for the same phenomenon. These include Schon (1987, 1991, 2002) who uses the term ‘reflection in action’ (and ‘knowing in action’), Lave and Wenger (1991) who use the term ‘situated learning’ and Belenky, Clinchy, Goldberger and Tarule (1986b) who describe the learning that comes from women’s experiences as ‘women’s ways of knowing’.

Kolb’s (1984) experiential learning model posits a four-stage cycle that describes how experience is translated into concepts which, in turn, are used as guides for future experiential learning (Boud, Keogh & Walker 1985c, p.12). A reprint of some of Kolb’s work (Cross & Israelit 2000) labels this model as ‘the Lewinian Experiential Learning Model’ (p. 314). Kolb (2000, pp.313 - 314) wrote that the aim of his work was

...not to pose experiential learning theory as a third alternative to behavioural and cognitive learning theories, but rather to suggest... a holistic integrative perspective on learning that combines experience, perception, cognition and behaviour... [I start with] the learning models of Lewin, Dewey and Piaget and identify the common characteristics they share – characteristics that serve to define the nature of experiential learning.

Central to this approach is reflection on experience in order to decide on the next course of action (see, for example, Kolb 1984; Boud, Keogh & Walker 1985; Johns & Freshwater 1998). The notion of reflection on experience has a long documented history - Grundy (1982) notes that reflection in learning can be traced back to Aristotle’s discussion of practical judgement and moral action. It is based on an implicit belief that ‘...knowledge is personally constructed, socially mediated and inherently situated’ (Clarke 1995, p. 43).

3.4 Situated learning

All learning (and all human activity) is situated in a context and the nature of this context will impact on and shape the learning that occurs. However, it is the primacy and the role of the context that differentiates situated learning from other forms and approaches to learning.

The recognition of situated learning has derived from three sources of research endeavour. The first of these is the situated cognition or situated action movement (Merton & Booth 1997, p. 11), which centres around studies of learning and thinking in everyday situations outside of educational institutions. Key figures in this area are Jean Lave and Etienne Wenger (for example, 1991; 1996b; 2002) and John Seely Brown and associates (including Brown 2000; Brown, Collins & Duguid 1989; Brown, Collins & Duguid 1996).

The second area of research endeavour that has contributed to our understanding of situated learning is that of computer scientists seeking alternative models to explain human-computer interactions, such as Clancy (1992) and Suchman (1987). Both these research areas place emphasis on researcher observation as a means of explaining human actions in terms of their social or cultural situatedness.

The third area is that of the socio-cultural or socio-historical school of psychology developed originally by Vygotsky and his followers. Known more commonly as *activity theory* (Engeström 1999), this third area provides a powerful methodology for the study of change in terms of the social and cultural context in which it occurs (see the next section for an elaboration of the theory and the way in which it provides an underpinning methodological orientation for the study). As Marton and Booth (1987) explain, Vygotskian psychology seeks to understand and explain consciousness (the inner) in terms of society (the outer), which is the reverse of the cognitivist approach, which explains the outer (acts, behaviour, etc) in terms of the inner (mental representations).

Situated learning is generally understood as the learning that occurs when the learner sets out to acquire the necessary skills, knowledge and attitudes that will enable him/her to be part of a community of practice. This community of practice could be domestic, social or vocational. It is what Lave and Wenger (1991, p.20) describe as *legitimate peripheral participation*, which:

...provides a way to speak about the relations between newcomers and old-timers, and about activities, identities, artefacts and communities of knowledge and practice. It concerns the process by which newcomers become part of a community of practice. A person's intentions to learn are engaged and the meaning of learning is configured through the process of becoming a full participant in a sociocultural practice. This social process includes, indeed it subsumes, the learning of knowledgeable skills.

Lave and Wenger (1991, 1996, 2002) argue that 'transparency of the socio-political organisation of practice, of its content and of the artefacts engaged in practice is a critical resource for increasing participation (2002, p. 111). They argue that learners are inevitably part of a *community of practice* whether it be an occupational community or a family or a common interest group, and that the development of knowledge and skills requires them, as newcomers to the community, to move towards full participation in the socio-cultural practices of the community. Wenger and others have elaborated on the concept of a *community of practice* (Wenger 1998, 2002; Wenger, McDermott & Snyder 2002), describing their value, their structural elements and their cultivation.

The concept of the *community of practice* has become part of our educational, managerial and organisational language and discourse. It has also been adapted to *learning communities*. What has not been translated quite so easily and rapidly is the nature and role of the particular contexts in which learning occurs and how that impacts on the learning itself. Lave and Wenger (1991, p. 33) note that it is not just the activity or experience that gives rise to the learning which is situated, but also the process of the learning itself. They emphasise that instead of 'receiving' a body of factual knowledge, situated learning involves the whole person, and that the learner, activity and the world mutually constitute each other.

The concept of situated learning is often criticised for its inability to be generalised because of the particularity of the context and the uniqueness of the context's role in shaping the learning. Lave and Wenger (1991, p. 33) counter with the argument that generalisation means that data is abstracted from its context and that the way this is done is dependent on the context of the abstraction. Secondly, a generalisation is only useful if it can be applied to a particular context. The test of a generalisation is its application to 'a specific event in specific circumstances' (1991, pp. 33-34). The power of abstraction is 'thoroughly situated in the lives of persons and in the culture that makes it possible' (1991, p. 34).

4. A theoretical approach for work-based learning

The theoretical foundations of learning at work are grounded on constructivism (Lasonen 2005). According to this view, knowledge is not an objective reflection of reality which is transferable as such, but rather as something constructed by an individual and a social community in interaction (Bruner 1990; Miettinen 2000). Constructivist theory emphasises experiences, collaboration, problem-solving and the contextual aspect of learning. Learning is the active cognitive and social activity of the learner who engages in the continuous construction of their picture of the world and its phenomena, interpreting new information on the basis of their previous knowledge, conceptions and beliefs. In this way, learning reshapes an individual's conceptions.

Traditional learning theories posit knowledge as stable. It is there to be obtained by the learner, with guidance from a teacher who has a priori possession of the knowledge. However, this can impose limits on knowledge. It becomes a stable commodity being perpetuated from one generation of learners to the next. Constructivist theories of learning, on the other hand, see knowledge not as a stable commodity that can be acquired, but as something that is constructed. Engeström (2001) argues that 'people and organizations are all the time learning something that is not stable, not even defined or understood ahead of time. In important transformations of our personal lives and organizational practices, we must learn new forms of activity which are not yet there. They are literally learned as they are being created. There is no competent teacher' (pp. 137-38).

Because the epistemic assumptions of constructive learning are different, therefore, from those of traditional instruction, classical methods of analysis are inappropriate for constructivist learning environments (Jonassen 1999). As a relatively recent and novel approach, Engeström's theory of *expansive learning* (1987), which is based on the implicit belief that '...knowledge is personally constructed, socially mediated and inherently situated' (Clarke 1995 p. 43), provides a framework for the analysis and understanding of learning within work environments, especially those characterised by change and uncertainty, and provides an important theoretical orientation and anchor for workplace learning and, consequently, for this study.

Engeström (1999a) argues that standard theories of learning are focused on processes where, traditionally, an individual or, more recently, an organisation, acquires some identifiable knowledge or skills in such a way that a corresponding and relatively lasting change in the performance of that person or organisation is observed. Further, he claims that it is a ‘self-evident supposition that the knowledge or skill to be acquired is itself stable and reasonably well defined. [In addition] there is a competent ‘teacher’ who knows what is to be learned’ (Engeström 1999a, p. 6).

However, in a changing world, much of the learning which occurs in workplaces and communities is not bounded, stable, well-defined or even understood ahead of time. As Engeström (1999a, p. 6) notes, ‘[i]n important transformations of our personal lives and organisational practices, we must learn new forms of activity which are not yet here’. In such situations we create knowledge as we learn it. Understanding that much of the knowledge we utilise on an everyday basis is neither bounded nor stable is an important step in understanding how we adapt what we already know and can do to new situations.

Engeström (1999a, p. 1) argues that any theory of learning must answer at least four central questions:

1. Who are the subjects of learning, how are they defined and located?
2. Why do they learn, what makes them make the effort?
3. What do they learn, what are the contents and outcomes of this learning?
4. How do they learn, what are the key actions of processes of learning?

He uses these four questions to develop his theory of *expansive learning* (Engeström 1987), which conceptualises learning not as the internalization of discrete information or skills by individuals, but rather as expanding social and intellectual involvement with other people and the tools available in their culture. The question of individual learning becomes the question of how that which is inside a person might change over time as a consequence of repeated social interactions with ‘other people and their tools, including the very powerful tools of words, images, and gestures’ (Hutchins 1995, p. 290). It also places considerable importance on the ‘discursive construction of a shared object and intention in knowledge creation’ (Engeström 1999c, p. 385).

5. Activity theory

Engeström's approach is based on *activity theory* (Vygotsky 1962, 1978, 1986), an increasingly dominant constructivist paradigm that focuses on the cultural embeddedness of learning, employing the methods and framework of cultural anthropology to examine how learning and cognition are distributed rather than stored (Engeström 1993; Cole & Engeström 1985, 1993; Saxe 1992; Cunningham and Knuth 1993). This socio-cultural, socio-historical lens focuses on the interaction of human activity and consciousness within its relevant environmental context. It offers a framework for describing activity and provides a set of perspectives on practices that interlink individual and social levels (Engeström 1987, 1993; Leont'ev 1974; Nardi 1996).

Activity theory has its roots in the classical German philosophy of Kant and Hegel, which emphasised both the historical development of ideas as well as the active and constructive role of humans. This philosophy provided the foundation for the more contemporary philosophy of Marx and Engels, and the Soviet cultural-historical psychology of Vygotsky, Leont'ev and Luria (Kuutti 1996) on which *activity theory* is based. It adopts Marx's dialectic materialist view of activity and consciousness as dynamically interrelated (Leont'ev 1972), which provides an alternative perspective to the mentalistic and idealist views of human knowledge that claim that learning must precede activity. *Activity theory* posits that learning emerges from activity (performance), not as a precursor to it, thereby providing us with an alternative way of viewing human thinking and activity.

Activity theory 'grounds analysis in everyday life events, the ways people interact with each other using tools over time' (Russell 2004, p. 311). The main unit of analysis in *activity theory* is the activity system, defined as 'object oriented, collective, and culturally mediated human activity' (Engeström & Miettinen 1999, p. 19). Kuutti (1996) defines activity as a form of doing that is directed towards the fulfilment of an object (in the sense of an objective) which, in turn, is linked to an anticipated outcome (Leont'ev 1975). An activity is undertaken by a human agent (subject) who is motivated toward the solution of a problem or purpose (object) mediated by tools (artefacts) in collaboration with others (community) (Ryder 2008). In this dynamic, purposeful relationship the subject learns and grows while the object is interpreted and reinterpreted by the subject in the ongoing conduct of the activity.

Activity theory understands learning not as the internalisation of discrete information or skills by individuals, but rather as expanding social and intellectual involvement over time with other people and the tools available in their culture. ‘The question of individual learning becomes the question of how that which is inside a person might change over time as a consequence of repeated social interactions with’ other people and their tools, including the very powerful tools of words, images, and gestures (Hutchins 1995, p. 290). As John-Steiner and Mahn (1996, p. 3) note, ‘Vygotsky conceptualised development as the transformation of socially shared activities into internalised processes. In this way, he rejected the Cartesian dichotomy between the internal and the external.’

According to Vygotsky, human learning, unlike much animal learning, is not the simple result of stimuli, or inborn cognitive structures, but rather a complex result of our interactions with others mediated by tools in the culture, including language. At the beginning stages of development, the object-oriented acts of an individual are accomplished through the joint activity of a learner and another person performing together as a working social system (interpsychological plane). Only after that, the interpsychological categories used between people in discursive practices are appropriated as tools for thinking by an individual learner (intrapyschological plane). In other words, when people encounter some object in the environment (i.e. a stimulus) they interpret and act on it not directly, but through the mediation of tools used by others. For example, a child learns the uses of a ball as a part of joint activity by watching others use the ball for a game, by listening to their words (another kind of tool), and perhaps by becoming involved in the game, the joint activity.

Activity theory investigates human activity in a specific social setting (Parks 2000). Situations are actively construed by social actors and at the same time the actors also shape these situations. It illustrates how the effectiveness of any learning is dependent on the interplay of subjects and objects (Engeström 1993; Leont’ev 1978). An activity system allows for the interactions and consequent transformations of personal, social, cultural and technical elements within its boundaries. It represents the processes of learning as developmental transformations in the Vygotskyian tradition (1978), occurring through the interaction of contradictory variables within a dynamic system. This interplay of contradictions creates developmental transformations, which are understood as learning outcomes.

Activity theory is a theoretical framework for the analysis and understanding of human interaction through the use of tools and artefacts and offers a holistic and contextual method of discovery that can be used to support qualitative and interpretative research. It is particularly relevant in situations that have a significant historical and cultural context and where the participants, their purposes and their tools are in a process of rapid and constant change (Hashim & Jones 2007). It is at its best in ‘messy’ situations, at analysing poorly-understood processes of developmental transformations over time (Madsen 2009). As a framework for learning in concrete, local, socially-situated practices, it lends itself to developmental or illuminative requirements in situations where people are learning to do things that have not been done before (Lave 1996; Avis 2007).

Because *activity theory* sees the mind as both embodied and culturally and historically embedded, involved in a continuous process of interpretation and response, it is compatible with the aim of social transformation through the discursively-informed agency of practitioners. While a constructivist outlook emphasises the development of a capacity to make informed interpretations of cultural contexts and the importance of collaborative or systematic responses to those interpretations, *activity theory* adds to these concerns a focus on the historical construction of possible interpretations and responses.

Nardi (1996) contends that the goal of social researchers applying *activity theory* is not to achieve reliable predictions about human behaviour but to shed light on the complex experiential unity of individual cognition and social activity. It ‘rejects cause and effect, stimulus response, explanatory science in favour of a science that emphasise the emergent nature of mind in activity and that acknowledges a central role for interpretation in its explanatory framework’ (Cole 1996, p. 104). However, while *activity theory* might illuminate explorations of informed action and institutional change by pioneering and reinventing praxis responsive to social change, it is less a tight theory than a ‘philosophical framework for studying different forms of praxis as developmental processes at both the individual and social levels’ (Kuutti 1994, p. 52). It is a heuristic framework for asking important questions that other theories may not raise so clearly, and for seeing relationships among those questions that may guide design and evaluation.

Activity theory does not offer a fixed methodology; its conceptual tools can be applied to analyse particular activity systems using a repertoire of methods, including ethnographic field study, interviews, focus groups, case studies and discourse analysis (Kuutti 1996). The assumptions of *activity theory* are consonant with those of constructivism, situated learning, distributed cognition, case-based reasoning, social cognition and everyday cognition that underlie constructivist learning environments (Jonassen & Land 1999).

Although relatively new to Western researchers, activity theory has a long tradition as a theoretical perspective in the former Soviet Union (Leont'ev 1974, 1981, 1989; Vygotsky 1978) and has its roots in the work of the Russian psychologist Vygotsky during the first half of the 20th century. Vygotsky, Leont'ev and Luria provided the original conceptual framework, building directly on the theories of Marx and Engels relating to the primacy of practice in shaping human consciousness (Engeström & Miettinen 1999; Kuutti 1996). In the 1980s, the theory was modified by Scandinavian researchers, principally Engeström (1987), and began to be applied to analyse socio-technical (i.e. human-technology) interaction. It has gained a foothold in the United States and elsewhere, predominantly through the work of Nardi (1996), where a growing number of researchers in a wide range of fields value *activity theory* for its descriptive conceptual framework and the insights it provides into the myriad reasons why human behaviour and consciousness so effectively evade totalising theoretical explanations.

A broad range of work in psychology (Leont'ev 1978; Vygotsky 1978; Luria 1979; Scribner 1984; Newman, Griffin, and Cole 1989; Norman 1991; Salomon 1993), anthropology (Lave 1988; Suchman 1987; Flor and Hutchins 1991; Hutchins 1991; Nardi and Miller 1990, 1991; Gantt and Nardi 1992; Chaiklin and Lave 1993), and computer science (Clement 1990; Mackay 1990; MacLean et al. 1990) has shown that it is not possible to fully understand how people behave if the unit of study is the unaided individual with no access to other people or to artefacts for accomplishing the task at hand. The study of context, therefore, becomes important in order to understand the relation between individuals, artefacts and social groups. In comparing a number of methods of qualitative analysis, Nardi (1996) concluded that *activity theory* offers the richest framework for studies of context (largely because of its comprehensiveness and engagement with the difficult issues of consciousness, intentionality and history).

5.1 Overview of activity theory

When discussing activity, activity theorists are not simply concerned with ‘doing’ as a disembodied action but are referring to ‘doing in order to transform something’, with the focus on the contextualised activity of the system as a whole (Engeström 1987, 1993; Kuutti 1996). The ‘minimal meaningful context’ for understanding human actions is the activity system, which includes the actor (participant) or actors (subgroups) whose agency is chosen as the point of view in the analysis and the acted on (object) as well as the dynamic relations among both. Ideally, the subject’s motives become the stabilising feature of every activity system. The motive stimulates the subject intentionally with regard to the object, which is both the thing being transformed by the activity and the activity’s purpose.

Contemporary *activity theory* defines activity systems as structured collaboration with long-term and/or continuously-renewed objects, such as building a house to use one of Kuutti’s examples (Kuutti 1996). Analysts decompose the activity system into the principle tasks constituting it, which are referred to as actions. Actions are goal-directed processes carried out consciously. An activity system consists of networks of actions, which, in turn, consist of linked operations, well-defined routines developed as habitual responses to conditions which both evoke and mediate an action. Many actions become operations with time and practice. But an operation can also revert to the level of action, involving conscious attention, when conditions impede the execution of the action through the unconsciously-performed operation (Kuutti 1996).

Engeström (1999) argues that *activity theory* has evolved through three generations of research, characterised by mediation (first generation), the dichotomy of activity (second generation), and the complex interactions between the individual subject and his or her community (third generation).

5.2 First generation activity theory

The initiation of *cultural-historical activity theory* (sometimes referred to as *socio-historical activity theory*) is generally attributed to Lev Vygotsky (1978) in the 1920s and early 1930s. The evolution of *activity theory* as a concept in the time between when Vygotsky first formulated the concept and the published version of it some fifty to sixty years later is, unfortunately, lost or distorted because of the political conditions which prevailed in Russia during the time which deemed philosophy and thought an activity detrimental to the State (Bakhurst 1993).

Vygotsky (1978) originally introduced the idea that a person's interactions with their environment are not direct but instead are mediated through the use of tools (sometimes referred to as artefacts). These interactions are essentially subjective and shaped by the history of each individual's social and cultural experience (Vygotsky 1978). Vygotsky (1978) defined human activity as essentially a dialectic relationship between subject and object, i.e. a person working at something.

Vygotsky's work was continued by others, among them Leont'ev, who developed a conceptual framework for a complete theory of human activity (Leont'ev, 1981). According to Leont'ev (1981), activity is a system that has structure, its own internal transitions and transformations and its own development. In Leont'ev's formulation, more precisely referred to as cultural historical activity theory (CHAT), an activity system relates a *subject* (one or more individuals) and an *object* through the mediation of *tools*, which are used by the subject to transform the object into an outcome (Leont'ev, 1978). This notion is usually represented using what has come to be known as the *basic mediational triangle* model of human activity or simply the *activity system* (Kuutti 1996) as depicted in Figure 2.1.

Figure 2.1: First generation activity theory - Basic mediational triangle

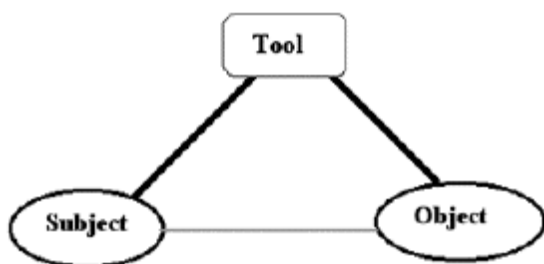


Figure 1. Basic Mediational Triangle

The *subject* refers to the individual or group whose point of view is taken in the analysis of the activity. It portrays both the individual and social nature of human activity through the manipulation of tools in order to satisfy desired objectives.

The *object* (i.e. objective) is held by the subject and motivates activity, giving it a specific direction. It 'refers to the raw material or problem space at which the activity is directed and which is moulded or transformed into outcomes with the help of physical and symbolic, external and internal tools' (Engeström 1993, p. 67). It is the target of the activity within the system and portrays the purposeful nature of human activity that allows individuals to control their own motives and behaviour through the manipulation of tools. The objective of an activity therefore forms the basis for distinguishing the various sub-activities that may exist within the main activity system.

The *tool* component of the model reflects the mediational aspects of human activity using both physical and conceptual tools. A tool could be something as straight-forward as a hammer or a spanner, or it may be something much more abstract, such as language and culture. Physical tools are used to handle or manipulate objects while conceptual tools are used to influence behaviour in one way or another. The tool component of the triangle helps to address the notion that all human activity involves the use of tools.

Tool mediation is one of the most important concepts of activity theory. Humans are seen as continually changing tools or artefacts or creating new ones. Tools or artefacts refer to culturally-produced means for changing the environment and achieving goals. Tools/artefacts shape the way human beings interact with reality and vice versa and 'artefacts themselves have been created and transformed during the development of the activity itself and carry with them a particular culture and a historical residue of that development' (Kuutti 1996, p. 26). Therefore, the use of tools/artefacts is a means to accumulate, transmit and transform socio-cultural knowledge. Activity theorists argue that changing tools is bound to change the role of the members of a learning community and vice versa. For example, changes in the design of a tool may influence a subject's orientation towards an object, which, in turn, may influence the cultural practices of the community. In addition, it is possible that the object and motive themselves will undergo changes during the process of an activity (Kuutti, 1996).

Engeström (1999a) characterises the insertion of tools/artefacts into human actions as revolutionary because they helped to overcome the split between individual and societal structures. Individuals could no longer be understood as separated from their cultural resources, and society could not be understood without the agency of individuals who use and produce artefacts. 'Objects become cultural entities and the object-orientedness of action became the key to understanding human psyche' (Engeström 1999a, p. 2). As Engeström (1999a, p.1) notes:

The individual could no longer be understood without his or her cultural means; and the society could no longer be understood without the agency of individuals who use and produce artefacts. Objects no longer were just raw material for the formation of the subject as they were for Piaget. They became cultural entities and the object-orientedness of action became the key to understanding human psyche.

This model (referred to by Engeström, 1996b, as first generation activity theory) helped to overcome the limiting behaviourist stimulus-response model which implies instinct-based unmediated activity involving direct action between a subject and an object. The behaviourist model neglects socio-cultural context. As opposed to behaviourists, Vygotsky (1978) argues that most object-oriented human activities are mediated through the use of culturally established physical and semiotic tools/artefacts. He saw a difference between physical and semiotic tools in that the latter directs the mind and behaviour, whereas the physical tool directs changes in the object itself (Vygotsky 1978).

5.3 Second generation activity theory

In the course of time, researchers began to see the limitations of first generation activity theory, particularly the individually-focused unit of analysis. Later representations of Vygotsky's ideas (referred to by Engeström, 1996b, as second generation *activity theory*) integrated the notion that social relations are an essential part of mediated actions (Dias et al. 1999 p. 24). Wertsch (1981) argued that activities are defined not simply by the central activity but on the basis of the conditions under which they are carried out. Initial work in this regard was undertaken by Leont'ev (1981).

Six years later, Engeström (1987) introduced a further expanded version of the activity system in order to reflect the collective and collaborative nature of human activity.

Engeström (1987) expanded the basic subject-tool-object activity system model by adding two other mediated triads and proposed a new unit of analysis he calls a 'human activity

system', which is composed of 'the individual practitioner, the colleagues and co-workers of the workplace community, the conceptual and practical tools and the shared objects as a unified dynamic whole' (Engeström 1991, p. 267). According to Engeström the system is object-oriented, tool-mediated and culturally-mediated and is depicted in Figure 2.2.

Figure 2.2: Second generation activity theory – expanded triangle model

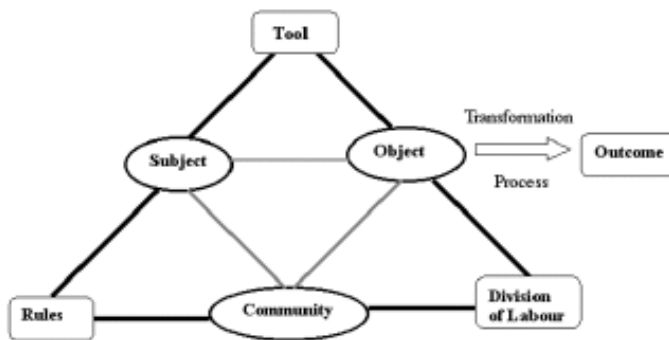


Figure 2. Expanded Triangle Model

In Engeström's expanded model, the subject's activity is constrained by its relation to a community of practice mediated by conventions, policies and rules. The *community* is comprised of one or more people who share the objective with the subject. This component of the model puts the analysis of the activity being investigated into the social and cultural context of the environment in which the subject operates. The *rules* component highlights the fact that within a community of actors, there are bound to be rules and regulations that affect in one way or another the means by which activity is carried out. These rules may either be explicit, or implicit, for example, cultural norms that are in place within a particular community (Engeström 1993; Kuutti 1996). Meanwhile, the division of labour mediates the community's relationship to the object. The *division of labour* refers to the allocation of responsibilities and variations in job roles of the subjects as they carry out activity in the community.

In this model the uppermost triangle may be considered as the 'tip of the iceberg' representing individual and group actions and is the part which is generally seen and reported on. However, these actions are embedded in a collective activity system where the often-unseen, unreported and unconsidered effects of the community, its rules and its division of labour, influences the actions of the individual or the group.

5.4 Third generation activity theory

People participate in multiple activity systems, such as family, school, work – ‘the real life situations always involve an intertwined and connected web of activities that can be distinguished according to their objects’ (Kuutti 1996, p. 30). A person engaged in one activity system is simultaneously influenced by other activity systems in which he/she participates. These influences are both horizontal (happening across communities) and vertical, as social actions are also embedded within history, culture and inequitable power relations that both influence the production of meaning and shape human activities in important ways.

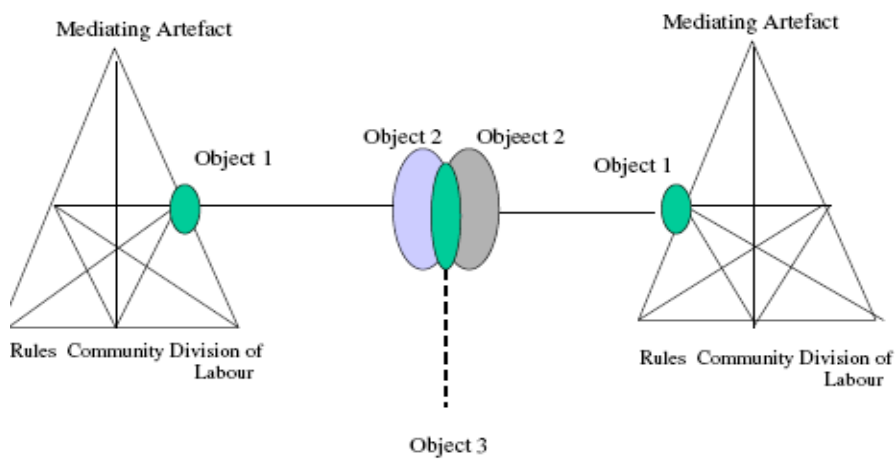
Third generation activity theory grew from a concern to address interactions that occur when two activity systems come together, and incorporates the idea of boundary objects; i.e. objects that operate at the interface of many contexts (Edwards 2005). Where two (or more) activity systems come into contact there may be contradictions and tensions through which expansive learning is possible. If practitioners engage in discussion, debate and reflection then learning beyond what was possible within a single activity system becomes possible (Russell 2002). Cole (1998) and Griffin and Cole (1984) were among the first in the West to suggest that researchers should pay attention to horizontal development and focus on questions of diversity, dialogue between different perspectives, voices and networks of interacting activity systems.

Engeström (1999a) notes that third generation advances include:

- the work of Wertsch (1991) in introducing Bakhtin’s (1981, 1986) ideas on dialogicality as a way to explain the Vygotskian framework
- Ritva Engeström’s (1995) work in pulling together Bakhtin’s ideas and Leont’ev’s concept of activity
- notions of activity networks (Russell 1997)
- possible links between activity theory and Latour’s (1993) actor-network theory (Engeström & Excalante 1996; Miettinen 1999)
- the concept of boundary crossing (Engeström, Engeström and Karkkainen (1995)
- the concept of a ‘third space’ to account for examples of expansive learning (Gutierrez, Rymes & Larson 1995).

The third generation of *activity theory* takes joint activity or practice (rather than individual activity or practice) as the unit of analysis for activity theory. It is concerned with developing conceptual tools to understand the diversity and complexity that exists within activity systems and networks of interacting activity systems. The third generation of activity theory, as proposed by Engeström (1999a), intends to develop conceptual tools to understand dialogues, multiple perspectives, and networks of interacting activity systems. He draws on ideas on dialogicality and multivoicedness in order to expand the framework of the second generation. The idea of networks of activity, within which contradictions and struggles take place in the definition of the motives and object of the activity, calls for an analysis of power and control within developing activity systems. The minimal representation (see Figure 2.3) shows but two of what may be a myriad of systems exhibiting patterns of contradiction and tension.

Figure 2.3: Third generation activity theory – joint activity or practice



5.5 Using activity theory for the study

In adopting *activity theory* as an overall theoretical approach for the study, I, as researcher, am the *subject*, motivated by experience and a desire to develop a contextualised method to take account of qualitative factors that are germane to the behaviour of people in a particular mass gathering setting. The *tool* is the traditional risk assessment methodology (to be refashioned by identifying and integrating relevant qualitative factors into a contextualised risk assessment tool). The *object* (ive) is to provide a framework for better event planning and crowd management, with the outcome of improved health and safety at outdoor music festivals. The *community* consists of concert promoters, venue owners and operators, and associated safety personnel. The *rules* relate to the legal environment of due diligence and compliance with standards relating to risk management, occupational health and safety, and public liability laws. The *division of labour* is represented by the various approaches taken by the individuals involved in the different venues.

The use of an *activity theory* approach is appropriate for this study for several reasons. Firstly, conventional methods of problem identification and assessment via testing, performance review and/or failure data are not available or suitable for assessing crowd safety management. This is why the traditional approach relies so heavily on the experience of individuals. It is proposed to collate and examine this experience in order to gauge current 'fit' between theory and practice and to confirm the need for a new contextualised method. Contradictions will be identified and examined with a view to providing an impetus and possible template for innovation and change.

Secondly, at a more conceptual level, integrating psychology and engineering is somewhat of a contradiction in itself, as traditionally these disciplines are characteristically mutually exclusive in their focus on the perspective of crowd members who think and behave (psychology) or on static and dynamic objects (engineering).

6. Expansive learning

In developing his theory of *expansive learning*, Engeström (1987, 1993, 1999) started from Bateson's theory of learning (1972). Bateson's writing emphasises the relational (Belenky, Clinchy, Goldberger, & Tarule 1986) and contextual, rather than individual and intrapsychic, aspects of learning, yet from an epistemological rather than social perspective. Among other things, he argues that 'mind' resides in connections and relations in systems, not in the brains of individual people. Bateson applied this principle to human interaction, arguing that it necessarily involves simultaneous, experientially fused but logically distinct, communication about both (a) content, and (b) the nature of the relationship between those communicating. In other words the latter type, which is often non-verbal, classifies the interaction. He called this 'metacommunication' (Bateson 2000, p. 137; Watzlawick, Beavin, & Jackson 1968).

Bateson posits five levels of learning as shown in Table 2.2. Bateson scarcely discussed Level 4 learning, commenting that it 'probably does not occur in any adult living organism on this earth' (2000a, p. 293), suggesting that it is likely to involve evolutionary change in a species. Accordingly, this discussion is limited to learning at Level 0 through to Level 3.

Table 2.2: Bateson's levels of learning, adapted (Bateson 2000a, p. 293)

Level	Description	Example
Level 0	Characterised by specificity of response which is not subject to correction	Something is either right or wrong
Level 1	Conditioning through the acquisition of responses deemed correct within a given context	Learning the correct answers and behaviours in a classroom
Level 2	Acquisition of the deep seated rules and patterns of behaviour characteristic to the context itself	Learning the 'hidden' curriculum of what it means to be a student
Level 3	Radical questioning of the sense and meaning of the context and the construction of a wider alternative context	Learning leading to change in organisational practices
Level 4	A change in Learning Level 3	Probably does not occur in any adult living organism

Bateson's levels do not represent a stage theory of learning whereby what is sought is progression from one level to the next. The hierarchical arrangement of levels does not mean that a higher level is necessarily superior to, or more desirable than, a lower level. Nor are the levels sequential in time. As Bredo observes, '...the different levels of learning go in parallel' (1989, p. 32).

Level 0

As with the dictum, ‘if you always do what you’ve always done, you’ll always get what you’ve always had’²¹, Bateson’s notion of Level 0 learning entails responding to stimuli but making no changes based on experience or information. This is like the initial response of the two mice in the popular business book ‘Who Moved My Cheese?’ (Johnson 1998), who continue to look for their cheese in the same place each day even after it had disappeared - until, that is, the mice registered that the cheese really had gone, and that they needed to do something different. While at first glance one might dismiss the value of Level 0 learning, it includes skilled, unconscious performance, as well as the apparently unintelligent behaviour of the two mice. The professional who, apparently intuitively, understands the heart of the problem brought to them by a client, using pattern recognition developed through many years of practice, is displaying Level 0 learning. Level 0 learning has utility in that if people did not filter out much information in their workplaces, they could end up paying needless attention to insignificant detail. It is, therefore, far from being the case that Level 0 learning is inferior to ‘higher’ levels.

Level 1

Level 1 learning refers to changes in Level 0 learning resulting in ‘...change[s] in specificity of response by correction of errors of choice within a set of alternatives’ (Bateson 2000a, p. 293). We can regard Level I learning as the explicit focus of much management development, in the sense that training and other developmental activities aim to develop new choices of this kind (skills and knowledge).

The emphasis of Level 1 learning is change within a set of alternatives, like Watzlawick et al.’s concept of first-order change (1974), the set of alternatives itself does not change. This is encapsulated in the saying, ‘rearranging the deckchairs on the Titanic’, as a metaphor for some organisational changes - one can apply the utmost ingenuity to the configuration of the deckchairs, yet it will make no difference to the trajectory or fate of the ship. The implication is that transformational learning cannot result from Level 1 learning alone. In the context of organisational development, Level 1 learning would result in managers knowing many new ‘tricks’ without ever transforming the context of the workplace.

²¹ This concept is to be found in neuro linguistic programming.

Level 2

Level 2 learning is described by Bateson as ‘... change in the process of Learning 1’ (Bateson 2000a, p. 293) entailing ‘... changes whereby an individual comes to expect his world to be structured in one way rather than another’ (Bateson 2000a, p. 249). In Watzlawick et al’s (1974) terms, this is second-order, discontinuous change that identifies a new set of alternatives, within which new choices exist.

Level 2 learning can be thought of as learning the principles, governing rules, or patterning of a context. According to Bateson, context (play, work, training, etc.) is not objectively definable and it may be perceived differently by different individuals – ‘...a way of punctuating is not true or false’ (Bateson 2000a, p. 301). Thus ‘context’ does not refer straightforwardly to the location in which interaction takes place. In Bateson’s writing it is a more sophisticated and subtle concept. Bredo observes, for example, that ‘[i]nstrumental conditioning tasks... teach not only how to discriminate between particular stimuli, but also about instrumentality itself’ (1989, p. 36). In other words, learning to discriminate between stimuli is Level 1 learning, learning about the relational context called ‘instrumentality’ represents Level 2 learning.

French and Bazalgette (1996) argue that all ‘learning organisations’ are also ‘teaching organisations’ in the sense that these contextual ‘rules’ are taught – akin to the notion of the ‘hidden curriculum’ (Snyder 1971). Similarly, when an employee attends a training course they learn new skills and knowledge (Level 1 learning) and they learn about how to be effective in the context, broadly called ‘training’ (Learning 2). In essence, this suggests that the classic human resource development (HRD) issue of transfer of learning (e.g. Wilson 2005)) concerns not Level 1 learning, but the more intangible and contextual Level 2 learning.

Bateson (2000a, pp. 249-300) also cites the phenomenon of ‘transference’ as representing Level 2 learning about the patterning of relationship between (say) a child and a parent. Transference (e.g. McAuley 2003) means that the individual imports this learning into other situations later in life, configuring and behaving in these new contexts in such a way that the transference is habitually reproduced (i.e. it becomes Level 0 learning). A classic example of transference is the way in which a person’s relationships with authority figures in the workplace can replicate family patterns. In Bateson’s words ‘this behaviour is controlled

by former Learning 2 and therefore it will be of such a kind as to mould the total context to fit the expected punctuation... this self-validating characteristic... has the effect that such learning is almost ineradicable' (Bateson 2000a, p. 301). Level 2 learning happens when, in effect, a new meaning evolves and is enacted in such a way that the person differentiates between past and present contexts.

Level 3

Bateson added the section on Level 3 learning to his work in 1971. If Level 2 learning is about the emergence of new understandings of context, Level 3 learning by analogy implies some deeper shift, such as a change in the set of contexts. Indeed Bateson said that at this level, 'the concept of "self" will no longer function as a nodal argument in the punctuation of experience... ' (2000a, p. 304). Level 3 learning equates to notions of transformational change (Yorks & Marsick 2000). Indeed Bartunek and Moch (1994, p. 25) draw on Bateson's theory when they talk about 'third order change', which they say is 'very difficult to achieve in practice, primarily because it must be based on a transconceptual model of understanding'. Hence they seek to understand it by exploring mystical experience.

According to Bredo (1989, p. 35), 'The "problem" to which third-order learning is a "solution" consists of systematic contradictions in experience'. Bateson refers to being 'driven to Level 3 by "contraries" generated at level 2' (2000a, p. 305), and emphasised that Level 3 learning is no everyday occurrence but that '...something of the sort does, from time to time, occur in psychotherapy, religious conversion, and in other sequences in which there is profound reorganization of character' (Bateson 2000a, p. 301). Bateson (2000a, p.301) also suggested that Learning 3 is often beyond the realm of language, insisting that '...no amount of rigorous discourse of a given logical type can "explain" phenomena of a higher type'. Engeström (2001, p. 139) suggests that 'Bateson's conceptualization of Learning 3 was a provocative proposal, not an elaborated theory'.

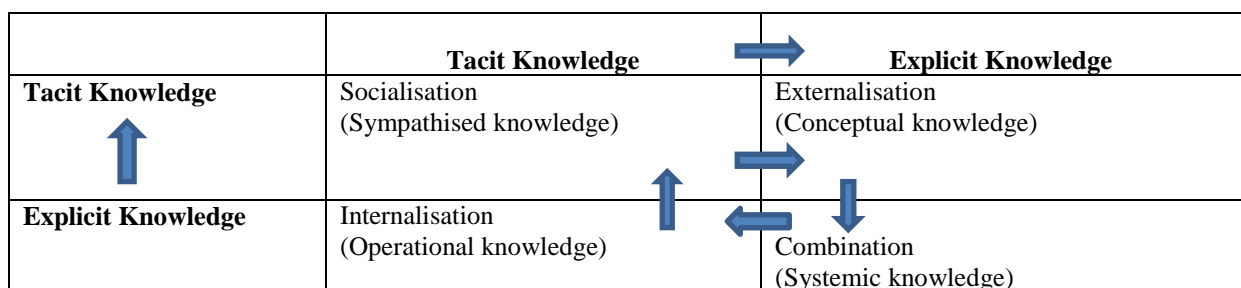
Learning at level 3 is where one begins to radically question the sense and meaning of the context and to construct a wider alternative context. As Bateson himself recognised, learning at level 3 is a high risk activity (1979 p. 305). Expansive learning develops from level 3 learning and actively and collectively develops new patterns of activity. The approach resonates with the discussion in the previous section regarding critical reflection (Mezirow 1991) and perspective transformation (Elias 1997).

In developing his theory, Engeström also adopts and generalises Nonaka and Takeuchi's (1995) framework of cyclic knowledge creation, which was developed in the context of organisational learning. Nonaka and Takeuchi's (1995) model, which is based on conversions between tacit and explicit knowledge, describes the creation of knowledge in five-phase processes involving four stages of knowledge conversion – socialisation, externalisation, combination and internalisation (Engeström 1999a, p. 19). The process begins with the tacit knowledge of one or several individuals, who share it with others, thereby developing a common understanding. This common understanding is transferred into explicit knowledge in the form of a concept in the second phase of the process. In the third phase, the emerged concept is justified by comparing and linking it to other explicit knowledge within as well as outside the organisation. In the fourth stage the concept is manifested into a model operating procedure that can be further discussed and tested. In the final stage the new knowledge is cross-levelled or spread in the organisation for practical purposes.

Nonaka and Takeuchi (1995) believe that four modes of knowledge conversion are at work. These are socialisation (transferring tacit knowledge to tacit knowledge), externalisation (transferring tacit to explicit knowledge), combination (transferring explicit to explicit knowledge) and internalisation (transferring explicit to tacit knowledge). In this model, tacit knowledge is generally viewed as prerequisite for the use of explicit knowledge. It is through tacit knowledge that explicit knowledge is interpreted and manifested in practical sense.

Engeström's adaptation of Nonaka and Takeuchi's model of knowledge conversion (1999c, p.379) is represented in Figure 2.4:

Figure 2.4: Modes of knowledge conversion (adapted by Engeström 1999c, p. 379; Nonaka & Takeuchi 1995)



6.1 From concrete to abstract

Engeström's theory of *expansive learning* (1987, 19993, 1999) is based on the dialectics of moving from the concrete to the abstract. This makes it very different from those theories of learning which are approached theoretically and then applied to concrete situations.

According to Engeström (1999, p.382):

The theory of expansive learning is based on the dialectics of ascending from the abstract to the concrete. This is a method of grasping the essence of an object by tracing and reproducing theoretically the logic of its development, of its historical formation through the emergence and resolution of inner contradictions. A new theoretical idea is initially produced in the form of an abstract, simple explanatory relationship, a *germ cell*. This initial abstraction is enriched step by step and transformed into a concrete system of multiple, constantly developing manifestations.

Because a dialectical-theoretical approach is used, an abstraction captures the smallest and simplest primary unit of activity. This is necessary in order to explain its particular relevance to the phenomenon being researched and as a method of analysis:

The cultural-historical theory of activity (activity theory for short) approaches human cognition and behaviour as embedded in collectively organised, artefact-mediated activity systems (Cole and Engeström, 1993; Engeström, 1987; Leont'ev 1978). Activities are social practices oriented towards objects. An entity becomes an object of activity when it meets a human need (Engeström 1999c, p. 380).

6.2 Zones of proximal development

Because the activity systems that give form to (and are formed by) our lives are dynamic, they constantly present opportunities for learning. Vygotsky (1978, p. 86) called these opportunities 'zones of proximal development', which he defined as 'the distance between actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers'. Engeström (1987 p. 174) refers to them as 'the distance between the present everyday actions of the individuals and the historically new form of the societal activity that can be collectively generated as a solution to the double-bind potentially embedded in everyday actions'.

In these 'construction zones', learning takes place as people using tools mutually change themselves and their tools (Newman, Griffin & Cole 1989, p. 61). People change and learn as they expand their involvement with others in a community and the tools that community uses in certain ways. Learning is 'the product of a collaborative construction of

understanding between two individuals that results in it being appropriated by the learner' (Vygotsky 1978). In this view, learning is primarily social. What appears first in the social or interpersonal plane is then (perhaps) internalised, appearing on the cognitive or intrapersonal plane. It may then be externalised in future social activity, leading to further change and perhaps learning. Learning within an activity system should be viewed, therefore, not as internalisation of discrete information or skills, but as 'negotiating new ways of acting together' (Russell 2002, p. 69) and expanding involvement – social, intellectual and emotional – with some activity system over time. It is, in Engeström's phrase, 'learning by expanding' (1987).

The zone of proximal development has become synonymous in the literature with the term 'scaffolding'. However, it is important to note that Vygotsky never used this term in his writing, and it was introduced by Wood et al. (1976). Scaffolding is a metaphor to describe the effective interactions that take place within the zone of proximal development. Artefacts and tools assist learners to ascend to higher levels of thinking and ability. This often occurs within a community of learners, such as a group of students, peers and work colleagues. Once the learner, with the benefit of scaffolding, masters a task, for example, the scaffolding can be removed and the learner will then be able to complete the task again on their own.

6.3 Contradictions as a catalyst and springboard for change

Contradictions constitute a key component or principle in *activity theory* (Engeström 2001) and are characteristic of activity systems (Engeström 1987; Il'enkov 1982). Engeström (1987) refers to an activity system as 'a virtual disturbance-and-innovation-producing machine' (p. 11), and emphasised the importance of contradictions driving these changes. Contradictions are not simply conflicts or problems, but are 'historically accumulating structural tensions within and between activity systems' (Engeström 2001, p. 137). They generate 'disturbances and conflicts, but also innovate attempts to change the activity' (p. 134). The notion of contradictions as the driving force of change and development in activity systems has been gaining 'status as a guiding principle of empirical research' (Engeström 2001, p. 135).

Activity systems are 'constantly working through contradictions' and, in that sense, are 'virtual disturbance- and innovation-producing machine[s]' (Centre for Activity Theory and Developmental Work Research 2003-2004, section 12). As Cole and Engeström (1993)

explain, in activity systems, ‘equilibrium is an exception and tensions, disturbances and local innovations are the rule and the engine of change’ (p.8). Engeström (1999) suggests that it is the internal tensions and contradictions of an activity system, which include both historical continuity and locally situated contingency, which are the motive for change and development. According to Kuutti (1996), ‘contradictions manifest themselves as problems, ruptures, breakdowns, clashes. Activity theory sees contradictions as sources of development; activities are virtually always in the process of working through contradictions’ (p. 34).

Contradictions can be described as a ‘misfit within elements, between them, between different activities, or between different developmental phases of a single activity’ (Kuutti 1996, p. 34). They have also been characterised as conflicts (Dippe 2006), as tensions (Basharina 2007; Berge & Fjuk 2006) and as historically accumulating tensions (Engeström 2001). Drawing on Wenger (1998), Barab, Barnett, Yamagata-Lynch, Squire and Keating (2002) conceptualised tensions as system dualities and used the term *systemic tensions* instead of contradictions. Murphy and Rodrigues-Manzanares (2008) used a general definition of contradiction as a ‘tension, contrast, denial, or opposition between two propositions’ (p. 445). Peruski (2003) notes that *activity theory* provides a perspective which ‘view[s] conflict as not so much rooted in the personalities of individuals...but as rooted in the systems in which individuals are a part of (p. 158).

Contradictions emerge as disturbances, which are visible manifestations of contradictions (Capper & Williams 2004) or ‘unintentional deviations from the script [which] cause discoordinations in interaction’ and ‘deviations in the observable flow of interaction’ (Engeström, Brown, Christopher & Gregory 1991, p. 91). They are disruptions (Berge & Fjuk 2006), ‘problems, ruptures, breakdowns, clashes’ in activities (Kuutti 1996, p. 34). They result in double binds in everyday practices when an individual receives ‘two messages or commands which deny each other’ (Engeström 1987, p. 174).

Contradictions are important, not in and of themselves, but because they can result in change and development (Engeström 2001). Activity systems are capable of continual transformations, because any component’s development will impact on the behaviour of other system components. Rather than seeing contradictions as adverse consequences, Engeström (1987, 1991) sees them as a potential driving force for innovation and improvement of practices and services and, therefore, as a springboard for change. Engeström and Miettinen

(1999) emphasise a view of contradictions as ‘the motive force for change and development’ (p. 9). Wells and Claxton (2002) also recognise the positive aspect of contradictions when they notes that ‘[w]ithout the contribution of new and even antithetical ideas and suggestions, there would be no way of going beyond ways of acting and thinking repeated from the past’ (p. 5). Engeström (2001, p.137) explains how contradictions can lead to innovation and transformation in an activity system:

As the contradictions of an activity system are aggravated, some individual participants begin to question and deviate from its established norms. In some cases, this escalates into collaborative envisioning and a deliberate collective change effort. An expansive transformation is accomplished when the object and motive of the activity are reconceptualised to embrace a radically wider horizon of possibilities than in the previous mode of the activity.

Despite the potential of contradictions to result in transformation in an activity system, this transformation does not always occur. In fact, contradictions can either enable learning to progress, or they can actually disable it, depending on ‘whether or not they are acknowledged and resolved’ (Nelson 2002, p. 34). Additionally, in order for systemic contradictions to lead to innovation, their resolution cannot occur at the individual level ‘because contradictions are in social/material relations among groups of people and the tools they use’ (Wardle 2004). The notion of contradictions as a driver for change is supported by a constructivist epistemology of learning and development (Good & Brophy 1990) first articulated by Bartlett (1932), that ‘meaningful change takes place only when previous conceptions go through a process of disequilibrium in light of new information’ (Slavin 2006, p. 243). Dewey (1938) refers to the same stimulus as a perturbation (Rochelle 1992), and Duffy (Savery & Duffy 1995) refers to it as puzzlement.

According to Piaget (1977), change and development is driven by the process of equilibration. Equilibration encompasses assimilation (i.e. people transform incoming information so that it fits within their existing thinking) and accommodation (i.e. people adapt their thinking to incoming information). Piaget (1977) suggested that equilibration takes place in three phases. First, people are satisfied with their mode of thought and therefore are in a state of equilibrium. Then, they become aware of the shortcomings in their existing thinking and are dissatisfied (i.e. are in a state of disequilibrium and experience cognitive conflict). Last, they adopt a more sophisticated mode of thought that eliminates the shortcomings of the old one (i.e. reach a more stable equilibrium).

Confusion is considered to be an epistemic or knowledge affective state (Pekrun & Stephens 2012; Silvia 2010) that occurs when learners reach an impasse, are confronted with a contradiction, anomaly, or system breakdown, and are uncertain about what to do next (Brown & VanLehn 1980; Carroll & Kay 1988; VanLehn et al. 2003). Learners are placed in a state of cognitive disequilibrium and experience confusion when these discrepant events occur (Bjork & Linn 2006; Festinger 1957; Graesser, Lu, Olde, Cooper-Pye & Whitten 2005; Piaget 1952). Engeström (1999c) describes a typical sequence of epistemic actions (at pp. 383-384) as:

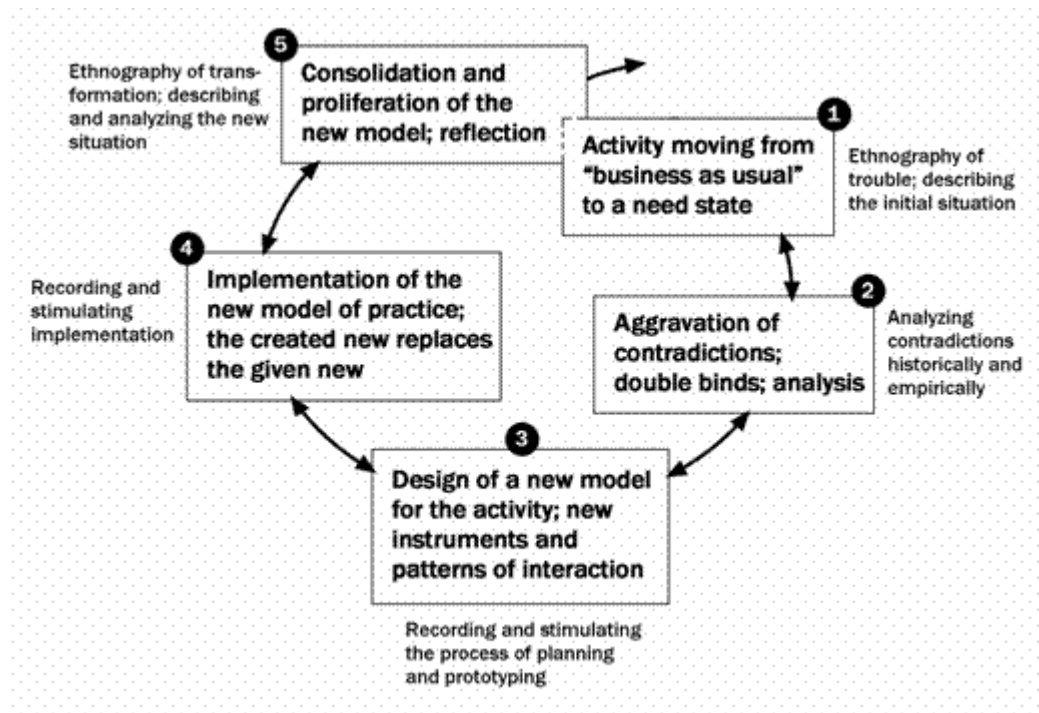
- questioning accepted practice and existing wisdom
- analysing the situation
- constructing an explicit, simplified model
- examining the model in order to understand its dynamics, potentials and limitations
- implementing the model through practical application
- reflecting on and evaluating the process
- consolidating its outcomes into a new form of practice.

Confusion and cognitive disequilibrium can trigger cognitive activities such as reflection and problem solving that can be beneficial for learning. In fact, increased experiences of confusion during learning have been linked to deeper comprehension (Craig et al. 2004; D'Mello & Graesser 2011; Graesser et al. 2007; Lehman, D'Mello, & Graesser 2012). However, it is not the mere occurrence of confusion that leads to increased learning, but rather the effects of confusion resolution processes (D'Mello & Graesser 2012; VanLehn et al. 2003). The question arises, how can learning environments take advantage of the benefits of confusion, while also avoiding any potential pitfalls, to maximize learning? Lehman et al. (2011) propose that the benefits of confusion can only be leveraged in a learning environment if three fundamental conditions are met:

- (1) the learning environment has events that *induce* confusion
- (2) the learning environment can detect and *track* the associated confusion
- (3) the learning environment *regulates* (scaffolds) the confusion in a way that maximises learning.

Engeström's theory of *expansive learning* meets these criteria. *Expansive learning* is achieved through specific epistemic or learning actions which together form an expansive cycle or spiral, as outlined in Figure 2.5.

Figure 2.5: Engeström's Expansive Learning Cycle



A brief explanation of each of the steps in the cycle is outlined in Table 2.3.

Table 2.3: Explanation of the steps in Engeström's Expansive Learning Cycle (adapted from Engeström 1999)

Action	Explanation
1. Questioning	Questioning, criticising or rejecting some existing aspects of the accepted practice and existing wisdom.
2. Analysing	Mental discursive or practical transformation of the situation in order to find out causes or explanatory mechanisms. Evokes 'why?' questions and explanatory principles. Two types of analysis: (a) Historical (genetic) – seeks to explain the situation by tracing its origination and evolution; (b) Actual (empirical) – seeks to explain the situation by constructing a picture of its inner systemic relations.
3. Designing a new model	Models the newly-found explanatory relationship in some publicly observable and transmittable medium. Means constructing an explicit, simplified model of the new idea that explains and offers a solution to the problematic situation.
4. Implementing the new model	Running, operating and experimenting on the model to fully grasp its dynamics, potentials and limitations.
5. Consolidating the new model	Concretising the model by means of practical applications, enrichments and conceptual extensions.

6.4 Summarising Activity Theory and Expansive Learning

Activity theory and *expansive learning* provides a framework that recognises the importance of context in understanding relations among individuals, artefacts and social groups. They focus on how we develop understandings of the real world, draw meanings from that understanding, create learning from those meanings and are motivated to respond to that learning. These cognitive mental models correspond to how we think about the real world and engage with it, not necessarily how the world actually works in a physical or biological sense. In this dynamic, purposeful relationship the 'always active' *subject* learns and grows, while the *object* is interpreted and reinterpreted by the subject in the ongoing conduct of the activity. It represents the processes of learning as developmental transformations in the Vygotskian tradition (1978), occurring through the interaction of contradictory variables within a dynamic system. This interplay of contradictions creates developmental transformations, which are understood as learning outcomes.

Engeström (1999) summarises his position with the help of five principles, which stand as a manifesto of the current state of *activity theory* and *expansive learning*. The first principle is that a collective, artefact-mediated and object-oriented activity system, seen in its network relations to other activity systems, is taken as the prime unit of analysis. Goal-directed individual and group actions, as well as automatic operations, are relatively independent but subordinate units of analysis, eventually understandable only when interpreted against the background of entire activity systems. Activity systems realise and reproduce themselves by generating actions and operations.

The second principle is the multi-voicedness of activity systems. An activity system is always a community of multiple points of view, traditions and interest. The division of labour in an activity creates different positions for the participants, the participants carry their own diverse histories, and the activity system itself carries multiple layers and strands of history engraved in its artefacts, rules and conventions. The multi-voicedness is multiplied in networks of interacting activity systems. It is a source of trouble and a source of innovation, demanding actions of translation and negotiation.

The third principle is historicity. Activity systems take shape and get transformed over lengthy periods of time. Their problems and potentials can only be understood against their own history. History itself needs to be studied as local history of the activity and its objects,

and as history of the theoretical ideas and tools that have shaped the activity. Thus, medical work needs to be analysed against the history of its local organisation and against the more global history of the medical concepts, procedures and tools employed and accumulated in the local activity.

The fourth principle is the central role of contradictions as sources of change and development. Contradictions are not the same as problems or conflicts. Contradictions are historically accumulating structural tensions within and between activity systems. The primary contradiction of activities in capitalism is that between the use-value and exchange value of commodities. This primary contradiction pervades all elements of our activity systems. Activities are open systems. When an activity system adopts a new element from the outside (for example, a new technology or a new object), it often leads to an aggravated secondary contradiction where some old element (for example, the rules or the division of labour) collides with the new one. Such contradictions generate disturbances and conflicts, but also innovate attempts to change the activity.

The fifth principle proclaims the possibility of expansive transformations in activity systems. Activity systems move through relatively long cycles of qualitative transformations. As the contradictions of an activity system are aggravated, some individual participants begin to question and deviate from its established norms. In some cases, this escalates into collaborative envisioning and a deliberate collective change effort. An expansive transformation is accomplished when the object and motive of the activity are reconceptualised to embrace a radically wider horizon of possibilities than in the previous mode of the activity. A full cycle of expansive transformation may be understood as a collective journey through the zone of proximal development of the activity.

Since interpretivism looks for ‘culturally derived and historically situated interpretations of the social life-world’ (Crotty 1998, p. 67), Engeström’s theory provides a theoretical anchor for *work-based learning* and the ideal theoretical orientation for this study. Rather than seeing contradictions as adverse consequences, they provide a driving force for innovation and improvement of practices and services, as the process forms an original and logical series of steps leading to the formation of new knowledge and new practices in a work-based environment.

6.5 Aligning the aims/objectives and research questions to the theoretical approach

It is now possible to align the aims/objective of the study and the research questions to the theoretical approach as outlined in Table 2.4.

Table 2.4: Aligning the aims/objectives, the research questions and the expansive learning theoretical approach

Aims/Objectives	Research Questions	Expansive Learning Cycle (Activity Theory)
To show how risk assessment can best be applied to crowd safety.	What is the best way for music promoters and public venue owners/operators to identify potential crowd safety problems, bearing in mind the wide-ranging outcomes due to human behaviour?	1. Questioning
To investigate and explore, through the identification of relevant hazards and risk factors, how risk assessment for crowd safety can be improved.	What hazards can arise in public venues, how do they differ from problems elsewhere and how to evaluate the risks given that there is no relevant failure data to support the evaluation process?	2. Analysing
		3. Designing a new model
To determine whether a methodology which takes into account the specific nature of crowd safety risks will affect the approach taken by crowd safety assessors, thereby leading to improved planning for outdoor music festivals.	How to ensure that the risk assessment method for crowd safety is suitable and can be used by practitioners as efficiently and effectively as possible?	4. Implementing the new model 5. Consolidation of the new model

7. Summary

The USQ Professional Studies program with its emphasis on work-based learning has provided the optimum academic medium through which to pursue this study. The program integrates university-level learning with learning from experience in the workplace, bringing together self-knowledge, expertise at work and formal knowledge. It is a program that is candidate driven, emerges from context-based concerns, effects professional development for the candidate, and uses an action-oriented research perspective to create practical development and change.

Work-based learning is informal, experiential and situated and, therefore, dependent on social and cultural context. Any analytical approach to it needs to be based on the same epistemic assumptions of constructivism. The contemporary notion of *expansive learning*, based on the implicit belief that knowledge is personally constructed, socially mediated and inherently situated, provides a comprehensive theoretical framework for the analysis and understanding of learning within work environments.

Expansive learning emanates from *activity theory*, which recognises the importance of context in understanding relations between individuals, artefacts and social groups. *Activity theory* focuses on how we develop understandings of the real world, draw meanings from that understanding, create learning from those meanings and are motivated to respond to that learning. These cognitive mental models correspond to how we think about the real world and engage with it, not necessarily how the world actually works in a physical or biological sense, and are formed generally through the interaction of contradictory variables within a dynamic system. Rather than seeing contradictions as adverse consequences, they provide a driving force for innovation and improvement. In this dynamic, purposeful relationship the subject learns and grows while the object is interpreted and reinterpreted by the subject in the ongoing conduct of the activity.

CHAPTER 3

PLANNING AND METHODOLOGY

‘If we could first know where we are, and whither we are tending,
we could better judge what to do and how to do it’
Abraham Lincoln (1809 – 1865)

Chapter Outline

1. Introduction
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4. The research design framework
5. The inquiry methodology
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7. Data collection methods
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1. Introduction

Chapter 2 postulates that *activity theory*, which looks for ‘culturally derived and historically situated interpretations of the social life-world’ (Crotty 1998, p. 67), provides a conceptual and theoretical framework underpinning the constructivist epistemology of *work-based learning*. Such a theoretical position seeks an equally interpretivist research design.

Interpretive methodologies encompass an experience-near orientation that sees human action as meaningful and historically contingent (Bevir & Kedar 2008). In this view, social science and the subjects it studies are located within particular linguistic, historical and value standpoints. This contrasts strongly with the drive to identify generalizable laws independent of cultural historical specificity.

The research for this study is framed around an evaluation framework which accommodates descriptive, exploratory and developmental approaches during its various phases. The study is essentially interpretive in nature and adopts a mixed method design which is predominantly qualitative in nature, though quantitative surveys and a quantitative pre- and post-intervention evaluation are used to collect relevant data.

Qualitative research is naturalistic; it attempts to study the everyday life of different groups of people and communities in their natural setting: ‘...qualitative research involves an interpretive, naturalistic approach to its subject matter; it attempts to make sense of, or to interpret, phenomena in terms of the meaning people bring to them’ (Denzin & Lincoln 2003). It is designed to help researchers understand people, and the social and cultural contexts within which they live (Myers 2009). Such studies allow the complexities and differences of worlds-under-study to be explored and represented (Philip 1998, p. 267). According to Domegan and Fleming (2007, p.24):

Qualitative research aims to explore and to discover issues about the problem on hand, because very little is known about the problem. There is usually uncertainty about dimensions and characteristics of the problem. It uses *soft data* and gets *rich data*.

This chapter commences with a reflection on, and discussion of, the preliminary requirements of the USQ Professional Studies program: the preparation of a Learning Portfolio and a Learning Plan. They map the way forward by linking the historical with the aspirational. The purpose of the Learning Portfolio is to chronicle past formal learning and experience with a view to formulating an appropriate plan of action for proposed projects. The purpose of the Learning Plan is to identify suitable work-based projects to be undertaken for the doctoral study and outline key deliverables. In addition, development of the plan provides an opportunity to explore methodological issues and to develop an overall approach to the study, including timeframes and reporting mechanisms.

The chapter then sets out the research design framework adopted to guide and implement the study. Essentially an evaluation model, the framework focuses on the improvement of designs and places priority on guiding the planning and implementation of development efforts. The framework recommends the use of a qualitative and naturalistic research approach where change is sought to be effected in a low-understanding environment such as the one that characterises the study. The chapter then discusses the use of a mixed methods approach and, in particular, the nature of qualitative research approaches that are descriptive, exploratory, developmental and evaluative, and notes that these are appropriate for the study. Issues relating to insider research are also discussed. Finally, the chapter considers relevant inquiry methods and concludes by identifying possible project constraints.

2. The Learning Portfolio - reflecting on the past and mapping the way forward

The first requirement (and deliverable) of the USQ Professional Studies program is the development of a Learning Portfolio (see Appendix A). The explicit purpose of this document is to chronicle past formal learning and experience with a view to formulating an appropriate plan of action for proposed projects. It develops the logical connection between the past, present and future, and concludes with a preliminary discussion of the proposed projects, thereby leading on to the development of the Learning Plan. Its implicit purpose, though, is equally, if not more, important in that it provides a catalyst and vehicle for the type of reflection which is at the heart of experiential learning.

Reflective practice can be understood as the ‘ability to evaluate critical incidents within daily work, using this evaluation as a means of improving practice and knowledge’ (Macfarlane et al. 2005, p. 50). Thompson (2002 p. 235) states that reflective practice is ‘an active process of constructing solutions, rather than a passive process of following procedures or guidelines’. Reflective practitioners analyse a problem, seek to understand it within their context, think about the results of their actions, and puzzle over why things worked out like they did (White 2002, p. 2). The reflective practitioner is one who provides space for ‘new possibilities to be explored and realised’ (Moss & Petrie 2002, in Macfarlane et al. 2005, p. 50).

It is important to distinguish between reflection on learning and other forms of mental musings, such as contemplation, idle meanderings or day dreaming, although these may trigger reflection on learning. Reflective practice is also more than just thoughtful practice. Dewey (1933) explains the act of reflection as a process directed at seeking a conclusion through inquiry. This definition of reflection extends beyond the more simplified notion that reflection is thinking about the problem. Instead, thinking about a problem is a first step of reflection. Reflective practice is a process of thinking in action, usually in ‘muddy waters’, and involves wondering what it would be best to do, and eventually finding a better way forward. Wade and Yarborough (1996 p. 64) suggest that reflection:

...reveal(s) to us aspects of our experience that might have remained hidden had we not taken time to consider...Past experiences are considered in the light of new information. Reflection allows us to draw conclusions about our past experience and develop new insights that we can apply to our future activities.

At a micro-level 'reflection is a process of reviewing an experience of practice in order to describe, analyse, evaluate and so inform learning about practice' (Reid 1993, p. 305). At the broader level, however, reflection is an active process whereby the professional can gain an understanding of how historical, social, cultural and personal experiences have contributed to professional knowledge and practice (Wilkinson 1996). According to Jarvis (1992 p. 180), 'it is that form of practice that seeks to problematise many situations of professional performance so that they can become potential learning situations and so the practitioner can continue to learn, grow and develop in and through practice'.

Reflection involves a number of cognitive processes such as association, integration, validation and appropriation. Therefore, for reflection to result in learning, we need to learn how to reflect and how to access the necessary support for this to happen. Boud, Keogh and Walker (1985c, p. 11) identify three aspects of reflection. The first of these is that only learners can construct their own learning and only learners can reflect on their experiences. The second is that reflection is a purposeful activity 'pursued with intent' (p. 11). The third is that the reflective process is a complex one in which both feelings and cognition are closely inter-related and interactive.

Boud, Keogh and Walker (1995a) identify three elements they believe are important in the reflective process. These are returning to the experience, attending to feelings and re-evaluating experience (p. 26). These elements are important if we are to process our reflection so it results in learning and changed practice.

Schon (1983, 1987) takes a slightly different view of reflection on experience by stressing the learner's action in the reflective process. He notes that most of our knowledge is tacit in nature, 'implicit in our patterns of actions and our feel for the stuff with which we are dealing' (Schon 2002, p. 50). Our everyday actions are characterised by 'tacit recognitions, judgements and skilful performances (p. 50). He suggests that we can engage in reflection in one of two ways - either by 'reflecting on action', after the experience, or by 'reflecting in action', during the experience. Reflecting on action enables us to spend time exploring why we acted as we did, what was happening in a group, and so on. In so doing we develop sets of questions and ideas about our activities and practice.

Schon also recognises that there is a kind of knowing or know-how which is inherent in intelligent action. He calls this 'knowing in action' the characteristic mode of ordinary practical knowledge. Reflection in action means that the learner becomes a researcher in the practice. The learner constructs a new theory about the unique situation. His/her reflective process is characterised by an interaction of means and ends, a framing of a problematic solution and an integration of inquiry and implementation. This means that reflection in action does not depend on certainty but can proceed in situations of uncertainty and uniqueness (Schon 2002, pp. 59-61).

Reflecting in action is sometimes described as 'thinking on our feet'. It involves looking to our experiences, connecting with our feelings, and attending to our theories in use. It entails building new understandings to inform our actions in any situation that is unfolding. Schon argues that when we reflect on our actions, sometimes during that action, then we also reflect on the tacit understandings within that action. These tacit understandings are then surfaced, criticised, restructured and embodied in our future action. Schon calls this the process of 'reflection in action'.

Killion and Todnem (1991) expanded Schon's reflection model to include the concept of 'reflection for action'. This type of reflection combines reflection on action and reflection in action. It guides future action based on past thoughts and actions and requires critical reflection. Johns (2000) describes critical reflection as 'a window through which the practitioner can view and focus self within the context of his/her own lived experience in ways that enable him/her to confront, understand and work towards resolving the contradictions within his/her practice between what is desirable and actual practice' (Johns 2000, p. 34). Four elements are central to critical reflection – assumptions analysis, contextual awareness, imaginative speculation and reflective scepticism (Brookfield 1988, p. 325).

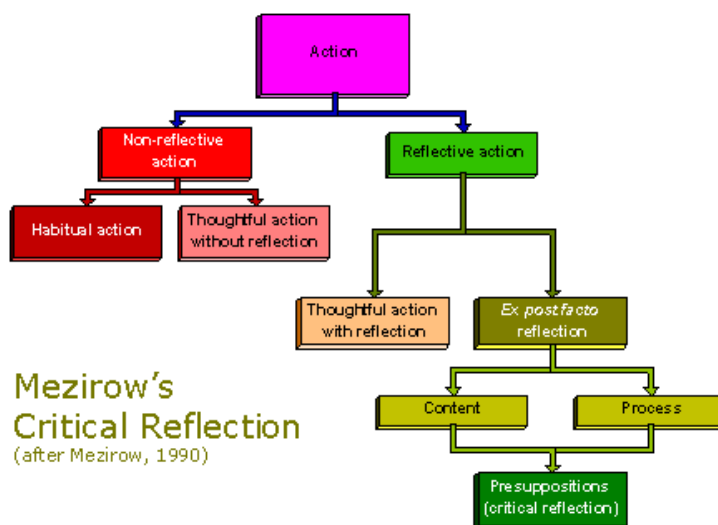
Argyris (2000, p. 280) posits the concept that the process of solving a problem (i.e. identifying and correcting errors in the external environment) is not in itself sufficient to result in learning. He maintains that we also need to look inwardly at our own behaviour, identify the ways in which this behaviour has, often inadvertently, contributed to the problem and then change how we act. He refers to this process of both looking inwardly and outwardly and acting on our conclusions as 'double loop learning'.

By itself, reflection is not necessarily critical (Brookfield 1995; Ecclestone 1996). To engage in critical reflection requires moving beyond the acquisition of new knowledge and understanding into questioning existing assumptions, values and perspectives (Cranton 1996, p. 76). Boyd and Fales (1983, p. 100) claim that critical reflection ‘is the core difference between whether a person repeats the same experience several times becoming highly proficient at one behaviour, or learns from experience in such a way that he or she is cognitively or affectively changed’. Duffy (2007) believes that reflective practice is an active deliberate process of critically examining procedures where an individual is challenged and enabled to undertake the process of self-enquiry to empower the practitioner to realise desirable and effective practice within a reflexive spiral of personal transformation. Critical reflection is thus viewed as transformational learning which, according to Baumgartner (2001), can happen either gradually or from a sudden or critical incident and alter the way people see themselves and their world. Mezirow (1990, p. 5) also sees critical reflection as an essential component of learning:

Perhaps even more central to ... learning than elaborating established meaning schemes is the process of reflecting back on prior learning to determine whether what we have learned is justified under present circumstances. This is a crucial learning process egregiously ignored by learning theorists.

In order to maximise learning through critical reflection we need to contextually locate ourselves within the experience and explore available theory, knowledge and experience to understand the experience in different ways, as depicted by Mezirow (1990) in Figure 3.1

Figure 3.1: Mezirow’s Critical Reflection (after Mezirow 1990)



Mezirow (1990, p.14) maintains that such reflection on assumptions and presuppositions (particularly about oneself) leads to transformative learning:

Perspective transformation is the process of becoming critically aware of how and why our presuppositions have come to constrain the way we perceive, understand, and feel about our world; of reformulating these assumptions to permit a more inclusive, discriminating, permeable and integrative perspective; and of making decisions or otherwise acting on these new understandings. More inclusive, discriminating permeable and integrative perspectives are superior perspectives that adults choose if they can because they are motivated to better understand the meaning of their experience.

Clark (1991) identifies the following three dimensions to a perspective transformation:

- psychological (changes in understanding of the self)
- convictional (revision of belief systems)
- behavioural (changes in lifestyle).

In other words, the real significance of learning appears when learners begin to re-evaluate their lives and to re-make them. This, for Mezirow, takes precedence over whatever it was they set out to ‘learn’ in the first place. Freire (1970) calls this the process of conscientization.

Merriam and Caffarella (1999, p. 321) suggest that transformative learning traverses the three phases of critical reflection, reflective discourse and action. Mezirow (1990) suggests that engaging in this process can result in frames of reference that are more permeable to additional amendments, reflective, inclusive, discriminating, and overall more emotionally capable of change. Rather than acting upon the ‘purposes, values, feelings, and meanings... we have uncritically assimilated from others’ (Mezirow 2000, p. 8), transformative learning often involves deep, powerful emotions or beliefs and is evidenced in action. As Elias (1997, p. 3) puts it:

Transformative learning is the expansion of consciousness through the transformation of basic worldview and specific capacities of the self; transformative learning is facilitated through consciously directed processes such as appreciatively accessing and receiving the symbolic contents of the unconscious and critically analyzing underlying premises.

Reflective practice (Turnbull 2009; Cherry 1999; Kitchener 2006; Westberg 2001; Peters 2009) then, needs to be at the core of one’s being. Thinking about what we have done is, in some ways, an instinctive act. But unless we are systematic and purposeful about our reflection, then our learning will remain tacit and not under conscious control. Our learning from experience is not necessarily positive. We learn how to avoid unpleasantness, to

prevaricate and procrastinate and to protect ourselves from criticism. Effective reflection needs to be learnt, practised and enhanced.

While reflection on practice is inherently valuable, without structure it risks being random (McGonagill, 2008). Framing reflection as model-building introduces discipline and structure, encouraging a more systematic effort with the likelihood of a more vigorous and robust result. He sees professional development as evolving through at least 3 stages, each with a corresponding orientation.

The first stage is that of the novice. The orientation here is imitation. The beginning professional attempts to faithfully reproduce an established model(s) derived from theory and training. The second stage is competency and the orientation here is directed at 2 activities:

- (i) adaptation – refining particular models of practice on the basis of experience
- (ii) exploration – investigating and trying out alternative or complementary models of practice, which lead to further cycles of imitation and adaptation.

The third stage is that of mastery. The master achieves autonomy – the integration of all influences and experiences into an internally-consistent and consistently-impactful practice.

Most professionals don't seem to develop beyond the competent stage (McGonagill 2008). They rely primarily on tacit learning and the part of their learning that is explicit tends to be episodic and fragmented. The resulting practice often consists of unintegrated clusters of largely intuitive practices. McGonagill (2008) suggests that making your model of practice explicit:

- enables you to view your practice as a set of hypotheses to be tested and refined
- encourages a mindset of learning v blaming when things don't go well
- allows you to better manage differences with clients or colleagues over preferred practices
- improves your ability to teach your practice to others
- offers you the satisfaction of being the author of your effectiveness.

The 'New Professional' is one who has expanded on their existing knowledge by developing a more intricate macro and micro analysis of what they know, why they do what they do, and how to do it better through a theoretical framework of action, research and learning.

There are a number of conditions that prevent us from being reflective. Berman, Brown and McCartney (1999, pp.21-22) cite Eraut (1994) as having identified these as the availability of time to reflect in the increasingly busy workday, the erosion of the disposition to reflect once the obligations of assessed work have been removed, and the post-qualification routinisation of professional work (1999, pp. 21-22).

There are a number of strategies and tools which are used to develop and support reflection. These may be facilitated or self-practised and include:

- the use of schema or patterns of self-questioning - for example, Brookfield's matrix of best/worst experiences (2000, p. 31)
- using writing as a tool – this includes constructing personal autobiographies (Powell 1985, p. 41), portfolios as an initiator of reflection on experience, and the keeping of reflective journals
- making a space for reflection in one's daily schedule
- reflecting with others, either a work group, family members and/or friends – this can include story-telling as a way of framing the reflection. Having a drink after work in the pub with trusted friends can often lead to valuable group reflection as well as hilarity and release as the day's events are unpacked and put into proportion
- working with a mentor or coach to debrief and analyse recent experiences
- preparing for a meeting or in-depth conversation and, thereby, sorting out nebulous ideas and impressions into a coherent whole
- constructing 'mind maps' (McCormack & Pancini 1999, pp. 41-45) to consolidate one's thinking
- reflecting aloud with the aware attention of another person (Knights 1985, p. 85)
- debriefing in a one-to-one or group situation (Pearson & Smith 1985, p. 83).

Initially, the author viewed the preparation of the Learning Portfolio as a necessary perfunctory and administrative requirement. Formal qualifications, position descriptions and competency matrices were meticulously chronicled and developed, primarily with a view to 'ticking the box' and obtaining the maximum number of exemptions possible. This exercise of compiling the portfolio was a useful one at the functional level in bringing together evidence of qualifications and experience into the one mega curriculum vitae.

However, as work progressed on developing the portfolio, the value of the reflective process and the reflection required to develop the document emerged. Diez (1994) maintains that the ‘...process of looking at one’s development through a portfolio process functions like a literal mirror – when one sees one’s own image or performance – the literal reflection sparks internal reflection’ (p. 24). Engaging in the compilation of this portfolio and reflecting on the various stages of my professional life, achievements and what I have learnt as part of this journey, sparked a kind of meta-reflection on the evolution of what could be described as my model of professional practice.

The value of the Learning Portfolio has been in providing:

- a process and instrument to recall and to document professional practice achievements over the past 10-20 years
- a vehicle to identify patterns and themes, and from those observations to identify areas of professional strength and weakness
- an opportunity to reflect on and position historical behaviour within an academic frame of reference
- independent review and validation of those experiences and competencies
- an opportunity to test and examine the strength of my convictions
- an instrument to consider my current personal and professional environment
- an opportunity to consider personal, professional and academic goals
- an opportunity to develop a strategy and delivery mechanism for achieving those goals.

In addition to its administrative function, then, the Learning Portfolio provided an ideal platform from which to springboard into the development of a proposal for various projects/phases to move the study forward with a view to contributing to the development of new knowledge, the enhancement of existing practice, and personal professional development.

3. The Learning Plan - linking the historical with the aspirational

The second requirement (and deliverable) of the USQ Professional Studies program is the development of a Learning Plan (see Appendix B). The purpose of the plan is to identify suitable work-based projects to be undertaken for the doctoral study and outline key deliverables. In addition, development of the plan provides an opportunity to explore methodological issues and to develop an overall approach to the study, including timeframes and reporting mechanisms.

Although the author identified the aims/objective of the study (see Chapter 1) and formulated the research questions (see also Chapter 1) relatively easily, initially it was a struggle to identify relevant projects as required by the structure of the program. Even when a fairly concrete idea of the final output to be achieved was clear, how to ‘carve up the cake’ remained elusive until the following methodological issues were settled:

1. a meta-theoretical umbrella under which to position the study
2. an appropriate research design framework to structure and organise the study.

In relation to the first matter, the usefulness of *activity theory* with its underpinning notion of *expansive learning* was explored and adopted – see Chapter 2 for a comprehensive discussion of *activity theory* and *expansive learning*. *Activity theory* focuses on how we develop understandings of the real world, draw meanings from that understanding, create learning from those meanings and are motivated to respond to that learning. Activity is undertaken by a human agent (subject) who is motivated towards the solution of a problem or purpose (object) mediated by tools (artefacts) and in collaboration with others (community). Within an activity system, all elements constantly interact with one another and are virtually always in the process of working through changes. In this dynamic, purposeful relationship, the subject learns and grows while the object is interpreted and reinterpreted by the subject in the ongoing conduct of the activity. The value of this approach lies in the use of *activity theory* as a comprehensive analytical tool for evaluating interactions at a systems level and as a learning and development system that takes account of the interactions between the various contradictory forces that produce outcomes for learning and change. Rather than seeing contradictions as adverse consequences, they provide a potential driving force for innovation and improvement of practices and services, a practice described by Engeström (1987, 1991) as *expansive learning*.

In relation to the second matter, Guba and Stufflebeam's (1970) Context, Input, Process, Product (CIPP) Model (see later in this chapter) was adopted as the organising and reporting framework. Essentially an evaluation framework, its focus on planning and implementation assisted in effectively structuring the various stages of the overall study into projects. The particular value of this framework over others lies in its fundamental tenet that the design of evaluation should be grounded in knowledge about the amount and importance of any proposed change and the amount and quality of understanding which is available to support decision-making to effect change. Project deliverables (in the form of chapters of this dissertation) align with the elements of the CIPP model.

Having settled the meta-theoretical position and having found a suitable research design framework for the study, inquiry methods and tools were then investigated. Braybrooke and Lindblom's 'decision making settings' (as reported by Guba & Stufflebeam 1970) characterise the study as one attempting to effect neomobilistic change (i.e. significant change in an environment involving low understanding of the change). According to the CIPP model, neomobilistic change should be investigated and implemented using qualitative research methods which are heuristic, exploratory and developmental. Due to the low level of understanding by music promoters and owners/operators of public venues of how to assess the risks arising from the dynamics of a crowd and the lack of any dedicated resources to be able to do so, these approaches allow innovative activity involving inventing, testing and diffusing possible solutions to be explored and undertaken.

Finally, it is to be noted that original timeframes were modified and that proposed project approaches and inquiry methods were varied as the various phases of the study were undertaken. For example, a number of proposed case studies of festivals were not undertaken, the whole approach to 'testing' the validity and reliability of the new methodology was modified, and qualitative data collection methods (by way of survey and evaluation) were included. In addition, after consideration of relevant social psychology literature relating to crowd behaviour, a new model attempting to explain the transition of individual to collective behaviour was formulated (as a preliminary to development of the proposed new monitoring and assessment method), something which had not been anticipated in the initial development of the plan and approach.

4. Identifying a suitable research design framework

Guba and Stufflebeam's (1970) Context, Input, Process, Product (CIPP) model was selected as the theoretical and operational framework to plan and implement the study. The CIPP model provides a comprehensive framework to facilitate an integrated and critical review of the planning, conduct and outcomes of a project. Essentially an evaluation model, it has, nonetheless, been used to support research in other contexts (e.g. Tan, Lee & Hall 2010; Walker 2011). It arose from the observation that traditional approaches to evaluation designs were found to be limited and often too rigid for evaluating dynamic social contexts (Stufflebeam 2003a).

Evaluation involves exploring how existing knowledge is used to inform and guide practical action (Gray 2008). The CIPP approach is based on the view that the most important purpose of evaluation is not to prove, but to improve (Stufflebeam 1969; Stufflebeam et al. 1971). As Stufflebeam notes (1969, p. 118):

...the use of the CIPP model is intended to promote growth and to help the responsible leadership and staff of an institution systematically to obtain and use feedback so as to excel in meeting important needs, or, at least, to do the best they can with the available resources.

According to Stufflebeam, evaluative case studies seek to 'delineate and illuminate' (Stufflebeam 2001, p. 34) and provide 'stakeholders... with an authoritative, in-depth, well-documented explication of the program' (Stufflebeam 2001, p. 34). Evaluation is conceived, therefore, primarily as a functional activity oriented in the long run to stimulating, aiding, and abetting efforts to strengthen and improve enterprises and efforts.

CIPP focuses on the improvement of designs, whereby priority is given to planning and implementation of development efforts (Tan, Lee & Hall 2010). Consistent with its improvement focus, the CIPP framework places priority on guiding the planning and implementation of development efforts. The model's intent is to supply evaluation users with timely, valid information for use in identifying an appropriate area for development; formulating sound goals, activity plans and budgets; successfully carrying out work plans; periodically deciding whether and, if so, how to repeat or expand an effort; and meeting accountability requirements.

The CIPP model comprises 4 decision-making settings - context, input(s), process and product. Each of these settings asks specific questions pertaining to the current stage of development of a project. By asking these questions, CIPP can inform a number of decisions, such as:

- the goals or objectives for undertaking a project (What needs to be done?)
- what are the plans or strategies to carry out the project (How should it be done?)
- what actions or activities need priority or further attention (Is it being done?)
- do the outcomes answer the objectives (Did it succeed?).

Planning consists of an evaluation of context and inputs. The main purpose of a *context evaluation* is ‘to identify the strengths and weakness of some object, such as an institution, a program, a target population, or a person and to provide direction for improvement (Stufflebeam 1983, p. 128). Context evaluations assess needs, problems, assets, and opportunities to help decision-makers define goals and priorities and help the broader group of users judge goals, priorities and outcomes. *Input evaluation* is ‘to help the clients consider alternatives in the context of their needs and environmental circumstances and to evolve a plan that will work for them’ (Stufflebeam 1983, p. 131). Input evaluations assess alternative approaches, competing action plans, staffing plans, and budgets for their feasibility and potential cost-effectiveness to meet targeted needs and achieve goals. Decision-makers use input evaluations in choosing among competing plans, writing funding proposals, allocating resources, assigning staff, scheduling work, and ultimately in helping others judge an effort’s plans and budget.

Implementation consists of process and product evaluations. These may be conducted at the same time. A process evaluation is used to determine congruency between the planned and actual activities of the program (Stufflebeam 1983). *Process evaluations* assess the implementation of plans to help staff carry out activities and later help the broad group of users judge program performance and interpret outcomes. On the other hand, *product evaluation* examines the outcomes of the program during field tests and compares them to expected outcomes (Stufflebeam 1983). Criteria for this comparison are drawn from the project objectives and the information collected from context, input and process evaluation (Stufflebeam 2000). Product evaluations identify and assess outcomes—intended and unintended, short-term and long term—both to help staff keep an enterprise focused on achieving important outcomes and ultimately to help the broader group of users gauge the effort’s success in meeting targeted needs.

4.1 Preliminary consideration

According to Guba and Stufflebeam (1970), the design of evaluation should be grounded in knowledge about the amount and the importance of any proposed change and the amount and quality of understanding which is available to support decision-making to effect the change. Braybrooke and Lindblom's 'decision-making settings' (as reported by Guba & Stufflebeam 1970), as set out in Table 3.1, provide a useful framework in that regard.

Table 3.1: Decision-making settings (Guba & Stufflebeam, 1970, 1983, 2000)

		Degree of change	
		Small	Large
General understanding of the proposed change	Low	Incrementalism - developmental activity for continuous improvement. - based on expert judgement plus structured inquiry.	Neomobilism - innovative activity involving inventing, testing and diffusing solutions. - based on conceptualisation and heuristic investigation.
	High	Homeostasis - restoration and maintenance - based on technical standards and quality control.	Metamorphism - complete change. - based on overarching theory.

This project attempts to effect significant change (i.e. a new or enhanced contextualised methodology) in a low understanding environment and reflects nemobilistic activity.

4.2 Building the framework

Within each decision-making setting, Braybrooke and Lindblom suggest a typology whereby decisions should be classified as a function of whether they pertain to ends or means that are intended and achieved, as set out in Table 3.2:

Table 3.2: Types of decisions (Guba & Stufflebeam, 1970, 1983, 2000)

	Ends	Means
Expected outcomes	<i>Planning decisions</i> (intended ends) - to determine objectives (based on needs, problems, opportunities)	<i>Structuring decisions</i> (intended means) - to design procedures (an action plan specifying outcomes to be achieved, work to be performed and resources/time to be used)
Actual outcomes	<i>Recycling decisions</i> (actual ends) - to judge and react to attainments (determining the relation of attainments to objectives and determining whether to continue, terminate, evolve or modify an activity)	<i>Implementing decisions</i> (actual means) - utilise, control and refine procedures

The evaluation designs outlined in Table 3.3 relate to each of these four decision types (based on context, inputs, processes and products).

Table 3.3: Evaluation designs (Guba & Stufflebeam, 1970, 1983, 2000)

	Ends	Means
Expected outcomes	<p><i>Context</i></p> <ul style="list-style-type: none"> - outline the problem. - define the environment in which change is to occur. - suggest a strategy for improvement/change. 	<p><i>Inputs</i></p> <ul style="list-style-type: none"> - what design or procedural plan should be employed for implementing the selected strategy.
Actual outcomes	<p><i>Product</i></p> <ul style="list-style-type: none"> - measure and interpret attainments against predetermined standards. - make rational interpretations of the outcomes using the recorded context, input & process information. 	<p><i>Process</i></p> <ul style="list-style-type: none"> - the objective is to detect or predict, during the implementation stages, defects in the procedural design or its implementation. - the overall strategy is to identify and monitor, on a continuous basis, the potential sources of failure in a project.

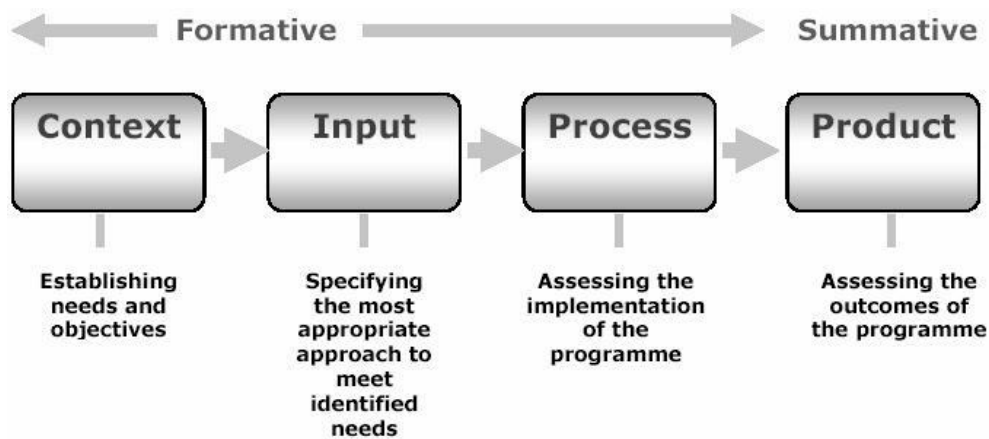
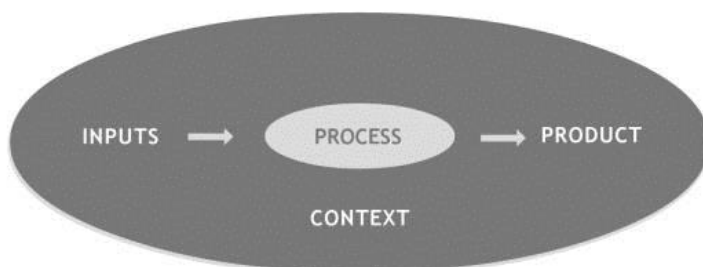
The model proposed by Guba and Stufflebeam (1970) suggests that where incremental or neomobilistic changes are sought, as is the case with this study, ad hoc evaluation mechanisms are needed to support such change, because both the context evaluation mechanism and the research literature provide inadequate information to support these types of changes. In such situations, an input evaluation study should be conducted to identify and evaluate strategies and procedures (which might well come from other subject areas or disciplines) that could be used to effect desired changes. Such input evaluation information would then be used to assist in designing desired change procedures. Such structuring decisions usually lead to some kind of a trial or pilot phase (since the desired change is still an innovation and has not yet been adequately tested).

Process and product evaluation are then conducted to assist in decisions pertaining to the trial phase. Process information provides information for implementation decisions needed for efficient operation of the trial, including the recycling of structuring decisions as necessary. Product evaluation would occur simultaneously throughout the trial and would support recycling decisions, which could lead to a reformulation of the change to be brought about, a modification in strategy or procedure, termination of the change effort, or acceptance of the innovation and change in practice. Drawing these elements together results in the CIPP matrix outlined in Table 3.4.

Table 3.4: The CIPP matrix for the study

	Ends	Means
Expected Outcomes	<p><i>Planning - Context</i></p> <p>What is the change I am proposing to effect? Why am I doing it? What need is there for change?</p> <ul style="list-style-type: none"> - what is the problem I am responding to (what evidence is there for it)? - what is the extent of it (i.e. parameters)? - is there any underlying psycho-social rationale for the problem? 	<p><i>Structuring - Inputs</i></p> <p>What is my proposed solution and expected outcome? How will what I am proposing 'fix' the problem, or at least contribute to a 'fix'?</p> <p>How am I going to do it?</p> <ul style="list-style-type: none"> - analyse the literature to validate the problem and any suggested solutions.
Actual outcomes	<p><i>Recycle - Product</i></p> <p>Did it work? Will it work? Did it achieve what was intended? How do I measure if it worked? What is the impact of what I did? Has learning occurred (individually & collectively)? Has professional practice changed?</p>	<p><i>Implementing - Process</i></p> <p>What did I do? What strategies, processes and resources did I use? What other persons were involved, how were they involved and what was their contribution? Did these contributions assist?</p>

For ease of reference, the model can be expressed diagrammatically in a number of ways, as outlined in Figures 3.1 and 3.2.

Figure 3.2: Diagrammatic representation of the CIPP model**Figure 3.3: Alternate diagrammatic representation of the CIPP model**

4.3 Aligning the research design framework to the theoretical approach, research questions and aims/objectives of the study

The framework offered by Guba and Stufflebeam's CIPP model resonates with the theoretical approach (i.e. Engeström's expansive learning cycle), and the two can be aligned as set out in Table 3.5.

Table 3.5: Aligning the research design framework to the theoretical approach for the study

Expansive Learning Cycle		CIPP Framework	
Step	Function	Phase	Setting
1	Question: Description of the need Question current practice	Planning	Context: What needs to be done?
2	Analysis: - historical - empirical		Inputs: How should it be done?
3	Design of a new model		
4	Implementation of the new model	Implementation	Process: Has it been done as planned?
5	Consolidation of the new model		Product: Has it been effective?

In addition, the aims and objectives of the study and the research questions can now be aligned to these models as outlined in Table 3.6.

Table 3.6 Alignment of the aims/objectives, research questions, organising framework and theoretical approach to the study

Aims/objectives	Research questions	Expansive Learning Cycle (Activity Theory)	CIPP Framework
To show how risk assessment can best be applied to crowd safety.	What is the best way for music promoters and public venue owners/operators to identify potential crowd safety problems?	Question: Description of the need Question current practice	Context: What needs to be done?
To investigate and explore, through the identification of relevant hazards and risk factors, how risk assessment for crowd safety can be improved.	What hazards can arise in public venues, how do they differ from problems elsewhere and how to evaluate the risks, given that there is no relevant failure data to support the evaluation process?	Analysis: - historical - empirical	Inputs: How should it be done?
		Design of a new model	
To determine whether a method which takes into account the specific nature of crowd safety risks will affect the approach taken by crowd safety assessors, thereby leading to improved planning for outdoor music festivals.	How to ensure that the risk assessment method for crowd safety is suitable and can be used by practitioners as efficiently and effectively as possible?	Implementation of the new model	Process: Has it been done as planned?
		Consolidation of the new model	Product: Has it been effective?

4.4 Heuristic inquiry

According to Guba and Stufflebeam (1970, p. 43), neomobilistic decision-making ‘...denotes innovative activity for inventing, testing and diffusing new solutions to significant problems. Such change is supported by little theory or extant knowledge, yet the change is large often because of great opportunities such as those being produced by the knowledge explosion...’, and they recommend that neomobilistic change be evaluated using heuristic approaches.

Heuristic inquiry is a process that begins with a question or problem which the researcher tries to illuminate or find an answer to. The question itself is usually focused on an issue that has posed a personal problem and to which answers are required. It seeks, through open-ended inquiry, self-directed search and immersion in active experience, to ‘get inside’ the question by becoming one with it. Generally described as an ‘organised and systematic form for investigating human experience’ (Moustakas 1990, p. 9), heuristic research requires that the investigator has a ‘direct, personal encounter with the phenomenon being investigated and [be] present throughout the process’ (Moustakas 1990, p. 14).

One of the primary processes of heuristic research is self-dialogue in which the researcher enters into a conversation with the phenomenon and is questioned by it (Moustakas 1990). It is hoped that the process will lead to self-discoveries, awareness and enhanced understanding. Through this, the researcher is able to develop the skills and ability to understand the problem itself and, in turn, to develop the understanding of others. Philosophically, heuristic inquiry does not start from the premise that there is an external, ‘objective’ truth to be discovered. In contrast, it starts phenomenologically from the belief that understanding grows out of direct human experience and can only be discovered initially through self-inquiry. Heuristic research is richly descriptive and strongly subjective. This, in turn, may have implications for the generalisability of the findings.

Such an approach is particularly appropriate for this undertaking, as the study of crowd behaviour at outdoor music festivals is a new area of inquiry (Arbon 2004), with relevant literature and related theory still in their infancy.

5. The research design adopted for the study

The study adopts a mixed methods research design which is predominantly qualitative in nature. A qualitative approach is particularly appropriate for this study given the paucity of data and lack of contextual approaches to the assessment of crowd-related safety risk, and is supported by Sherman and Webb's (1988, p. 5) assertion that '...the aim of qualitative research is not verification of a pre-determined idea, but discovery that leads to new insights...with [a] focus on the natural setting'. In addition, quantitative approaches have been used for data collection.

5.1 Mixed methods research

Mixed methods research includes the mixing of qualitative and quantitative data, methods, methodologies, and/or paradigms in a research study or set of related studies and recognises that monomethod research can be improved through the use of multiple data, methods, methodologies, perspectives, standpoints, and paradigms (Creswell 2003; Johnson & Christensen 2014; Tashakkori & Teddlie 2014). The overall purpose and central premise of mixed methods is that the use of quantitative and qualitative approaches in combination may provide a better understanding of research problems and complex phenomena than either approach alone (Creswell and Plano Clark 2011).

The case for mixed methods research as a strategy for intervention and/or research is based on four observations:

1. Narrow views of the world are often misleading, so approaching a subject from different perspectives or paradigms may help to gain a holistic perspective
2. There are different levels of social research (i.e.: biological, cognitive, social, etc.), and different methodologies may have particular strengths with respect to one of these levels. Using more than one should help to get a clearer picture of the social world and make for more adequate explanations
3. Many existing practices already combine methodologies to solve particular problems, yet they have not been theorised sufficiently
4. Multimethodology fits well with pragmatism.

Greene, Caracelli and Graham (1989) defined mixed methods research designs as those that include at least one quantitative method (designed to collect numbers) and one qualitative method (designed to collect words). Tashakkori and Teddlie (1998) refer to mixed methods

studies as those that combine the qualitative and quantitative approaches into the research methodology of a single study. Johnson and Onwuegbuzie (2004) indicated that mixed methods research is the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study. This study adopts the definition by Plano Clark (2005) that methods research is research that combines qualitative and quantitative data collection and data analysis within a single study.

There are three broad classes of research studies that are currently being labelled as “mixed methods research” (Johnson, Onwuegbuzie, & Turner, 2007):

1. *Quantitatively driven approaches/designs* in which the research study is, at its core, a quantitative study with qualitative data/method added to supplement and improve the quantitative study by providing an added value and deeper, wider, and fuller or more complex answers to research questions; quantitative quality criteria are emphasized but high quality qualitative data also must be collected and analysed;
2. *Qualitatively driven approaches/designs* in which the research study is, at its core, a qualitative study with quantitative data/method added to supplement and improve the qualitative study by providing an added value and deeper, wider, and fuller or more complex answers to research questions; qualitative quality criteria are emphasized but high quality quantitative data also must be collected and analysed; and
3. *Interactive or equal status designs* in which the research study equally emphasizes (interactively and through integration) quantitative and qualitative data, methods, methodologies, and paradigms.

Mixed methods research are desirable and feasible because they provide a more complete view, and because the requirements during the different phases of an intervention (or research project) make very specific demands on a general methodology. In addition, in transcending the supposed paradigmatic divergence of quantitative v qualitative approaches, many authors advocate for a pragmatic worldview for mixed methods (Cherryholmes, 1992), which advances multiple pluralistic approaches to knowing, using “what works”, a focus on the research questions as important with all types of methods to follow to answer the questions, and a rejection of a forced choice between positivism and constructivism. Thus, a major tenet of pragmatism is that quantitative and qualitative methods are compatible.

5.2 Qualitative research

The qualitative paradigm operates under the assumptions that individuals construct reality, multiple realities exist in any given situation, and the construction of reality is context-bound (Lincoln & Guba 1985). A qualitative research design avoids generalisation in favour of ‘thick description’ and hypotheses and aims at understanding the richness and complexity of a particular phenomenon (Merriam & Simpson 1989). Denzin (1989, p.83) maintains that ‘thick description’:

...goes beyond mere fact and surface appearances. It presents detail, context, emotion and the webs of social relationships that join persons to one another. Thick description evokes emotionality and self-feelings. It inserts the sequence of events for the person or persons in question. In thick description, the voices, feelings, actions and meanings of interacting individuals are heard.

Qualitative inquiry assumes that many interrelated layers of meaning exist in any given situation and the goal is to search for patterns among those layers for the purpose of understanding rather than prediction or control. Ticehurst and Veal (cited in Cavana et al. 2001) suggest that qualitative research is valuable for gaining quality data from relatively few people, and allows the researcher to develop the research question or hypothesis throughout the research process.

The methodology under the qualitative paradigm relies on inductive logic, allowing categories, themes and patterns to emerge (Bogdan & Biklen 1992). According to Gray (2008), ‘the inductive approach does not set out to corroborate or falsify a theory. Instead, through a process of gathering data, it attempts to establish patterns, consistencies and meanings’ (p. 6). Particularly helpful in this regard is the conceptual map suggested by LeCompte and Schensul (1999, p.237) who compare doing qualitative study, and grounded analysis in particular, to assembling a jigsaw puzzle:

The edge pieces are located first and assembled to provide a frame of reference. Then attention is devoted to those more striking aspects of the puzzle that can be identified readily from the mass of pieces and assembled separately. Next [after sneaking a look at the puzzle picture on the box for hints] the puzzle worker places the assembled parts in their general position within the frame, and finally locates and adds connecting pieces until no holes remain.

Data gathered using qualitative methods tends to be ‘rich, personal, close to the real world and contain a depth of meaning that more abstract forms of evidence lack’ (Sowden & Keeves 1988, p. 513). Greene (1988) notes that research of this kind ‘cannot be carried out by

people who see themselves as detached, neutral observers concerned with the kinds of observation, measurement and prediction that are presumed to be unbiased [and] unaffected by the inquirer's vantage point or location in the world' (p. 175). Examples of qualitative methods are action research, case study research and ethnography. Qualitative data sources include observation and participant observation (fieldwork), interviews and questionnaires, documents and texts, and the researcher's impressions and reactions. A number of these approaches will be used throughout the study.

When adopting a qualitative approach, there is 'always a horizon of pre-understanding on the part of the researcher, even as there is a horizon of pre-understanding in the situation being studied' (Greene 1988, p. 176). This pre-understanding will guide the design and direction of the study and promote higher levels of understanding and more in-depth analysis of the outcomes. This is described by Sowden and Keeves (1988, p. 514) as a process of induction in that 'some of the orienting constructs, informed by the prior knowledge, the experience and the values of the investigator, have been put forward and operationalised and matched to the body of field data'. This, according to Sowden and Keeves (1988), has the advantage of 'focusing and reducing the data that could be collected' (p. 154).

5.2.1 Potential shortcomings of a qualitative approach

The concept of validity and, therefore, reliability, in social research is the subject of much debate. In traditional studies, validity usually referred to the degree to which the study accurately reflected the issue or topic that the research was attempting to measure (Feldman 2003). More specifically, this type of validity also referred to the role of research instruments and their appropriateness for collecting data that answers the research questions (Black & Champion 1976). Such positivist accounts assumed that science could produce objective knowledge and the researcher's goal was, therefore, to accurately capture an objective reality or 'truth' (Hammersley 2000).

However, with changing ontological and epistemological frameworks, and particularly with the emergence of a naturalistic paradigm of enquiry, criteria for validity changed. It was no longer deemed possible to produce objective knowledge through research – instead criteria for validity changed to include factors such as credibility, believability and reliability (Guba quoted in Cohen et al. 2000).

With changes in the philosophical foundations of social research, the role of the researcher also changed. While positivists viewed validity as being dependant on the researcher's objectivity, neopositivists, while acknowledging the impossibility of complete objectivity, espoused the importance of eliminating researcher biases. At the other extreme, postmodernists argued that researchers' subjectivities were central to the research process and must be recognised as such.

With insider research²², the concept of validity becomes increasingly problematic because of the researcher's involvement with the subject of study. Merton (1972) defined the 'insider' as 'an individual who possesses *a priori* intimate knowledge of the community and its members (quoted in Hellowell 2006). The term 'insider research' is used to describe projects where the researcher has a direct involvement or connection with the research setting, be it their work (Robson 2002) or their community (Stephenson & Greer 1981). Such research contrasts with traditional notions of 'scientifically sound' research in which the researcher is an 'objective outsider' studying subjects external to himself/herself (Denzin & Lincoln 2000).

Positivists argue that, because of this involvement, the researcher is no longer 'objective' and their results may be distorted (Kvale, 1995). Galea (2009) suggests that the notion of validity for insider researchers is complicated by the relationship between the researcher and the researched. This relationship adds an additional qualitative dimension which, from an intellectual basis it is more difficult to reference supporting techniques and procedures for controlling 'subjectivity' (Alvesson 2003). Rooney (2005, p. 6) acknowledges the complexities of qualitative research. In her contribution to this issue, she raises questions about researcher's biases which may threaten validity and trustworthiness, including; the

²² There are various ways in which a researcher can be characterised as an insider. For example, professionals may carry out a study in their work setting – also called practitioner research (Robson 2002, p. 382). Examples include Smith's (1995) investigation into social work support for parents of children with a serious illness – Smith at the time was a social worker, whose clients formed part of the study. Another example is Holian's (1999) study of human resource management/ethical decision-making in her own organisation. Researchers might be a member of the community they are studying or they may become an accepted member after a period with the community. For example, in ethnographic research, the researcher may be a native of the community they are studying (Tedlock 2000). Collaborative research – where researcher and subject are both actively involved in carrying out research (Titchen quoted in Jarvis 1999) exemplifies the 'blurring of boundaries' between researcher and researched which causes allegations of invalidity. Such boundaries are obliterated when the researcher becomes the subject of study, as in personal narrative. Insider research could also be extended to include cases where the researcher is partisan to the emotional/political/sexual affiliations of the 'subject(s)'. Examples include feminist research carried out by feminists (Devault 2004) and gay research carried out by homosexuals/lesbians (Leck 1994).

researcher's relationships with subjects that may have a negative impact on the subject's behaviour; the researcher's tacit knowledge leading them to misinterpret data or make false assumptions; the researcher's knowledge that may lead them to miss potentially important information; the researcher's politics, loyalties or hidden agendas may lead to misinterpretation; and the researcher's moral, political and cultural standpoint may lead them to subconsciously distort data.

5.2.2 Overcoming issues relating to insider research

However, Berg (1998) asserts that an insider position is unique and there are many cited advantages of insider research²³. Some argue that insiders have a wealth of knowledge which the outsider is not privy to (Jones quoted in Tedlock 2000). It is argued that interviewees may feel more comfortable and freer to talk openly if familiar with the researcher (Tierney 1994). Hockey (1993) maintains that as an insider the researcher does not have to deal with culture shock, enjoys enhanced rapport with the subject, is able to measure the accuracy of the responses to questions, and is seen by the respondent as empathetic. From an anti-positivist perspective, therefore, insider research has the potential to increase validity due to the added richness, honesty, fidelity and authenticity of the information acquired (Rooney 2005).

Promoters of anti-positivism and anti-positivist qualitative research claim that arguments against insider research are applicable to all research. For example, one can never guarantee the honesty and openness of subjects, and our research is always coloured by our subjectivities. Because complete objectivity is impossible, the task is to minimise the impact of biases on the research process, to carry out research in consciousness of its socially situated character and to make the researcher's position vis-à-vis the research process transparent (Hammersley 2000). By making the research process transparent and honest, it is argued that readers can construct their own perspectives which 'are equally as valid as our own' (Cohen et al. 2000, p. 106).

²³ An interesting example of such advantages is Naples' (2004) account of her ethnographic study of a rural Iowan community. Although she identifies herself as an outsider to the community (because she has only recently moved there), during interviews she discovers that many others also feel like outsiders to the community for various other reasons (for example, racial differences, economic and social inequalities and so on). Naples describes how the commonality between herself and her subject(s), which could classify her as an insider to their emotional perspective, became a resource through which she gained a more in-depth understanding of the subjects' descriptions and feelings.

How then can one ensure the results of a research project using qualitative methods are transparent, honest and reliable? Guba and Lincoln (cited in Keeves) note that naturalistic enquiry parallels to the positivist criteria of internal and external validity, reliability and objectivity are to be found in the notions of credibility, transferability, dependability and confirmability and recommend the use of the following techniques in order to increase the trustworthiness of a naturalistic study:

- (i) prolonged engagement at a site to overcome a variety of possible biases and misconceptions and to provide time to identify salient characteristics
- (ii) persistent observation, to understand salient characteristics, as well as to appreciate atypical but meaningful features
- (iii) peer briefing, to test growing insights and receive counsel about evolving design, discharge personal feelings and anxieties, and leave an audit trail
- (iv) triangulation, whereby a variety of data sources, different investigators, different perspectives (theories) and different methods are pitted against one another
- (v) referential adequacy material, whereby various documents, films, videotapes, audio recordings, pictures and other 'raw' or 'slice-of-life' material are collected during the study and archived for later use
- (vi) members' checks, whereby data and interpretations are continuously checked with members of the various groups from which data were solicited, including an overall check at the end of the study.

5.3 Quantitative research

While the study adopts a qualitatively-driven methodological approach, nonetheless, quantitative methods have been employed for data collection. Quantitative research methods are characterised by the collection of information which can be analysed numerically, the results of which are typically presented using statistics, tables and graphs. The advantage of legitimate quantitative data, that is data which is collected rigorously, using the appropriate methods and analysed critically, is in its reliability.

However, while quantitative approaches are relatively easy and inexpensive to implement and are standardised so comparisons can be easily made and the size of the effect can usually be measured, they are limited in their capacity for the investigation and explanation of similarities and unexpected differences (Hawe, Degeling & Hall 1990).

5.4 Research approaches adopted for the study

In order to achieve its aims and objectives, the study adopts qualitative approaches which are descriptive, exploratory, developmental and evaluative in the various phases/projects as outlined by the research design framework, as set out in Table 3.7.

Table 3.7: Research approaches aligned to the research design framework

CIPP model	Research approaches
Context	Descriptive
Inputs	Exploratory
Instrument and Method	Developmental
Process and Product	Evaluative

5.4.1 Descriptive research

A descriptive research approach was adopted in the first phase of the study, viz. outlining the problem, its scope and context. Descriptive research is used to describe behaviour and attributes that are observed and measured rather than tested with an experiment. Descriptive studies do not test specific relationships between factors; rather they provide information about behaviours and attitudes with the goal of reaching a better understanding of the subject. This method of research has the advantage of studying individuals in their natural environment without the influence of the artificial aspects of an experiment. The most common type of descriptive research is the case study, which provides an in-depth analysis of a specific person, group or phenomenon. While findings may not be generalizable to the overall population, they can provide important information for future research.

5.4.2 Exploratory research

An exploratory research approach was adopted in the second phase of the study, i.e. collecting the various inputs from which a contextualised monitoring and assessment method might be developed. Exploratory research clarifies problems, gathers data and creates initial hypotheses and theories about subjects. It is most useful in situations where limited information is available and the researcher wishes to have the flexibility to further explore areas of research (Polonsky & Waller 2005; Cooper & Schindler 2006). The primary goal of exploratory research is to gain a better understanding of an issue or situation and it is an appropriate way to provide ground work for more rigorous studies at a later date (Davis 2000; Zikmund 2003; Cooper & Schindler 2006).

Exploratory research is a category of research that is 'descriptive' (Hedrick, Bickman and Rog 1993, p. 44) and provides a 'picture of a phenomenon as it naturally occurs' (Hedrick, Bickman and Rog 1993, p. 47). The World Health Organisation (2001) and Hedrick, Bickman and Rog (1993, p. 45) both report that it is common for this type of research to be less structured and not test a hypothesis or causality. Exploratory research has been associated mostly with areas of research where limited previous work has been undertaken (Hedrick, Bickman & Rog 1993, p. 45) and where the objective is to gain familiarity with a problem or to generate new insights for future research (Scott 1965; Eisenhardt 1989). Henry (1993) considers that 'exploratory research is generally undertaken to provide an orientation or familiarisation with the topic under study' (p. 48). This type of research is commonly used for the early or pilot stages of larger research projects (Henry 1993, p. 48).

Exploratory research is typically qualitative (Cooper and Schindler 2006). Qualitative research is often referred to as interpretive research as its intention is to build an understanding of an issue rather than prove a theory (Cooper & Schindler 2006). This type of research has the potential to provide the researcher with rich and useful data (Cavana et al. 2001; Cooper & Schindler 2006) and involves a high level of researcher involvement and interpretation (Cooper & Schindler 2006). The researcher is interested in the perspective and beliefs of the respondents being interviewed with the aim of identifying patterns through observations, documentation and analysis (Cavana et al. 2001). Zikmund (2003) notes that the first step in exploratory research is to analyse existing studies in the subject area and then transform potential issues into more defined problems in order to develop research objectives.

5.4.3 Developmental research

A developmental research approach was adopted for the third phase of the study - the development of a new risk monitoring and assessment method. The developmental research method is a disciplined investigation conducted in the context of the creation and implementation of a product or program for the purpose of improving either the thing being developed or the developer. It is holistic, contextual and evolutionary, where a prototype model is constructed and used with a target group. The dynamics of the system are analysed through participatory observation before the prototype (both the 'technology' and the emerging social system) is revised.

5.4.4 Evaluative research

An evaluative research approach was adopted for the final phase of the study; i.e. determining the effect and usability of the developed method. Evaluation research is undertaken to see whether a program, product or activity is meeting or has met the objectives set for it and is used to measure its social impact. Weiss defines evaluation as ‘the systematic assessment of the operation and/or the outcomes of a program or policy, compared to a set of explicit or implicit standards, as a means of contributing to the improvement of the program or policy’ (1998, p. 4). In her previous book, Weiss (1972) defines evaluation research as ‘an elastic word that stretches to cover judgments of many kinds’ (p. 1). The focus of evaluation research is on evaluating an event and to make judgment about its usefulness. In terms of methodology, a consensus exists with respect to the fact that both quantitative and qualitative methods have an important place in programme evaluation (Clarke & Dawson 1999).

There are many frameworks and models for evaluating interventions, some of which are generic and some domain-specific. In the occupational health and safety domain, for example, the Intervention Effectiveness Research Team established by the National Institute of Occupational Safety and Health (NIOSH) in the US developed a conceptual model for intervention research in OHS (Goldenhar et al. 2001). The model suggests that the intervention research process is cyclical and progressive and involves three broad research phases of intervention development, implementation and evaluation. In addition, La Montagne and Shaw (2004) expanded this model to describe a conceptual model that relates directly to occupational health interventions. More broadly, however, the framework developed by La Montagne and Shaw (2004) lays out a general systematic process for evaluating occupational health & safety (OHS) intervention programs.

While these models are content and domain-specific, nonetheless, the intervention that was evaluated in this study was a training/educational one, and as a consequence, a more traditionally education focussed evaluation method, Kirkpatrick’s Model of Training Evaluation (1998) was adopted. This model, which complements the CIPP model adopted as the research design framework, is discussed more fully later in this chapter.

6. Ethical considerations associated with the study

There are a number of ethical considerations that need to be borne in mind when conducting research, especially qualitative research, which poses particular challenges in relation to ethical considerations (Darlington & Scott 2002, p.24). These considerations are designed to protect the rights of research participants, create transparency in the research process and ensure robustness of the research outcomes.

The first is voluntary participation, which requires that people not be coerced into participating in research. This is especially relevant where researchers had previously relied on 'captive audiences' for their subjects -- prisons, universities, and places like that. Closely related to the notion of voluntary participation is the requirement for informed consent. Essentially, this means that prospective research participants must be fully informed about the procedures and risks involved in research and must give their consent to participate. Consent involves the procedure by which an individual may choose whether or not to participate in a study. The researcher's task is to ensure that participants have a complete understanding of the purpose and methods to be used in the study, the risks involved, and the demands placed upon them as a participant (Best & Kahn 2006; Jones & Kottler 2006). The participant must also understand that he or she has the right to withdraw from the study at any time.

Secondly, research participants should be assured of privacy through anonymity and confidentiality of information. Invasion of privacy represents a substantial risk in qualitative research because of the sensitive data often collected and analysed (Nagy Hesse-Biber 2011). Confidentiality involves assuring participants that information will not be made available to anyone who is not directly involved in the study, unless otherwise agreed. Anonymity essentially means that the participant will not be identified throughout the study and especially in any reporting of the outcomes of the study. However, this is sometimes difficult to accomplish, especially in situations where participants have to be measured at multiple time points (e.g., a pre-post study).

Finally, ethical standards also require that researchers not put participants in a situation where they might be at risk of harm as a result of their participation. Harm can be defined as both physical and psychological.

6.1 Informed consent

All participants and/or the organisations to which they belonged that participated in the study were personally known to the author through previous association and consented voluntarily to be involved. Participants or their organisations were contacted by telephone or email and invited to participate in the research. The aims and objectives of the research as well as a brief explanation of what was entailed and expected of each participant were outlined. It was explained to them that a survey would be administered by the author, with the distinct possibility of a future survey once the proposed new method was developed. Prior to participation, all were advised that involvement in the study was on a voluntary basis and that they could withdraw at any time without comment or consequence of any sort.

6.2 Anonymity and confidentiality

Participants were also assured that information collected would be treated with strict confidentiality and reported anonymously in the study. Participants' names were used only to track initial recruitment correspondence. Once participants were recruited, coding was used to identify participants and their organisations and there was no further use of participant names. In addition, coding was used to report attributed survey results.

6.3 Other risks

It was considered that all other risks to participants associated with this study were low.

6.4 Ethical issues associated with data collection

In addition to the broad ethical considerations outlined above, there are specific ethical issues associated with the various data collection methods. Consideration of these is designed essentially to ensure validity, reliability and objectivity of the data collected and to minimise sources of error as much as possible. (Gray 2008). These specific considerations are dealt with in the following section relating to the data collection methods adopted for the study.

7. The data collection methods adopted for the study

Inquiry and data collection for the study involved undertaking several substantial reviews of relevant literature relating to the various phases of the study and data collection using traditional quantitative survey methods. Table 3.8 sets out the inquiry and data collection methods and how these different methods contribute to addressing the research questions on hazard identification, risk evaluation and user requirements.

Table 3.8: Overview of the investigation methods

Research Question	Investigation Method
1. How best to assist music promoters and public venue owners and/or operators to identify potential safety problems (Hazard Identification)	<ul style="list-style-type: none"> • Literature review • Survey of current practice
2. How to evaluate the risks given that there is no relevant failure data to support the evaluation process (Risk Evaluation)	<ul style="list-style-type: none"> • Literature review • Development of conceptual model of behaviour • Development of behavioural risk monitoring and assessment method
3. How to ensure that the risk assessment method/instrument is suitable and can be used by assessors easily and efficiently (User Requirements)	<ul style="list-style-type: none"> • Information seminar/training • Process and product evaluation through pre and post training survey

As outlined in Table 3.9, investigations into hazard identification were conducted through a review of existing literature and a survey of current practice, risk evaluation issues were addressed principally through the development of a conceptual model of behavioural risk and a method to monitor and assess behavioural risk at events and suitability and ease-of-use of the new method were measured through a pre- and post-training survey.

Table 3.9: Alignment of the investigation methods and research questions to the research design framework (CIPP model)

CIPP Phase	Research Question	Investigation Method
Context	1. How best to assist music promoters and public venue owners and/or operators to identify potential safety problems (Hazard Identification)	<ul style="list-style-type: none"> • Literature review • Survey of current practice
Inputs	2. How to evaluate the risks given that there is no relevant failure data to support the evaluation process (Risk Evaluation)	<ul style="list-style-type: none"> • Literature review • Conceptual model of behaviour • Behavioural risk monitoring and assessment method
Process and Product	3. How to ensure that the risk assessment method/instrument is suitable and can be used by assessors easily and efficiently (User Requirements)	<ul style="list-style-type: none"> • Information seminar/training • Process and product evaluation through survey

7.1 Literature review

Literature reviews were conducted on a range of topic areas relevant to the study. A literature review is an examination of the research that has been conducted in a particular field of study. Its purpose is to identify the relevant information and outline existing knowledge, identify any gaps in the research that the project is intended to address, and to produce a rationale or justification for the study. Hart (1998, p. 13) defines it as ‘the selection of available documents (both published and unpublished) on the topic, which contain information, ideas, data and evidence and the effective evaluation of these documents in relation to the research being proposed’ and notes that ‘[i]t is written from a particular standpoint to fulfil certain aims or express certain views on the nature of the topic and how it is to be investigated’ (p. 13).

A literature review uses as its database reports of primary or original scholarship, and does not report new primary scholarship itself, but rather seeks to describe, summarise, evaluate, clarify and/or integrate the content of primary report (Cooper 1988). Boote & Beile (2005) suggest that a literature review goes beyond the search for information, and includes the identification and articulation of relationships between the literature and the research, thereby giving it a theoretical base. Bruce (1994) maintains that the purpose of a literature review is to provide the background to and justification for the research undertaken, and Afolabi (1992) suggests that the omission of a literature review represents a void or absence of a major element in research.

Relevant literature was reviewed in each of the phases of the study. Topics include legal requirements, risk assessment principles, some of the specific issues concerning risk assessment, risk assessment techniques and tools used elsewhere in other contexts, existing guidance available to venue owners, and the current practice in crowd safety planning and assessments. In addition, in order to establish a background to crowd behaviour and the management of crowds, the review included relevant literature relating to:

- a. the connection between event planning and safe festivals and the factors contributing to good planning in this context
- b. the social psychology of crowds, crowding and collective behaviour
- c. crowd movement and crowd flows
- d. human behaviour, particularly in the context of escape and evacuation during an emergency
- e. published guidelines on event planning, venue design, crowd management and emergency arrangements.

7.2 Survey

In order to collect data for the study, two surveys were administered to a focus group of representatives of music promoters and venue owners and/or operators with safety responsibilities.

7.2.1 Use of a focus group

The use of a focus group was particularly useful in this study. Focus groups offer the opportunity to gain insights into participants' perceptions and experiences while minimising costs that might be associated with individual interviews. Focus groups have been extensively used in the fields of health and social science research as a method of data collection (Beyea & Nicoll 2000). They are one of the most favoured and accepted methods of qualitative data collection. In the focus group setting, participants can provide their own explanations for behaviours and describe scenarios from an ecologically-relevant setting. In this setting, participants are using their own language in the context of their own and shared experiences, thereby providing examples which are likely to be engaging when used in the intervention. A particular advantage of using focus groups as a data collection method is that they allow data to be collected from a number of people in a relatively short period of time (Beyea & Nicoll 2000) and provide 'high-density' qualitative information. The group experience is also advantageous as it facilitates discussion in a supportive environment.

This 'community of practice' became the reference group for the study and also served as the subsequent sounding board for the new methodology and instrument. Lave and Wenger (1991) coined the term 'community of practice' to describe a group of people who share an interest, a craft, and/or a profession. The group can evolve naturally because of the members' common interest in a particular domain or area, or it can be created specifically with the goal of gaining knowledge related to their field. It is through the process of sharing information and experiences with the group that the members learn from each other and have an opportunity to develop themselves personally and professionally. The structural characteristics of a community of practice are a domain of knowledge, a notion of community, and a practice (Wenger et al. 2002, pp. 27-29). A domain of knowledge creates common ground, inspires members to participate, guides their learning, and gives meaning to their actions. The notion of a community creates the social fabric for that learning, and a strong community fosters interactions and encourages a willingness to share ideas. While the

domain provides the general area of interest for the community, the practice is the specific focus around which the community develops, shares and maintains its core of knowledge.

Communities of practice have become associated with finding, sharing, transferring, and archiving knowledge, as well as making explicit ‘expertise’, or tacit knowledge (Davenport & Prusak 2000; Hildreth & Kimble 2002). Because promoters’ experience in this context is largely experience-based, as indicated earlier, engaging in a community of practice in this way was instrumental in unlocking a rich potential source of helpful information in the form of actual experiences.

7.2.2 The first survey

An initial survey (see Attachment 1 to Appendix D) was administered to members of the focus group (May to June 2011) in order to ascertain how crowd safety is assessed by music promoters and in different venues, the pros and cons of the different methods used, the kinds of problems the assessors encounter, the constraints within which they have to work and, therefore, what help and support they may require. Specifically, the survey sought information on the following matters:

- operational issues – the main safety problems or concerns that exist in the environment/venues where the interviewees work
- current practice – what the interviewees do to assess crowd safety and any specific techniques or tools used
- practical constraints – what problems or constraints interviewees had experienced when assessing crowd safety and when using these techniques or tools
- the application of risk assessment to crowd safety – interviewees’ views on what a crowd safety risk assessment should entail
- assessors’ needs – what support and guidance the interviewees would like to see to assist them in their assessments.

The survey was intended primarily to identify the operational factors and constraints that need to be taken into consideration when determining what methods are suitable for crowd safety assessors, although some of the information generated here is also relevant to hazard identification and risk evaluation. Another purpose of the survey was to gauge current ‘fit’ between theory and practice and to confirm the need for the proposed method.

7.2.2.1 Selection of public venues for the survey

The first issue that needed to be resolved was what festivals and/or venues should be included in the survey. While there are approximately 20 major outdoor music festivals in South East Queensland each year, a number of promoters did not want to participate in the survey. As a consequence, this only left 7 festival promoters who readily agreed to participate. Of these festivals, 3 are held at the same venue, which fortunately also agreed to participate in the study. One other venue where festivals are held also agreed to be involved. Participation by both of these venues was particularly gratifying as both these venues host a number of other public events which also draw large crowds and consequently had some experience with crowd related safety issues.

Given the small number of participants at this point, the scope of operator and venue was extended to include additional public venues where crowds are often to be found and crowd safety is or should be a major consideration. In addition, it was considered that these venues were more likely to have some risk assessment system in place. For this purpose, the public venue categorisation scheme used by Au et al (1993) was used as a guide. It was selected because under this scheme venues are characterised according to the nature of their operation and the type of activities that normally take place – 2 of the key factors that affect crowd safety. Furthermore, no other categorisation schemes of this kind could be found in the literature. The five categories of public venues are as follows:

- Transport venues;
- Sports venues;
- Shopping venues, exhibition venues and trade fairs;
- Fairgrounds, festivals and leisure parks; and
- Shows and entertainment venues and pop concerts.

The additional venues selected from this list were sports venues and entertainment venues, as it was considered that the conditions here approximate those found at outdoor music festivals more so than do the conditions at transport or shopping venues or leisure parks. Ideally, equal numbers of interviews should have been conducted in each of the types of venue categories selected; however, this was restricted by a number of venues which were able and willing to participate.

Apart from the venue type, it was also necessary to take into consideration venue size when selecting venues for the survey. This is because although the same risk assessment principles should apply to venues of all sizes, the need for support and assistance could vary depending on the scale of the problems they face and the resources available. For example, hazards associated with crowd density are much less likely to be a prime concern in smaller venues where only relatively small numbers of visitors are expected. In such cases a relatively simple and straightforward risk assessment methodology is probably enough. For large venues, different methods and techniques might be required. It is the latter type of venue which is of particular concern to this study.

A further issue that needed to be addressed was how many venues the survey should cover. Obviously, the more venues covered the more “accurate” the findings. However, this had to be weighed up against the time and resources required in setting up interviews and the number of venues agreeing to take part. Making contact with the right person was often exacerbated by the complex structure in some venue owner organisations, approvals that had to be sought from management and the amount of time the relevant person was away from their usual place of contact.

In the end, a total of fourteen interviews were carried out. All interviews were with safety officers and/or managers from promoters of outdoor music festivals or from major venues that handle large numbers of visitors. They included 7 outdoor music festival promoters, 2 general purpose public venues (both of which host outdoor music festivals among other activities), 3 sports venues and 2 entertainment venues. As a commitment was given to maintain anonymity, the names of the festivals, promoters and venues are not disclosed, but where necessary (and, in particular, in the attachments) they are referred to by letter designation (eg: AAA, BBB, etc.)

7.2.2.2 Design of the survey instrument

The survey instrument was made up of 2 parts. Part A covered issues concerning current practice. The questions were designed to obtain information about how interviewees plan for and assess crowd safety in their venues and what they see as the benefits and pitfalls of the assessment methods they use. Part B of the questionnaire was only applicable to those who have carried out risk assessment or have used specific techniques to identify hazards or

evaluate risks. The questions were designed to elicit in-depth responses on the application of risk assessment in crowd safety.

Questions 1 and 2 asked interviewees to identify their main operational concerns and the reasons for those concerns. The questions served 4 purposes:

- (i) They provide a useful introduction to the interview
- (ii) They help to identify the type of safety problems most relevant to different venue types and to establish how important they are in relation to each other
- (iii) They give an insight into non-crowd safety concerns (eg: public disorder, crime), which could have an impact on their practice
- (iv) By establishing the reasons for the concerns, a better understanding could be gained on the thinking behind the setting of operational priorities.

The remaining questions in Part A sought to find out how crowd safety assessment and planning was done for the various festivals or in the various venues. Question 3 is an introductory question to turn respondent' attention from the previous questions back to crowd safety. Question 4 aims to establish an overview of the planning and assessment process involved, whereas Question 6 looks at each assessment stage. As indicated previously, a key problem associated with crowd safety assessment is that valuable information on what went wrong previously is lost or overlooked. What information is available to the assessors may also influence what assessment methods are used. Question 5 sets out to investigate this and also to look at how information is used in the assessment process and if it is used effectively. Finally, Question 7 invited interviewees to make comment on the benefits and pitfalls of the assessment methods they use.

Question 8 in Part B invited respondents to outline any problems or constraints they encountered when trying to adopt risk assessment principles to assess crowd safety. Under work health and safety legislation business operators are required to carry out risk assessment. However, as previously stated, due to the difference in nature of their operations, risk assessment guidance that is intended for ordinary and traditional workplaces could be unsuitable for crowd safety. Hence, Question 9 aims to gauge respondents' viewpoint on what might be a suitable risk assessment for their specific venues and for crowd safety in general. Question 10 invites respondents to suggest how a risk assessment method specifically for crowd safety may assist and support their assessment needs. Question 11 invites respondents to make any further comments on crowd safety risk assessment.

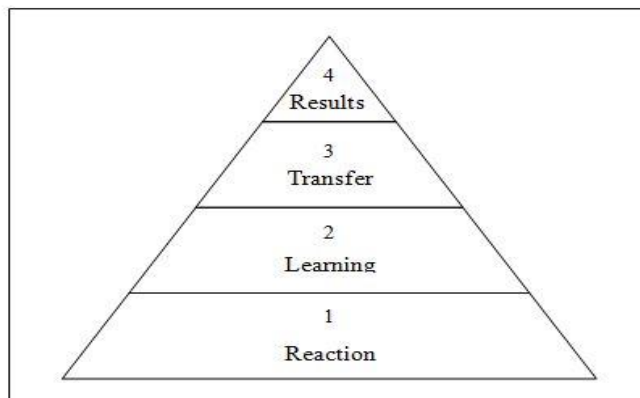
The questions used in the survey instrument were designed to be general and open-ended for 2 reasons. Firstly, all public venues are different. As such, and due to the range of public venues chosen, questions designed to cover a wide variety of operations, safety problems and assessment methods have to be non-specific. Secondly, the questions are intended as ‘prompters’ to encourage detailed and unrestricted discussions during the interviews.

7.2.3 The second survey

The second survey was administered to the group (with some slight alteration of members, but still representative of the original spread of organisations) with a view to determining the effect of a training intervention outlining the new method. Turner & McClure (2004) maintain that it is essential for any newly-developed program to be tested according to change in the target participants’ behaviour and an understanding gained of participants’ perceptions about the program. Evaluation of the model and the training was undertaken through the administration of a retrospective pre- and post-training questionnaire to ascertain change in knowledge and understanding following the training, as well as reaction to the training (process evaluation) and likely/proposed change as a result of the training (impact evaluation).

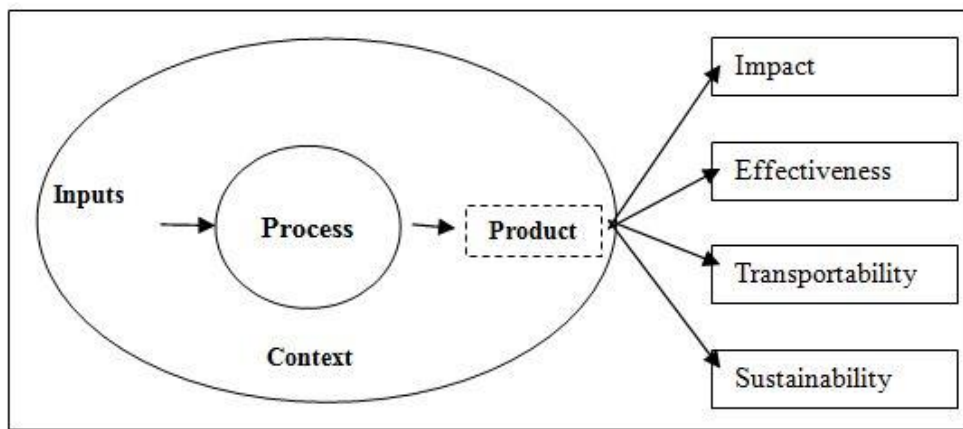
The survey was developed primarily using Kirkpatrick’s Model of Training Evaluation (Kirkpatrick 1998), which seeks to evaluate the effects of an intervention at four levels as outlined in Figure 3.5: (1) the reaction of the student and their thoughts about the training experience; (2) the student’s resulting learning and increase in knowledge from the training experience; (3) the student’s behavioural change and improvement after applying the skills on the job; and (4) the results or effects of the student’s performance.

Figure 3.5: Kirkpatrick’s successive four-level model of evaluation (Adedokun-Shittu & Shittu 2013)



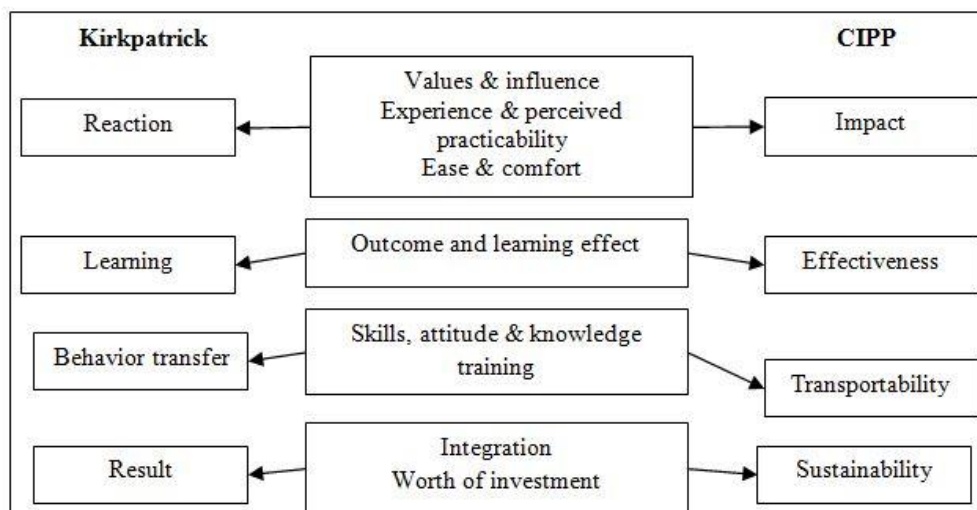
When considering the CIPP framework, *product evaluation* seeks to measure the impact and outcome of an intervention. Impact evaluation is concerned with the assessment of the immediate effects of the intervention and usually corresponds with the measurement of intervention objectives, while outcome evaluation is concerned with measuring the longer-term effects of the intervention (such as effectiveness, transportability and sustainability) and usually corresponds to the intervention goal. The key difference between impact and outcome evaluation is not what is being measured but rather is defined by the sequence of measurement. Figure 3.6 outlines this schematically.

Figure 3.6: CIPP Evaluation model – adapted and developed based on Stufflebeam (2007) (Adedokun-Shittu & Shittu 2013)



Adedokun-Shittu and Shittu (2013) maintain that Kirkpatrick’s (1998) four levels correspond with the product evaluation aspect of the CIPP model and have devised a blended model as outlined in Figure 3.7.

Figure 3.7: Blended model for impact and outcome studies (Adedokun-Shittu & Shittu 2013)



Process evaluation, on the other hand, monitors and records the processes associated with program or product implementation and forms an important component of the cycle of evaluation (McGraw et al. 2000; Basch et al. 1985; Windsor et al. 2004; Hawe, Degeling & Hall 1992; Dignam & Carr 1992; Saunders, Evans & Joshi 2005). In contrast to impact or outcome evaluations, which describe program or product efficacy or effectiveness and the outcomes it obtained, process evaluation provides information to help explain why a program achieved its outcomes (Windsor et al. 2004; Hawe, Degeling & Hall 1992; Dignam & Carr 1992; Saunders, Evans & Joshi 2005; Steckler & Linnan 2002). Windsor et al. (2004) defined process evaluation as an assessment ‘designed to document...how well and how much of the assessment and implementation procedures were provided, to whom, when and by whom’ (p. 23). Process evaluation assesses the quality and quantity of program implementation, including the extent the program is being delivered and received, whether this delivery is ‘as planned’ by program developers, and the acceptability of the program to the target audience (Windsor et al. 2004; Hawe, Degeling & Hall 1992; Steckler & Linnan 2002; Morris & Fitz-Gibbon 1978). Process information may be obtained via the collection of qualitative or quantitative data about program components (Windsor et al. 2004).

Accordingly, in order to capture participant sentiment regarding the acceptance of the training program, construction of the evaluation questionnaire was aided by recourse to the Theory of Planned Behaviour (TPB). According to the Theory of Planned Behaviour (Ajzen 1991), human behaviour is guided by three kinds of considerations - beliefs about the likely consequences of the behaviour (behavioural beliefs), beliefs about the normative expectations of others (normative beliefs), and beliefs about the presence of factors that may facilitate or impede performance of the behaviour (control beliefs). In their respective aggregates, behavioural beliefs produce a favourable or unfavourable attitude toward the behaviour, normative beliefs result in perceived social pressure or subjective norm, and control beliefs give rise to perceived behavioural control. In combination, attitude toward the behaviour, subjective norm and perception of behavioural control lead to the formation of a behavioural intention. As a general rule, the more favourable the attitude and subjective norm and the greater the perceived control, the stronger should be the person’s intention to perform the behaviour in question. Finally, given a sufficient degree of actual control over the behaviour, people are expected to carry out their intentions when the opportunity arises. Intention is thus assumed to be the immediate antecedent of behaviour.

7.2.4 Issues associated with the data collection methods

Both surveys were conducted by means of a questionnaire. Questionnaires as data collection tool provide both the researcher and the responder with many advantages. Disadvantages of questionnaires however also stem from the same factors that provide the advantage. A review of the pros and cons of questionnaires highlight questionnaires as an instrument that allows standardization, ease of use, and anonymity. All these factors, however, also become the basis for major disadvantages. The biggest advantage of using questionnaires for data collection is standardization. Questionnaires not only allow researchers to ask the same questions in the same order to all respondents, but also make tabulation and comparison of answers easy and consistent. Such standardization eliminates bias and allows objective collection of answers.

The standardization and removal of bias however come with the limitations on flexibility. Questionnaires do not allow asking follow-up questions or further probing based on the given answer, which may be critical for the research. Similarly, questionnaires do not encourage respondents to contribute anything extra than what is asked for, when some respondents may have some crucial information very relevant for the research, but overlooked by the question setter.

The popularity of questionnaires as data collection tool is largely due to its ease of use. Researchers can disseminate questionnaires to all respondents simultaneously, allowing for fast collection of data and much reduced effort than, say, interviewing the respondents one by one. Researchers also find compiling and analysing the data from questionnaires much easier than doing the same from most other methods. Respondents find answering questionnaires easy and convenient. The absence of the researcher waiting to write down answers and ask the next question allows respondents time to think and answer, resulting in high quality of response.

Such advantages, however, also create disadvantages. Most people do not take questionnaires, especially anonymous questionnaires, seriously and remain reluctant to spend time completing them, when the same people would readily agree to an interactive interview. Many respondents tend to answer questionnaires superficially, without much thought, especially if the questionnaire is long.

Questionnaires allow anonymity. In many surveys, honest answers depend on the extent to which the respondents feel the data remain confidential. Questionnaires without respondent names or location traces remain the best way to ensure such anonymity, with even the researcher not knowing the respondent identity.

Questionnaires also have an impersonal touch, as the researcher does not directly interact with the interviewee. This non-intrusive nature of questionnaires has its advantages for sensitive or controversial topics, in that the respondent feels free to make bold answers without embarrassment or fear of reprisal. Such anonymity however also has a direct disadvantage in that the interviewer misses gestures, visual cues and subtle hints, which may be major sources of interpreting answers correctly. This lack of visual cues affects questionnaires that elicit sensitive issues or attitudes more than questionnaire that elicits information. In addition, the anonymity or non-interactive nature of questionnaire leads to increased chances of misunderstanding or miscommunication, as the respondents may interpret a question differently than what the researcher intended, with no chance to seek clarification or make amends.

Finally, the researcher has no way to ascertain whether the intended respondent or someone else has completed the questionnaire.

For these reasons, the first survey was interviewer-administered during individual semi-structured interview sessions, thereby allowing further probing of respondents and addressing the disadvantages outlined above. While a structured interview has a rigorous set of questions which does not allow one to divert, a semi-structured interview is open, allowing new ideas to be brought up during the interview as a result of what the interviewee says. The interviewer in a semi-structured interview generally has a framework of themes to be explored, with the specific topic or topics that the interviewer wants to explore during the interview thought about well in advance. The second survey was self-administered following a training workshop and, consequently, did not suffer from the same potential disadvantages as the first survey.

Given the size and nature of the industry, the participation uptake and final sample size, it was not possible to pilot either of the surveys prior to their being administered to the sample group.

7.3 Aligning the data collection/inquiry methods to the research design framework and the aims/objectives and research questions

Table 3.10 aligns the aims/objectives of the project, the research questions to be addressed, the CIPP framework and the relevant inquiry methods.

Table 3.10: Aims/objectives, research questions, CIPP framework and inquiry methods

Aims/Objectives	Research questions	Research design (CIPP Framework)	Inquiry Methods
To show that a contextualised risk assessment can be applied to crowd safety to remedy the pitfalls of the conventional methods currently adopted and, therefore, to improve crowd safety assessment.	What is the best way for music promoters and public venue owners and/or operators to identify potential crowd safety problems, bearing in mind the wide-ranging outcomes due to human behaviour?	Context: What is the nature and extent of the problem? What needs to be done? What are the goals and objectives of the study?	Literature Review
			Survey
To investigate and explore, through the identification of relevant risk factors, how risk assessment can be best applied to assess crowd safety risks and provide support for decision-making in crowd safety planning and management.	What hazards can arise in public venues and how do they differ from problems elsewhere? How to evaluate the risks given that there is no relevant failure data to support the evaluation process?	Inputs: How should it be done? What are the plans and strategies to carry out the project?	Literature Review
			Conceptual model of behaviour
			Behavioural risk monitoring and assessment method
To demonstrate that such a method, which takes into account the specific nature of crowd safety risks, can lead to improved planning for outdoor music festivals.	How to ensure that the risk assessment method for crowd safety is suitable and can be used by practitioners as efficiently and effectively as possible?	Process and Product: Will the new methodology be adopted?	Information seminar/training
			Process and product evaluation via pre- and post- training survey administered to focus group

8. Identifying project constraints

The research undertaken for this study is applied in nature, aiming to provide a usable solution to a practical problem. The subject area, i.e. crowd safety, is a very young discipline and is one that has been rarely investigated in the past. The lack of research information and the various constraints and difficulties associated with studying crowd safety discussed in the previous sections, together with a number of other factors, pose some constraints on how this research was carried out. Two areas of the project that were particularly affected are:

- data collection
- testing.

8.1 Data Collection

Data collection would normally involve a review of past research studies and provide an account of the current situation and wisdom in the subject area of concern. This is often achieved by means of a literature review, which should be aimed at generating information relating to the nature of the research problem, the issues involved, what has already been done, and so on. This would enable the researcher to identify any gaps or inadequacies in the existing research and where further research is required. A theoretical perspective can then be proposed to address the research question, and further data collection would be carried out to gather information about the theoretical device.

However, the subject area being reviewed poses some problems for data collection. Crowd safety is a relatively new subject area. Even though people have been practising it for many years, crowd safety has received little research attention. Up until the Hillsborough Disaster in the UK in 1989, there had been no serious efforts to study crowd safety or to learn from past mistakes. In his inquiry report into the Hillsborough Disaster, Lord Justice Taylor (1990) wrote:

It is a depressing and chastening fact that mine is the ninth official (inquiry) report covering crowd safety and control at football grounds. After eight previous reports and three editions of the Green Guide²⁴, it seems astounding that 95 people could die from overcrowding before the eyes of those controlling the event.

²⁴ *Guide to Safety at Sports Grounds*, Home Office and Scottish Office, 1990.

Apart from a paucity of published studies, crowd safety problems and how they can be assessed is rarely discussed in public forums. This could be due to a number of reasons, such as, for example, a lack of appreciation of the risks involved and the reluctance of music promoters and venue owners and/or operators to share information about their mishaps and near misses for fear of adverse publicity.

Given the lack of published information, data collection on crowd safety could not be done by means of conventional literature review alone. Alternative data gathering methods were used to make this research possible including, in particular, unpublished and anecdotal material. However, these will most likely be insufficient on their own, not least because the source of this information cannot be referenced for reasons of confidentiality. In addition, the amount of relevant information may also be quite limited. For this reason, the literature review was supplemented by a survey of representatives of music promoters and venue owners and/or operators in order to ascertain the nature of public venue operations and crowd safety problems and to collect information about how crowd safety is assessed.

To a lesser extent, insufficient published research knowledge also has an impact on the review on risk assessments. In brief, there are two types of risk assessment: quantified risk assessment (QRA) and qualitative risk assessment. The former has been widely adopted in the process and the high hazard industries for years. It is well established and a lot of effort has been devoted to the development of methods and techniques and in the studies of specific risk assessment issues. While there is plenty of literature on QRA it is considered unsuitable for the vast majority of workplaces, including public venues, mainly due to a lack of data for risks to be quantified. The relative unpredictability of crowd safety problems, and the fact that crowd activities are very difficult to define also makes QRA unsuitable. Qualitative risk assessment, on the other hand, has received far less attention. Literature on the subject, be it on methods and techniques or on specific risk assessment issues, is few and far between.

The methods referred to above were used for gathering and analysing additional information from those venues that have attempted to do risk assessments about how they carry out the assessments and the issues involved.

8.2 Evaluation and Verification

The difficulties previously outlined (eg: rarity of major crowd safety accidents, a lack of failure data and unpredictability of crowd activities and problems) affected how the output of the study could be tested, in much the same way as how testing of plans and provisions is restricted. For example, to test the output against every possibility was prohibitive due to the wide-ranging outcomes in public venues. Testing was further restricted by availability of resource and suitable subjects for the test. Similarly, it was not possible to verify the research output against every outcome. It was also impossible to validate by reference to actual outcomes (i.e. to show that it can lead to fewer accidents or reduced severity) because of the rarity of major accidents, nor by simulation of the outcomes because of the risks to those who take part in the simulations.

In practice, it is possible to measure the effectiveness of the method (and the subsequent risk reduction measures) from evidence such as frequency of crowding or other dangerous occurrences, injury figures, and the number of complaints from visitors. The timeframes for conducting this aspect of validation did not allow this type of evaluation to be conducted as part of the study. Nonetheless, outcome evaluation of this type does need to be undertaken over the longer term in order to gauge the effectiveness of the intervention.

9. Summary

Formulating the relevant research questions for the study highlighted the need for a research design framework which gave priority to planning and implementation of development efforts. The CIPP model was chosen as the operational framework to plan and implement the study. It provides a comprehensive framework to facilitate an integrated and critical review of the planning, conduct and outcomes of a project. Essentially an evaluation model, it has, nonetheless, been used to support research in other contexts. It arose from the observation that traditional approaches to evaluation designs were found to be limited and often too rigid for evaluating dynamic social contexts.

The model identifies the proposed study as one attempting to effect neomobilistic incremental change, and recommends the adoption of heuristic research methods which are qualitative in nature and which are descriptive, exploratory, developmental and evaluative. These approaches are often adopted when there are few or no earlier studies to which references can be made for information, and their aim is to look for patterns, ideas or hypotheses rather than testing or confirming a hypothesis. The focus is on gaining insights and familiarity with the subject area for more rigorous investigation later. These methods are grounded in a constructivist epistemology and interpretivist perspective consistent with Engeström's *activity theory* and *expansive learning* approach, which provide the theoretical overlay for the study.

The study adopts a mixed methods research design which is predominantly qualitative in nature. Positivists argue that this type of 'insider' research compromises the validity and reliability of the research outcomes. Equally, anti-positivists argue that insider research has the potential to increase validity due to the added richness, honesty, fidelity and authenticity of the information. Because objectivity is impossible for any research, the 'trick' has been to minimise the impact of biases on the research process, to carry out research in consciousness of its socially situated character, and to make the researcher's position regarding the research process transparent. In addition, the study has employed quantitative data collection methods. Finally, a number of potential constraints have been identified and discussed.

CHAPTER 4

SCOPE AND CONTEXT OF THE ISSUE

‘We learn from history that we do not learn from history’

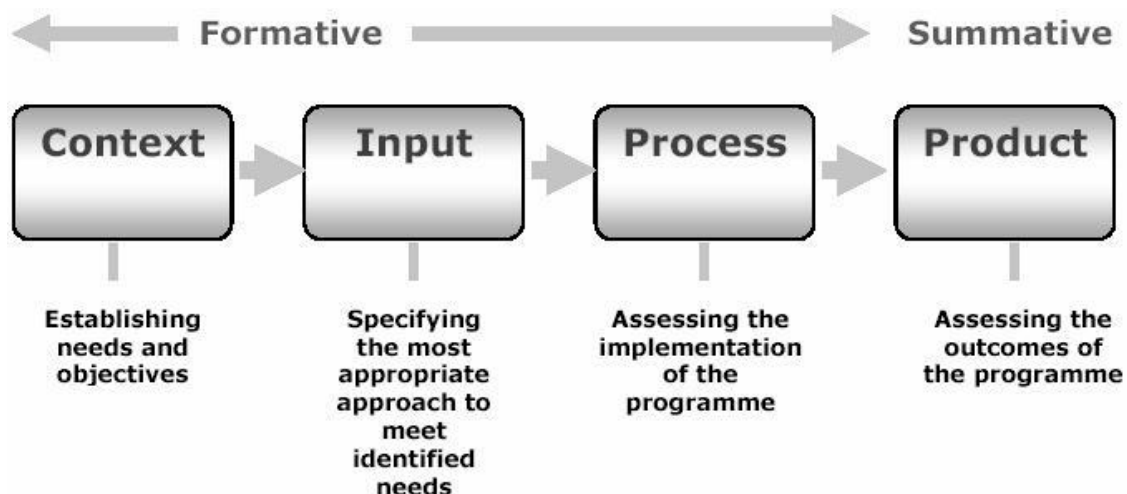
Georg Wilhelm Friedrich Hegel (1770 – 1831)

Chapter Content

1. Introduction
2. Background
3. Nature and magnitude of safety incidents at outdoor music festivals
4. Physical causes of injury and death at outdoor music festivals
5. Patron behaviour at outdoor music festivals
6. Behavioural triggers for high density crowd movement
7. The influence of contemporary youth culture on behaviour
8. Legal liability of the promoter and risk management
9. Responses to liability and risk management
10. Current practice in the assessment of crowd safety risks
11. Summary

1. Introduction

This Chapter outlines the scope and context of the issue under investigation as outlined in Chapter 1. It comprises the Context phase of the CIPP model adopted as the research design framework (see Chapter 3) as set out in the following diagram:



An understanding of the scope and context was undertaken through:

- a review of relevant literature describing the extent of the issue, examining the nature of its causes, and outlining current approaches to the problem
- a survey undertaken to determine whether the issue under consideration remains a problem.

The Chapter commences with a background introduction to festivals and the reasons people attend them, followed by an outline of the magnitude and severity of major incidents at mass gatherings worldwide, the physical causes of injury and death at these events, patron behaviour at these types of events, the contribution of patron behaviour to high-density crowd movement and their associated behavioural triggers, which are prompted by patron motivation and influenced by contemporary youth culture.

The Chapter goes on to consider the legal liability of the promoter and/or venue owner and/or operator, and the need to adopt a risk-based planning approach in order to minimise both common law liability for compensation for injury and criminal liability for breach of occupational health and safety statutes. Reference is made (and highlighted in Appendix C) to the Australian, New Zealand and International Standards Organisation Standard on Risk Management, *AS/NZS/ISO31000:2009 Risk management – Principles and guidelines* as an appropriate framework to guide promoters and venue owners and/or operators to identify and manage their risk exposure.

The Chapter then considers current recommended planning approaches to manage event safety risks and, consequently, minimise exposure to legal liability. While there are a number of resources available that provide good consistent advice for promoters, organisers and local authorities, the information regarding risk management is general in nature and insufficient in regard to the assessment of behavioural risks as mass gatherings including outdoor music festivals.

Finally, the chapter reports the outcomes of a survey of representatives of music promoters and venue owners/operators that confirms that the problem of inadequate assessment of crowd related safety risks still needs to be addressed.

2. Background

Since the early 1990s a global industry of festivals and events has evolved and developed rapidly (Gelder & Robinson 2009). Peterson (2004) describes them as ‘short term special events...oriented towards the interests and tastes of one group²⁵ while providing an opportunity for cultural tourism for all’ (p. 123). Outdoor music festivals, in particular, have become an affordable medium for many, delivering a complete entertainment experience (Earl 2006). They provide ‘leisure, social or cultural experience outside the normal range of choices or beyond everyday experience’ (Getz 1991). As places for celebration and consumption they have a place alongside other ‘cathedrals of consumption’ and are ‘enchanted settings’ (Ritzer 1999), even though as events theirs is a temporary existence.

Outdoor music festivals have seen a steady increase in both number and attendance over the past five years (Raj et al. 2013). Mintel (2009, 2010, 2012), for example, has reported music festival growth in the UK since 2008, with an 8% growth reported in 2009, one of the best percentages seen within the industry. Over one in ten adults attended a music festival in 2012 in the UK, up 10% on 2010 figures (Mintel 2012), with more than a third of these concert and festival goers prepared to pay extra for a ticket to a sold-out event (Mintel 2012), highlighting their popularity. In 2011 it was reported there were 272 music festivals in the UK, with this sector remaining the largest within the live market (PRS for Music 2011). Pop and rock concerts/festivals have produced the best performance during the past 5 years, due to broad appeal, now accounting for more than 60% of total visits to concerts and festivals (Mintel 2010).

In addition, music festivals within the UK attract 7.7 million ‘music tourists’ to the country (UK Music 2009), and in turn have a substantial economic impact on host communities (Robinson, Dickson & Wale 2010; MCDEM] 2003:5). This is almost universally the case. For example, the Queensland Folk Federation (2002, p.5) has reported that:

Apart from the nationally recognised cultural value of the event (Woodford Folk Festival), the festival has become a significant drawcard for interstate and overseas visitors. The 1966 visitors study...revealed a \$3 million injection into the local community...[including] \$1 million in box office sales. The 1992 survey indicated [there was] an economic impact to the local region in excess of \$7 million, which included \$2 million in box office sales.

²⁵ The groups identified by Peterson are most commonly young people or targeted counter cultures.

While the dominant reason for attending events relates directly to the theme of each and the specific attractions on offer, music is only part of the attraction. Event socialisation is also important and for many attendees, wandering around the site, meeting like-minded enthusiasts and soaking up a festive and celebratory ambience are equally as important (Nicholson and Pearce 2001). Uysal et al. (1993) found that socialisation, escape, excitement, novelty, and family togetherness are the main motivators. Festivals represent marginal, liminal zones, places outside the normal constraints of daily life, representing 'liberation from the regimes of normative practices and performance codes of everyday life' (Shields 1991). One characteristic of people experiencing liminality together at such events is the fostering of 'communitas', a term employed in cultural anthropology and the social sciences to describe an intense community spirit resulting from shared experience, associated with an atmosphere of social equality, sharing, intimacy and togetherness (Turner 1982). Ehrenreich (2007) considers that humans are born to indulge in 'the incommunicable thrill of the group deliberately united in joy and exultation'.

Research has suggested that it is not music alone, or specific artists, that draw large crowds (Bowen and Daniels 2005). Connell (2009) surveyed attendees at two major festivals in Australia and found that in addition to the music line-up patrons attended for a day out experience. Indeed, one piece of research concluded that budgets and star line-up are largely insignificant predictors of success (Leenders et al. 2005) and that organisers need to focus on creating a fun and festive atmosphere offering social opportunities (Tomljenovic et al. 2001) and new, non-musical experiences.

The simple enjoyment of spending extended periods outdoors is another part of the attraction of outdoor music festivals, providing a welcome break from the urban-based lives led by many and, for some, an introduction to the joys of camping. Overnight camping, with the attendant risks of cold and/or inclement weather, can be interpreted in terms of individual festival-goers making an investment in, and commitment to, the success of an event. A taste of camaraderie and egalitarian and fraternal values may be had at many music festivals, and Michael Eavis, organiser of the *Glastonbury Festival*, has referred to a 'Dunkirk spirit' evident in the presence of adversity at the festival (Stone 2009 cited in Ali-Knight et al. 2009).

In addition, a festival trip may be interpreted as an act of pilgrimage (Turner 1982), and even a 'rite of passage', involving preparation, the journey and arrival, the beginning, culmination and ending of the long-anticipated event, and finally departure and reflection.

However, at a more fundamental level, identity affirmation is an important consideration for a number of people to attend, and many are drawn to festivals in order to collectively celebrate a group identity. This is particularly relevant in the case of those subcultures associated with the musical genre which is the theme of the festival, or subcultures allied to the specific performers involved. Members of the subcultures to be observed at festivals are by definition in a/the minority in their day-to-day lives and may identify as outsider groups, marginalised to a degree by a dominant ideology. The social function and symbolic meaning of the event are closely related to the group's values, historical continuity and perhaps even physical survival (Falassi 1987 cited in Getz 2007). In congregating for the duration of a music festival they gain a voice and validation of their identities that may be withheld by mainstream society. An example of community with a shared worldview uniting at a music festival is the *Bulldog Bash*, 'Europe's No 1 Biker Party', held at a drag strip raceway in Warwickshire, England. Attracting about 30 000 people each year, *Bulldog* features heavy rock bands alongside custom bike and car shows, wrestling, a 'beer gut' competition and 'Rung What You Brung', a rare chance for the everyday biker to flog their own machine down a quarter-mile drag strip at full throttle.

Linked to the theme of group identity affirmation is the concept of cultural capital, part of the function and symbolic meaning of festivals. Championed by Bourdieu (1986), the concept distinguishes the assets of particular social groups between conventional material wealth and cultural assets in an effort to explain the way in which children of elite groups seem more likely than others to succeed in contemporary society, with clear implications for attitudes towards social pursuits. Individuals frequenting festivals are undertaking a 'performance activity', making status positioning statements to others (Rojek 1999) and accumulating popular cultural capital (or 'subcultural capital'). The social functions of such capital, validated within informal or subcultural networks, parallel those functions associated with dominant, conventional cultural capital (Fiske 1992).

3. The nature and magnitude of safety incidents at outdoor music festivals

There is considerable evidence to indicate that outdoor music festivals are associated with an increased safety risk to patrons (DoH 2004, p.76; CMS 2000, p. 1, 2001a, p. 1 and 2002, p. 1). The most significant impacts are deaths and injuries attributable to crowd-related issues (EMA 1999, p.63; DoH 2004, p. 5). This section sets out the number and extent of major crowd-related incidents that have occurred at mass gatherings worldwide.

3.1 Fatalities (mortality data)

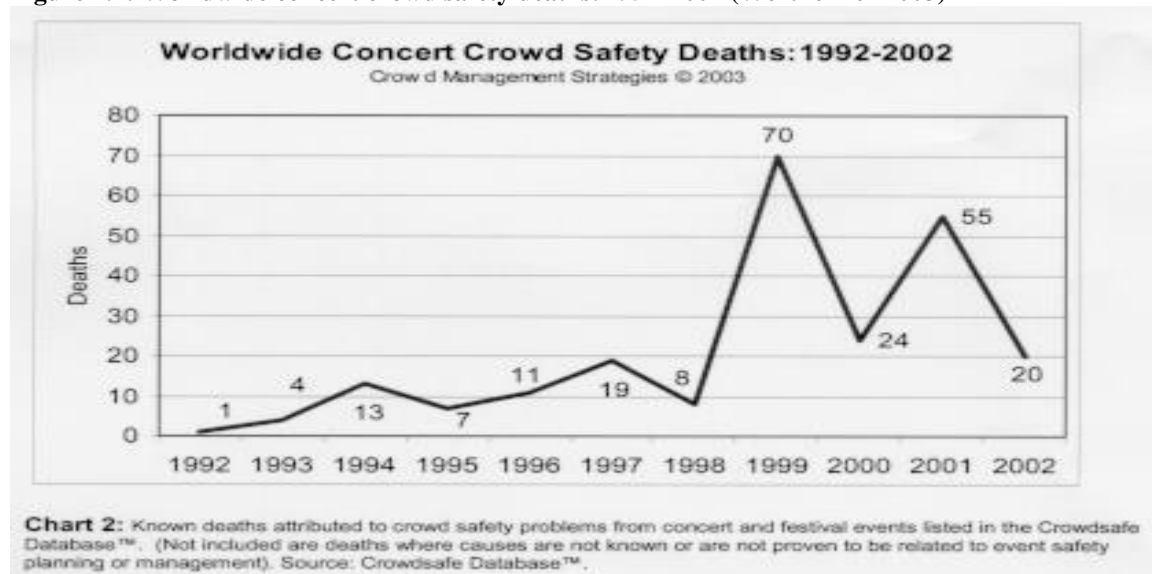
A list of crowd-related disasters over the years was drawn up by Dickie (1993) and is set out in Table 4.1 It shows that they could happen in a variety of venue types and at different stages of operation:

Table 4.1: Examples of Past Disasters (Dickie, 1993)

Year	Place	Venue	Deaths	Comments
1863	Santiago, Chile	Church	2000	Egress
1881	Vienna, Austria	Theatre	570	Emergency egress
1883	Sunderland, UK	Theatre	182	Egress
1902	Ibrox, UK	Stadium	26	Structural failure
1903	Chicago, USA	Theatre	602	Emergency egress
1943	London, UK	Tube station	173	Ingress
1946	Bolton, UK	Stadium	33	During event
1961	Rio de Janeiro, Brazil	Circus	250	Emergency egress
1964	Lima, Peru	Stadium	318	Riot
1967	Kayseri, Turkey	Stadium	40	Riot
1968	Buenos Aires, Argentina	Stadium	73	Egress
1971	Ibrox, UK	Stadium	66	Egress
1974	Cairo, Egypt	Stadium	48	During event
1979	Cincinnati, USA	Concert	11	Ingress
1982	Moscow, USSR	Stadium	96	During event
1989	Sheffield, UK	Stadium	96	During event
1990	Mecca, Saudi Arabia	Tunnel	1425	Ingress/egress
1991	New York, USA	Concert	9	Ingress
1992	Bastia, Corsica	Stadium	10	Structural failure

More specifically, Wertheimer (2003) reported that during the ten year period from 1992 to 2002, 232 people died at 306 outdoor music concerts around the world (CMS 2003; Raineri 2004, p. 2), as set out in Figure 4.1.

Figure 4.1: Worldwide concert crowd safety deaths: 1992-2002 (Wertheimer 2003)



Earl, Parker and Capra (2005) reported (see Figure 4.2) the following crowd-related incidents at music events over the 5 year period from 1999 to 2004:

Figure 4.2: Crowd related safety incidents: 1994-2004 (Earl, Parker & Capra 2005)

Year Incident

- | | |
|------|--|
| 2004 | Three people shot dead (including a popular artist) at an Alrosa Villa concert Hall in America (CMS 2005).
175 people and 714 injured from a fire in an overcrowded club in Buenos Aires (CMS 2005b). |
| 2003 | 21 people died in a crowd crush escaping a Chicago nightclub caused by action undertaken by security staff with emergency egress restricted (Wertheimer 2003a & 2003b).
97 people died in a fire at a rock show at Rhode Island (Bayles & Hampton 2003; Wertheimer 2003a & 2003b).
14 patrons and 2 terrorists died when explosives were detonated outside a rock concert at Moscow (CMS 2003). |
| 2001 | 11 people died (including a police officer) and 50 injured at a Bengali New Year's concert in Bangladesh resulting from a terrorist action. 3 bombs were involved (CMS 2002).
4 bombs were confiscated and 5 people arrested on route to the Ozzfest rock festival in George, Washington (CMS 2002).
A girl died as a result of injuries sustained during a crowd crush at the Big Day Out festival in Sydney, Australia (2001). |
| 2000 | 9 people died and 26 injured from a crowd surge at the Roskilde festival in Denmark (CMS 2001b).
After this tragedy, the Glastonbury Festival in England was cancelled for 2001 with concern over public safety the primary cause (Avon & Somerset Constabulary 2000). |
| 1999 | There was a riot, claims of rape, numerous arrests and 10000 injured during Woodstock 1999 (CMS 2001a; Vider 2004). There were numerous people injured and some fatalities (including 2 deaths and the hospitalisation of 9 others after taking poisonous pills disguised as the drug 'Ecstasy') and 1322 crimes (including assaults, thefts and assorted violent acts) at the Glastonbury Festival in 1999 (USA Today (2001)).
53 people died in a crowd crush at a subway station trying to escape a hailstorm at an OMF in Minsk, Belarus (CMS 2001b). |

Perkins (2004) refers to a Reuters News Service article on March 1, 1999 that reported that in the 6 years from 1993, 62 people worldwide had died and roughly 21 000 were injured while attending 177 concerts and festivals (p. 122). The highest number of deaths at music events recorded in the published data in any single calendar year was 70 in 1999 (CMS 2002, p. 5), and the highest number of fatalities at a single incident was 53 at Minsk, Belarus, also in 1999 (CMS 2001b, p. 5).

In attempting to determine the number of incidents attributable solely to the dynamics of crowd movement at outdoor music festivals, Upton (2004a) gathered data on accidents and incidents that occurred during the period 1974-2003 at concert events held in different countries. He found that at least 136 fatal incidents at concert events could not be explained by anything other than the dynamics of the crowd itself:

- 9 deaths during ingress into a concert venue
- 32 deaths during egress from a concert venue
- 53 deaths during egress from a concert venue directly into a railway station subway
- 29 deaths in front of (or diving off) a stage during a performance
- 13 falls from balconies at arenas and stadiums.

When considered along with sporting and religious events, Hughes (2003) reports that there are, on average, some 2000 fatalities per year which result from the dynamics of crowd movement. A sample of these for the period 1985 to 2005 is set out in Figure 4.3 (from Lee and Hughes 2006).

Figure 4.3: Examples of crowd related accidents (Lee & Hughes 2006)

Table 1
Examples of crowd related accidents occurred over the past two decades

Year	Place	Event held at the time of disaster	Disaster's causes	Deaths	Injuries
1985	Mexico City, Mexico	Football match	Trampling developed when fans tried to force entry into a stadium	10	29
1986	Sheffield, UK	Football match	Tragedy occurred when police open gates to alleviate crowding at Hillsborough Stadium	96	400
1992	South Korea	Pop concert	Fans rushed to the stage during a pop band's concert which was packed with about 16,000 fans	1	50
1993	Lan Kwai Fong, Hong Kong	Street party	Trampling accident occurred during the dispersion of a New Year's Eve street party	21	67
2000	Denmark	Rock concert	Crowds slipped and fell in mud at front of stage	9	26
2000	Lamping, Indonesia	Pop concert	Five teenagers were crushed to death during an oversold performance of Sheila	5	–
2001	Sydney, Australia	Rock concert	A teenage girl was killed in a festival seating mosh crowd crush	1	–
2001	Glasgow, Scotland	Rock concert	Crowd surge forward to the front of the stage at the "Gig On the Green" rock concert	0	45
2003	Benin, West Africa	Pop concert	Fifteen concertgoers were killed in a crowd crush near the front of the stage at a pop concert	15	–
2005	Wai, India	Religious festival	Two hundred and fifty-eight Hindu pilgrims, mainly women and children, were trampled to death during a stampede at an annual religious festival	258	200

These accidents are but a small sample of the total number of accidents that claim approximately 2000 lives annually. Note the diverse nature of both the events and geographical locations of these accidents.

A more up-to-date list of significant crowd-related disasters at mass gatherings was provided by Hoglund (2013) in Figure 4.4.

Figure 4.4: Event related accidents (Hoglund 2013)

Table 1

Earlier event accidents

Where	Country	Year	Death toll	Injured
The Who-concert	USA	1979	11 dead	23 injured
Heysel Stadium	Belgium	1985	39 dead	600 injured
Kathmandu Stadium	Nepal	1988	93 dead	100 injured
Hillsborough Stadium	England	1989	96 dead	766 injured
Mateo Flores Stadium	Guatemala	1996	83 dead	147 injured
Troitsa Festival	Belarus	1999	53 dead	-
Hultsfred Festival	Sweden	1999	1 dead	-
Roskilde Festival	Denmark	2000	9 dead	26 injured
Lantern Festival	China	2004	37 dead	15 injured
The Love Parade	Germany	2010	21 dead	510 injured
Khmer Water Festival	Cambodia	2010	347-456 dead	755 injured
New Year's celebration	Ivory Coast	2013	60 dead	200 injured

In addition, Still (2000, 2012) compiled a list of the most significant crowd-related disasters over the last 20 years, with causes grouped according to his DIM-ICE model, as set out in Figure 4.5.

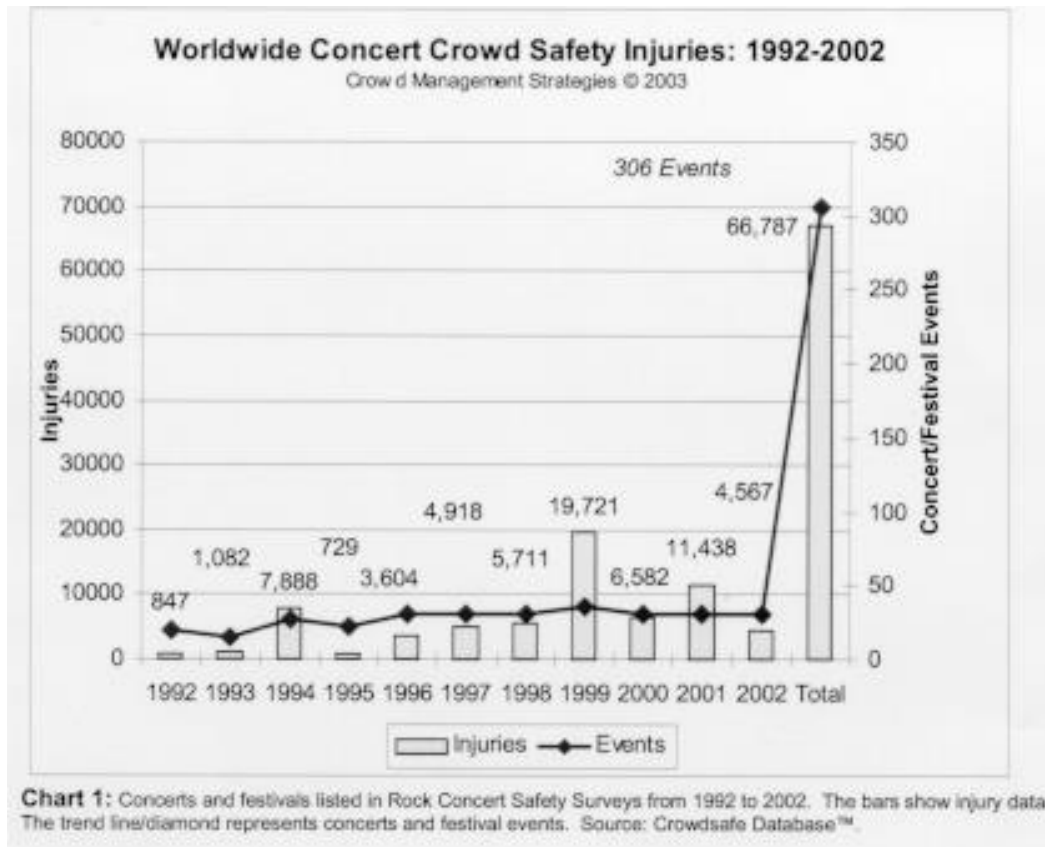
Figure 4.5: Significant crowd related disaster (Still 2000, 2012)

1989	- 96 dead, 400 injured (too many people)	Design (Throughput)	- Hillsborough, UK
1990	- 1426 pilgrims crushed (too many people)	Design (Throughput)	- Mina Valley, Saudi Arabia
1994	- 266 pilgrims crushed, 98 injured (too many people)	Design (Throughput)	- Jamarat, Saudi Arabia
1996	- 83 crushed, 180 injured (too many people)	Information (Forged Tickets)	- Guatemala City
1997	- 22 pilgrims crushed, 43 injured (too many people)	Design (Throughput)	- Jamarat, Saudi Arabia
1998	- 118 pilgrims crushed, 434 injured (too many people)	Design (Throughput)	- Jamarat, Saudi Arabia
1999	- 51 killed, 150 injured in stampede (reaction)	Information (Weather)	- Kerala, India
1999	- 53 killed, 190 injured in stampede (reaction)	Information (Weather)	- Minsk, Belarus
2001	- 35 pilgrims crushed, 179 injured (too many people)	Design (Throughput)	- Jamarat, Saudi Arabia
2001	- 4 dead, including 3 children (reaction)	Information (Handouts)	- Aracaju, Brazil
2002	- 10 trampled, Mall crowd craze (reaction)	Information (Handouts)	- Yokohama, Japan
2004	- 249 pilgrims crushed, 252 injured (too many people)	Design (Throughput)	- Jamarat, Saudi Arabia
2004	- 37 dead, 15 injured in crowd crush (too many people)	Design (Throughput)	- Beijing, China
2006	- 363 dead, 389 injured crowd crush (too many people)	Design (Throughput)	- Jamarat, Saudi Arabia
2006	- 74 dead, 300 injured crowd crush (reaction)	Design (Throughput)	- Manila, Philippines
2006	- 51 dead, 238 Injured crowd crush (reaction)	Information (Political Rally)	- Yemen, Middle East
2008	- 146 dead, 50 injured in stampede (narrow road)	Design (Throughput)	- Himachal Pradesh, India
2008	- 23 dead, dozens injured in Ramadan (reaction)	Information (Handouts)	- Pasuran, Java
2008	- 1 dead, 4 injured - store sales (reaction)	Information (Black Friday Sales)	- Wal-Mart, New York, USA
2009	- 22 dead, 132 injured - Football (reaction)	Design (Throughput)	- Abidjan, Ivory Coast
2009	- 60 injured, 4 hospitalised (JLS) (reaction)	Design (Capacity)	- Birmingham (JLS), UK
2010	- 26 dead, 55 injured (too many people)	Design (Throughput)	- Timbuktu, Mali, West Africa
2010	- 63 dead, 44 injured (too many people - narrow road)	Design (Throughput)	- Kunda, North India
2010	- 10 police officers injured (reaction)	Design (Capacity)	- Brick Lane, London
2010	- 60 injured (reaction)	Information (Screamer)	- Amsterdam, The Netherlands
2010	- 14 injured (too many people at entry gates)	Information (Forged Tickets)	- Johannesburg, South Africa
2010	- Over 100 injured (reaction)	Design (Choice of Barriers)	- EDC - Los Angeles, USA
2010	- 21 dead, 511 injured (too many people)	Design (Throughput)	- Duisberg, Germany, USA
2010	- 10 dead, dozens injured (reaction)	Information (Over Reaction)	- Bihar, India
2010	- 7 dead, 70 injured (reaction)	Information (Raining)	- Nairobi, Kenya
2010	- 347 dead, 395 injured (too many people)	Design (Capacity)	- Phnom Penh, Cambodia
2011	- 102 dead, 44 injured (too many people)	Design (Capacity)	- Kerala, India
2011	- 3 dead, dozens injured (too many people)	Design (Throughput)	- Budapest, Hungary
2011	- 11 dead, 29 injured (reaction)	Information (Shots Fired)	- Port Harcourt, Nigeria
2011	- 36 dead, 70 Injured (too many people)	Design (Capacity)	- Bamako, Mali

3.2 Injuries (morbidity data)

Injury figures from outdoor music festivals are much more difficult to determine as not all injuries that occur are reported. Wertheimer has collected injury data from 306 events around the world for the period between 1992 and 2002 (see Figure 4.6) showing an estimated 66 787 injuries recorded (Crowdsafe 2003)²⁶

Figure 4.6: Worldwide concert injuries: 1992-2002 (Wertheimer 2003)



The majority of injuries associated with these events are generally minor in nature (Arbon 2004, p. 62; Varon et al. 2003, p. 409). Varon et al. (2003, p. 409) reported that over 95% of the patients in their study returned to the event. Milsten et al. (2003, p. 335), Salhanick, Sheahan and Bazarian (2003, p. 350), and Thierbach, Wolcke, Piepho, Maybauer and Huth (2003, p. 16) found a slightly lower percentage (82-85%). All these researchers agreed in their findings that minor trauma and headaches were the most common reasons for presenting.

²⁶ The highest number of injuries was recorded in 1999 where one event, the Woodstock 1999 festival, contributed 4 000 injuries alone (CMS 2002, p. 5).

Janchar, Sammaddar and Milzman (2000, p. 62) reported that the combined injury rate of four large concerts in America was approximately 0.80% of the attendance, despite the Woodstock 1999 event having an unusually high injury rate of approximately 4.0% (CMS 2001b, p. 5). Chapman, Carmichael and Goode (1982, p. 936) found an injury rate of 1.5% while Furst and Sandor (2002, p. 200) reported a rate of 1.3% at two Canadian events. Forrest (1999, p. 2874) found an overall rate of 3.3% for three European festivals. The rate for an Asian summer concert was 0.56% (Kao et al. 2001, p. 525). Arbon (2002, p. 61) found that the highest rate for an outdoor music festival in Australia was 2.7%, though generally they were on a par with injury rates and outdoor music festivals around the world.

Concert violence typically results in head injuries, lacerations, abrasions, puncture wounds caused by foreign bodies, eye injuries and various musculoskeletal injuries, including fractures. A large study of concert medical usage rates found dermal injuries (33%) to be the most common cause of audience trauma when the study's 405 concerts were evaluated as a whole; however, head injuries, which accounted for 19% of total concert trauma, were responsible for approximately 31% of rock concert injuries (Grange et al 1995). The prevalence of head injuries at rock concerts is corroborated by a study of the 1992 Donnington *Monsters of Rock Festival* in the UK, which reported 123 head injuries, of which over 50% were the result of missiles thrown by audience members. The majority of missiles were large plastic containers (in which beer was sold, but which often contained human urine at the time of impact) or wooden replica LP souvenirs that were given away to attendees as promotional items (Hewitt et al 1996). A more recent study of four large concerts reported that 20% of all concertgoers who sought medical attention presented with musculoskeletal trauma and 10% with lacerations and abrasions (Janchar, Sammaddar & Milzman 2000). Salhanick, Sheahan and Bazarian (2003, p. 351) reported that the more serious injuries treated were concussions and fractures. Zeitz et al. (2002, p. 149) added asthma and cardiac pains.

In addition, there are likely to have been many more incidents and near misses that were unreported or did not receive as much media coverage. Moore (1992) cites two examples, for instance, of near disasters on the UK's football grounds – the collapse of a huge retaining wall at Sheffield Wednesday's ground in 1914 that injured 75 people, and an overcrowding at the Wembley Stadium in 1923 during which many people fainted and over 1000 people were treated for shock and minor injuries. Such incidents have the potential for disaster.

4. Physical causes of injury and death at outdoor music festivals

Davies and Associates (2003, p. 20) have enumerated the following specific matters that historically have led to injury and death at events like outdoor music festivals:

- slips, trips and falls in a crowded area
- fast uncontrolled movement of large numbers of people
- crowd surges
- crushing against immovable objects
- crushing against an immovable object that breaks, leading to a crowd collapse
- pressure and crushing caused by overcrowding
- opposing movements of people.

All of these matters are essentially related to the movement of people in high density environments. The physiological pressures within crowds at maximum density can be devastating. When crowd density equals the plan area of the human body, individual control is lost as one becomes an involuntary part of the mass. At occupancies of about seven persons per square metre, a crowd becomes an almost fluid mass. Shock waves can be propagated through the mass sufficient to lift people off their feet and propel them distances of up to three metres or more. Intense crowd pressures, exacerbated by anxiety, make it difficult to breathe. The heat and thermal insulation of surrounding bodies cause some to be weakened and faint. Access to those who fall is virtually impossible. Removal of those in distress can only be accomplished by lifting them up and passing them overhead to the exterior of the crowd.

Lee and Hughes (2006) note that the fatal consequences of crowding can be classified as one of two types, each accounting for approximately half the deaths that occur in crowd-related accidents.

The first type is that of pedestrians being trampled to death. In these situations, although the density of the crowd is high, movement of the pedestrians is still possible and any pedestrian who falls may find that they are unable to stand again because of jostling from the motion of other pedestrians. Consequently, fatalities may occur from percussion by those standing who are unaware of the fallen pedestrian, or by asphyxiation by others tripping and falling on top. In many cases this involves an interruption of a simple traffic process such as exiting a stadium or a passenger conveyor, resulting in a critical crowd pressure point. Passenger conveyors have the characteristic of continuously delivering people without regard to outlet condition. When restrictions at the outlet limit the discharge rate, a pileup will occur (Fruin

1988). Although these incidents are not attributable to crowd behaviour, they are, nonetheless, of interest, because the effect is the same as a crowd crush. For example, in 1964 a child was killed and 60 children were injured at the outlet end of a Baltimore, Maryland, stadium escalator. The escalator was set up for egress the day before with a one-person wide gate at the top. The escalator was reversed for entry the next day, but the gate was not removed. A pileup resulted at the exit, with many severely lacerated by the moving escalator steps. At the 1970 Japanese World Exposition, 42 people were injured at a moving walkway exit when a passenger fell and others were driven into the pileup.

In addition, ingress and egress flows need to be controlled. As Stanton and Wanless (1993) point out:

...flow volume has an optimum density. If this density is surpassed the obtainable rate decreases. One reason for this is that as the density increases, so does the swaying, shuffling motion of the body, as it becomes difficult to take normal sized strides, thus reducing the flow rate.

A study by Lee and Hughes (2005) provides a framework for the design of facilities to accommodate large crowds and suggests that in such designs, careful attention should be paid to managing crowds safely at abrupt salient corners and confined merging flows so as to minimise the likelihood of an accident caused by trampling.²⁷

The second type of fatality caused by crowding is where pedestrians are crushed²⁸. In these situations, the density of the crowd is extremely high and the physical movement of pedestrians is almost impossible. When crushing occurs, the high pressures developed within the crowd, which can bend steel barriers or push down brick walls, can be unbearable to some members of the crowd, producing asphyxiation while still standing. Generally, the highest pressures are felt by those people near any barrier that is checking the advance of the crowd. Such pressure will gradually restrict these people from breathing. Each time a breath is exhaled the weight of the load restricts inhalation of the next breath. A slow death caused by suffocation usually follows, unless rescue is immediate. Critical time can be measured in minutes.

²⁷ A full derivation of the mathematical theory and the details of the modelling results generated using the theory can be found at Hughes (2000), Lee and Hughes (2005) and Lee (2005).

²⁸ Lee and Hughes (2006) have also developed a model for anticipating crowd pressures through spectral analysis, with the aim of giving adequate warning of impending situations involving crushing. The model was developed utilising the standard forward-backward auto-regressive modelling approach (see Nuttall 1976) using data collected by Hopkins et al. (1993) from a heavy rock concert held in Britain by the group *Ride*.

Fruin (1993) has pointed out that virtually all crowd-related deaths are caused by compressive asphyxia, not as a result of being trampled on by a panicking crowd, as is often reported by the media. There is no fixed point at which death occurs from being subjected to an intolerable pressure load. Hopkins et al. (1973) for example, cited the death of a male when subjected to an estimated load of 1400 lbs (over 6Kn) in 15 seconds and of another when subjected to an estimated load of 260 lbs (1.1Kn) for 4.5 minutes.

Tests on live subjects conducted by Evans and Hayden (1971) found that the tolerable force was typically 623N for men when pushed against a 100mm wide flat bar. This force increased to 800N when the subject was allowed to push against the bar to reduce loading on his rib cage. For women, Evans and Hayden (1971) reported the tolerance level was significantly less.

Later experiments by Hopkins, Poutney, Heyes and Sheppard (1993) concluded that males and females were able to withstand pressure loads in the region of 140-180lbs (approximately 800 Newtons). Current medical opinion is that in conditions where the human body is subjected to a higher static pressure load greater than approximately 300lbs (1.1KN) on the chest cavity beyond 2.5-3 minutes, the brain begins to starve of oxygen and permanent injury may be caused. Beyond 3 minutes death may occur at any time (Kemp, Hill & Upton 2004).

An intolerable pressure load can be caused in a number of ways at a concert. For example, high crowd density or a lateral or dynamic surge can convert to a static load. In these circumstances, it is common for those persons right in front of a barrier to push backwards off the barrier in order to gain space to breath. This can then subject persons further back from the barrier to a two-way horizontal load as persons at the back press forward.

Alternatively, a crowd collapse can occur as a result of a dynamic or lateral surge. If a crowd collapse occurs, an intolerable vertical load is imposed on the person(s) at the bottom of a pile of bodies very quickly. A crowd collapse can occur anywhere within a crowd mass.

5. Patron behaviour at outdoor music festivals

It has been suggested that a considerable proportion of the safety risks associated with outdoor music festivals can be attributed to anti-social, irrational and unsafe behaviour by patrons (EMA 1999, p. 63; DoH 2004, 5). Earl and Van der Heide's (2001) study on patron risk perception found that there was particular concern about being in the mosh pits at outdoor music festivals. Ben Challis, a professor at the Buckinghamshire New University's International Centre for Crowd Safety and Security in the UK, recalls (2010, p. 56) how as:

...a teenage punk rocker in the late seventies, one of the joys of going to gigs was being able to pogo in some venues – bounce around with wanton abandon and then immediately as the music stopped, look down to see what badges you could collect – to replace the ones that had fallen off in the heat of the moment. Then along came grunge and the word 'mosh pit' was coined and groups of (mostly) male fans would indulge in often physical, aggressive and violent mass dancing (see Upton, 2004c and Marshall, 2004). In the nineties promoters, venues, event organisers and show security all had to get used to crowd surfing and stage diving, as well as moshing, and face up to the fact that at some events the audience and sometimes the performers voluntarily took part in potentially dangerous, if not lethal activities.

While overcrowding in the mosh pits is generally blamed as the major cause of incidents (Milsten et al. 2003; CMS 2000, p. 1, 2001, p. 1, 2002, p. 1; Ministry of Culture 2003, p. 3), the figures indicate that a fair proportion of incidents resulting in injury and fatalities also occur during ingress and egress. All relate to density, dynamics and behaviour.

A number of authors have commented on the escalation of bad behaviour at music events. Ambrose (2001, p. 4), who has been observing safety in mosh pits for some time, considers that there has been an escalation in violence and adverse behaviour at music events in recent years. He believes that there was once a crowd etiquette that no longer seems to apply. Wertheimer (in Radel 2000) agrees, referring to the mosh pit of old as 'a type of communal chaos' and suggesting that people would watch out for each other and help each other. Modern mosh pits have become associated with 'wanton recklessness and violence...that is why today's mosh pits cannot be guaranteed safe' (Wertheimer in Radel 2000).

The encouragement of such behaviour has, to some extent, been a deliberate strategy on the part of music promoters and press agents, resulting in patrons attending music events becoming more aggressive and violent. In fact, it might even be considered to be part of the attraction of attending.

It is a common perception that concert violence is a modern phenomenon. This is not the case. For example, Middle Age minstrel shows were occasionally marred by outbreaks of Tanzwuth, or 'dancing mania'. Tanzwuth epidemics were believed to accompany minstrels whose music was particularly loud and 'intoxicating'. Early episodes of Tanzwuth were often characterised by audience members dancing wildly until collapse; however, by the 14th century, there were reports of afflicted audiences tossing each other into the air and colliding repeatedly. Tanzwuth episodes were often associated with the consumption of copious amounts of wine, and musicians whose performances elicited these outbreaks often found their services in high demand (Morens 1995).

A later example of concert violence accompanied the 1831 debut of Igor Stravinsky's ballet, *The Rites of Spring*. Though now a familiar, much-loved work, the piece, which is characterised by musical dissonance and radical, even scandalous choreography, resulted in a full blown riot at its premiere. The atonal score and pagan themes incited catcalls within minutes of the curtain rising and several fights erupted among audience members. The show's producer tried, albeit unsuccessfully, to quell the violence by repeatedly flashing the house lights, and Stravinsky slipped out of the theatre moments before the police arrived (Ross 2007).

In more recent times, anti-social and irrational crowd behaviour has been associated with rock culture, which originated in the United States of America during the mid 1950s, and from the outset was promoted as an anti-establishment youth culture that deliberately encouraged a demonstrative response from a crowd. It arguably has its roots in the campaign by press agent George Evans in the 1940s, who appears to have drawn on traditionalist crowd theory to launch the career of Frank Sinatra. It has been alleged by some researchers (Kureishi & Savage 1995; Kelly 1998) that Evans paid young women to scream 'Frankie' during the singer's live radio performances, the objective being to create a mass hypnosis by peer pressure. The degree of success achieved by this marketing strategy can be seen from the research of Bliven (1944), who describes how 150 police officers failed to control 10 000 young women trying to get into a Sinatra concert at the 3500 capacity Paramount Theatre in New York in 1944. Throughout the 1950s and 1960s the strategies used by Evans were widely copied, most notably by Colonel Tom Parker to launch the career of Elvis Presley and Brian Epstein for the Beatles. Both these campaigns focused on artiste image to create hysteria among female fans.

With the greater involvement of male patrons, behaviour became more aggressive and violent. The addition of rap and hip-hop²⁹ to the mainstream music scene in the mid-1980s (Mendoza 1992) brought with it similar incidents.³⁰

In 1952, during the infancy of the rock and roll revolution, Cleveland disc jockey Alan Freed, the man who ostensibly coined the term ‘rock and roll’, found himself at the epicentre of the decade’s two main incidents. In March of 1952, Freed staged the *Moondog Coronation Ball* at a 10 000 seat venue in his hometown of Cleveland and a near riot broke out when many of the estimated 25 000 fans were not admitted. One man was stabbed and dozens more injured (De Barros 2000). Later, in 1958, a *Bill Haley and the Comets* show organised by Freed was stopped because of ‘pitched rioting’. Violence also reportedly erupted outside the Boston venue immediately following the show, and Freed was indicted for inciting a riot (Kleiner 1999). By the time Andrew Oldham launched the *Rolling Stones* in the early 1960s, there had been a dramatic change in crowd behaviour, particularly on their 1965 tour, which became notorious for stage invasions and disorder by predominantly male audiences (Anon 1965).

Wertheimer (1993), a US commentator, notes that over the 40 years leading up to 1993, outdoor music festivals had become more regular, larger and linked with scandals, crowd mayhems, deaths, injuries and chaos. Events such as the Woodstock festival, for example, are renowned not only for being a landmark event but also for adverse safety impacts. In 1969 the Woodstock event was attended by over 200 000 festival patrons and resulted in an unprecedented 3 deaths and 4 000 people receiving treatment for injuries (EMA 2001b, p. 23; De Barros 2000). The event was held again in 1999. Even though there were no fatalities and fewer people needed medical treatment for injuries, Ambrose (2001, p. 15) (see also Tully et al. 1999 and Vider 2004) nonetheless observed that:

...the Woodstock ’99 event shocked America and gave it a wake-up call as stark as that which the original festival gave in 1969. The new message was that the kids were turning weird, getting involved in something bizarre...riots...the pit turned into a serious war zone...women were being pulled into the pit and having their clothes removed before being assaulted and raped...rioters torched a fleet of articulated lorries.

²⁹ Hip-hop was founded in the Bronx in New York City and became a voice for disadvantaged Afro-American and Latino youth from that area (Blake 2003, p. 1).

³⁰ For example, two women were crushed to death in 1987 during a *Public Enemy* concert while trying to leave the arena after reports of gunfire: see De Barros 2000.

The Woodstock festival is not the only infamous event from the 1960s. In 1969, 850 injuries and three accidental deaths were reported during the infamous *Altamont Festival* in Northern California (De Barros 2000). The British band the *Rolling Stones* had helped organise the event and allowed the Hells Angels motorcycle group to act as security (De Barros 2000). During the festival, an over-zealous member of the Hells Angels³¹ security force stabbed a spectator to death (Kaltenbach 2000; Wood 2003, p. 251).³²

In 1979 in Cincinnati at a concert for *The Who* at the Ohio Coliseum (Fuller 1981), 11 people were crushed to death while trying to enter the arena. Dozens more were injured as thousands of fans pushed through and over each other to enter (Wertheimer 2002). After 10 000 persons had entered the venue, 8 000 were still waiting to enter the general admission event. Many were waiting for hours. A warm-up band started playing and the fans outside thought that the concert had begun and started to push forward. Only two doors were open for entry (Wertheimer 1980). In 1991, three rock music fans died of compressive asphyxia at a festival in Salt Lake City, Utah. Fans standing in an open area in front of the concert stage pressed forward, causing some to fall and others to be forced on top of seated fans (Gross 1991). In 1999, 61 fans were injured severely enough to warrant hospital trips during an all-day concert in Maryland, and a sixteen-year-old in Indiana collapsed in a crowd-crush incident and fell into a coma (De Barros 2000).

In 2002, the Seattle Times reported on the injuries suffered by a fourteen-year-old in a mosh pit at an all-ages show by the California band *Rage Against the Machine*. Leaving his seat to join the fans packed in front of the stage, the teenager suddenly found himself hoisted up in the arms of strangers, being passed back, over the heads of other concert goers, until there was no one left to catch him. His fall to Mercer Arena's cement floor left him with permanent brain damage. The boy's parents reached an out-of-court settlement with the band, the City of Seattle (which owns the Mercer Arena), the concert promoter and the security company contracted for the 1996 event. The City's share of the settlement, covered under the security company's insurance policy, was \$400 000, according to a City attorney (Green 2002).

³¹ Historically, the Hells Angels motorcycle group has been associated with aggressive assaults, narcotics trafficking, and violent feuding with other rival gangs. See, e.g., Border Police Turn Back Bikers up to Weekend Hells Angels Party, *Deutsche Presse-agentur*, Aug. 25, 2000 (noting information from European authorities on previous convictions of Hells Angels members).

³² The main criticism levelled at this event was the poor choice of security personnel: *USA Today*, 2001.

In the UK, the first warning that there could be serious problems with a mass crowd in front of a stage at an open air event came with a David Cassidy concert at the White City Stadium, London, in 1974. At this event, there was a crowd crush that involved over 500 persons – 30 were taken to hospitals and one fifteen-year-old female died. Tragedy occurred again in the UK at the Donington *Monsters of Rock* concert in 1988, where two young men died and 30 people were injured (Upton 1995), and in 2002, in Brighton, England, at the *Big Beach Boutique II* concert featuring international star and local celebrity DJ Fatboy Slim, 250 000 people showed up instead of the anticipated 60 000. One person died, and at least 140 people were injured.

In 2006, the Leeds Coroner recorded a verdict of accidental death (BBC 2006) after the inquest into the death of the lead singer of *Bad Beat Revue*, who died after diving from a stage, hitting a wooden floor. An eye witness described the tragedy (Challis 2010, pp. 56-57), saying:

He put the microphone down and crouched before leaping off the stage, which was about a metre high, and trying to grab the rig. I don't know whether he caught it or not, but his momentum carried him forward. He went upside down and hit the floor head first. The whole thing lasted about five seconds. It was horrendous.

Elsewhere, on 30 June 2000, during a *Pearl Jam* performance at the annual *Roskilde Festival* in Denmark, a serious crowd crush incident resulted in the death of nine persons and 43 injuries. The incident was attributable to overcrowding in the front of stage area ('mosh pit') and inadequate barrier design and placement (Drachmann & Tranberg 2001). On 18 July 1995, a sixteen-year-old girl and a seventeen-year-old boy died and many others were injured as a result of an ingress failure at the *Atrock Rock Festival* in Israel. Two days later a fifteen-year-old girl also died as a result of injuries she received during the disaster (Upton 2008). In 2007 a young fan died at a *Smashing Pumpkins* concert in Vancouver, Canada, after being involved in what police described as a 'mosh pit or crowd surfing incident' in an 'out of control mosh pit'. The man was removed unconscious from the crowd inside the PNE Forum venue and first aid specialists failed to revive him before he was transferred to a nearby hospital where he died (NME 2007). Most recently, 21 young people lost their lives and at least 500 were injured in July 2010 at the *Love Parade Music Festival* in Duisburg, Germany, following panic as crowds streamed through a single, jammed, and clearly inadequate, entry tunnel.

In Australia, at the 2001 *Big Day Out* at Homebush Stadium in Sydney, a crowd crush resulted in the death of a young girl from compressive asphyxia. At the same event, five patrons were hospitalised for suspected spinal injuries, and hundreds more were treated on site by the emergency services. In the subsequent investigation, the promoters implicated the band on stage at the time, *Limp Bizkit*, an American rap/metal band, due to the intensity of their performance (Courier Mail 2001). The band responded by alleging that security at the event was inadequate (McCabe 2001) and that they had pleaded with the promoters to increase security prior to the Sydney event. The band then left the *Big Day Out* tour, citing concerns of further incidents as their reason. An event manager for the *Big Day Out* revealed that ‘as soon as *Limp Bizkit* left [the tour] we had a totally different show, totally incident free’ when discussing the remaining events (Henderson 2001). The Coroner’s Court of New South Wales criticised the crowd control measures in use at the time and also criticised *Limp Bizkit* lead singer Fred Durst for ‘alarming and inflammatory’ comments during the rescue effort. Durst defended the band (see *Limp Bizkit* 2001) saying that he had warned event organisers against minimal security. In answer to claims that the band had provoked the incident, he replied that after the incident a quiet computer-generated music loop was played which had a soothing effect on the crowd. On balance, the Coroner held that while the band ‘could have been more helpful in efforts to aid the girl’³³ the security practices employed by the festival organisers bore the brunt of the blame.

In December 2009, a sixteen-year-old boy went into cardiac arrest after being hit in the chest during a concert at the Blacktown Masonic Hall in Sydney. The mosh pit incident led to the teenager being hospitalised on life support for eight days (Dale 2009), before he recovered. In April 2010, concern about crowd safety at a Justin Bieber concert led to police deciding that the event was too dangerous to go ahead. The concert was so highly anticipated that many fans (mainly female teenagers) camped overnight in Circular Quay in Sydney to get as close to the artist as possible. However, when fans began pushing forward while waiting for Bieber to appear, a crowd barrier was broken and fans near the front of the stage started being crushed. When the crowd failed to comply with police directives it was decided to call off the event (Middleton 2010).

³³ Anyone who has seen the footage of the band at Woodstock 1999 can ascertain the effect that a band can have on an audience – see *Limp Bizkit – Break Stuff* (Woodstock ’99) [http: www.youtube.com/watch/v=ywuYCON5cNg](http://www.youtube.com/watch/v=ywuYCON5cNg).

Following the Big Day Out incident in Australia, at the victim's funeral, her parents urged for 'drastic improvements in crowd safety, changes in the way the events are managed and that musicians should consider crowd safety before committing to a performance' (Cock 2001, p. 5). The findings from the subsequent Coroner's inquest suggested improvements to the planning and operation of outdoor music festivals (Weir 2002c, p. 10).

Incidents caused by crowd-related behaviours at outdoor music festivals are also generally sensationalised by the media, contributing to an increase in public concern and outcry against this type of entertainment.³⁴ Following the *Big Day Out* fatality, for example, the Queensland Minister for Youth was going to ban 'mosh pits'; however, a journalist did note that 'it would be premature to speculate on his position as he had not researched the issue at the time of the statement' (Franklin 2001, p.3). Subsequent newspaper articles focused on injury reports from other concerts and festivals throughout the country (e.g. White 2001; Mengel 2001). As Silvers (2005, p.1) notes:

Despite the millions of public and private events successfully organised each year, ...sensational media coverage of mass casualties at night clubs in the United States, sport events in South Africa, rock concerts in Australia and elsewhere, plus numerous civil liability actions against event organisers and facilities (Abbott and Abbott, 2000), the prosecution and conviction of an event organiser in New Zealand for criminal negligence (Grieve, 2003; 2004) and incidents such as the IKEA craze marketing episode in Jeddah, Saudi Arabia (Crowd Dynamics 2004) illustrates that the event industry is being defined by its disasters.

³⁴ See, for example, Brisbane *Courier Mail*, "Autopsy shows Jessica was crushed to death", 18 May, 2001.

6. Behavioural triggers for high density crowd movement

Crowds at outdoor music festivals are different from those at many other events in that they tend to be emotionally-charged (Tatrai 2001), highly-motivated (Raineri & Earl 2005), and somewhat unpredictable (Davis & Associates 2003). Behavioural problems within these crowds can typically result when there are disruptions to the flow of pedestrian traffic caused by obstructions such as queues forming in their path (DoH 2005), because of a perceived threat such as a crowd crush (EMA 1999), or during a competitive rush for a prime position or prized item (Fruin 1981, 2002; Tatrai 2001). Mortality data, in particular, indicates that the principal areas where crowd incidents have occurred are during ingress and egress and in the mosh pit areas of outdoor music festivals (Still 2009). The dangerous potential of these situations needs to be addressed in considering site lay-out and potential impediments to pedestrian flows, as well as in emergency planning.

The behaviour change process in a crowd commences with a failure of some aspect of the social system affecting the crowd, such as running out of alcohol, or a power failure resulting in an interruption of the music. Individuals, sensing there is a problem, analyse inputs and observe reactions within the crowd, a common belief begins to form and spreads throughout the crowd, the crowd becomes more organised, and finally is mobilised into action (EMA 1999). Vider (2004, p. 162), who studied the Woodstock riots in 1999, a particularly extreme crowd incident, surmised that it was the strong shared social identity in that crowd which contributed to the extreme behaviour at that event. The complete transition undertaken by that crowd to ultimately rioting was not clear – however, drugs and alcohol, along with discontent at the services and charges, appeared particularly influential (Vider 2004, p. 154).

Unsafe conditions during ingress and egress are likely to result from either a traffic flow interruption or a flight response, or a combination of both. Flight responses occur when people experience a real or perceived threat to their safety and generally occur during an emergency. Frequently mislabelled as panic, a closer investigation usually shows that flight was a reasonable group reaction under the perceived circumstances. For example:

- In 1981, 45 persons died (27 of them children) in the Qutab Minar Tower, New Delhi, India. The 800 year old tower is a popular tourist attraction and museum. A blackout, combined with what some witnesses said were cries that the tower was falling, triggered a sudden exodus of 300 to 400 people

- In 1988 more than 100 persons died and 700 were injured at Nepal's National Stadium in Kathmandu when a sudden violent hailstorm caused 30 000 spectators to flee the open grandstand but found that the exit gates were locked
- In 2003 in Chicago, the use of pepper spray to break up a fight in a nightclub caused the crowd to surge down a stairwell, killing or injuring over 70 people (CNN 2003a)
- Additionally, in 2003, in a Rhode Island nightclub, a fire started by a pyrotechnic display rapidly spread and overtook the crowd attempting to escape through the clogged front exit, killing 97 people (CNN 2003b).

These incidents often show mutual cooperation and assistance among individuals within the group rather than destructive behaviour. For example, in 1943 during World War II, 173 persons died of compressive asphyxia and 93 were injured in a London Underground air raid shelter after a person fell on a lower level entry stair. Excited by the sounds of bombing, people at the surface continued to press forward, resulting in a tangled mass of humanity on the stairs that took rescuers some three hours to unravel (Dunne 1943).

Unsafe conditions in mosh pits, on the other hand, are more likely to result from craze behaviour. A mass craze is a competitive rush to obtain some highly valued objective. This type of behaviour is heavily influenced by the psychosocial orientation of festival participants, which tends to exhibit not only the exuberant personal expression associated with contemporary youth culture, but also the sub-cultural characteristics of social movements associated with the theme of the event (eg: punk, rock, hip-hop, etc) or with the performer(s). For example:

- In Bangkok, Thailand, 19 persons died as a crowd of 3000 assembled to obtain packages of free food. The crowd was attempting to pass through a gate approximately 4 metres wide into a meeting hall where the food was being distributed. A contingent of 30 police officers assigned to control the crowd was overwhelmed by the crush
- In 1986, 46 pilgrims died in Hardwar, India, on a crowded bridge across the Ganges River. At the 12 year cycle of the Khumb Mlea festival as many as four million Hindus gather to bathe in the Ganges
- In 1990, 1426 people were killed in a crowd crush during the annual pilgrimage of two million people at Mecca, Saudi Arabia. The crush occurred in a 500 metre long tunnel joining Mecca and the tent city of Mina. Temperatures at the time were 44 degrees C outside the air-conditioned tunnel. It is speculated that someone fell in the tunnel, blocking movement.

Craze-like group behaviour is created where participation in an event, or viewing of a public personage, is intensively promoted. For example:

- Untold hundreds, and possibly even thousands, were killed in Moscow, Russia, during a massive procession of three million people viewing the body of Joseph Stalin after his death in 1953. Army tanks and trucks used to control movement of the crowd blocked side streets along the route to Stalin's bier. Police and military, some on horseback, beat people with clubs to further control the crowd, even as people were fatally crushed against building walls, the parked tanks and trucks. Horses were lifted off their feet by crowd surges and also crushed to death (Pozner 1990)
- During the 1980 world tour by the Pope, 13 people were killed in two African cities in crowd rushes.

General admission events³⁵ and so called 'festival seating'³⁶ concerts cause craze-like competition for favourable seats or standing positions close to entertainers. For example:

- In 1979, 11 young music fans were asphyxiated in a crowd crush outside the Cincinnati, Ohio Coliseum (Fuller 1981). After 10 000 persons had entered the venue, 8 000 were still waiting to enter the general admission event. Many were waiting for hours. A warm-up band started playing and the fans outside thought that the concert had begun. Only two doors were open for entry (Wertheimer 1980)
- In 1991, three rock music fans died of compressive asphyxia at a festival in Salt Lake City, Utah. Fans standing in an open area in front of the concert stage pressed forward, causing some to fall and others to be forced on top of seated fans (Gross 1991).

At an outdoor music festival, it is likely that different motivators influence patron behaviour at each of these points. For example, ingress behaviour is likely to be heavily influenced by a competitive rush for positioning close to the entertainers. Egress behaviour is likely to be influenced by the level of satisfaction with the event and the adequacy of facilities for moving patrons off-site. Circulation behaviour (including behaviour in the 'mosh pit') is likely to be influenced more by cultural attitudes and the behaviour and influence of the performers. In addition, any real or perceived threat will have a significant influence on behaviour.

³⁵ These are events for which tickets do not entitle holders to specific, or reserved, seating.

³⁶ This term refers to standing room only environments.

7. The influence of contemporary youth culture on behaviour

Commentators note that anti-social and irrational crowd behaviour is characteristic of contemporary youth culture³⁷ and that many of the risks associated with youth culture relate to exuberant expression. Youthful expression is usually defined by the norms of their individual social circles (Bennett 2002, p. 455). Modern youth culture can be characterised generally by such things as distinct dress, dislike of others outside their social circles, glorification of bad behaviour (for example, violence, drug taking and/or sexual behaviour), use of slang and profanities, strong desire to be ‘cool’, and the view that these social circles are a secondary family (Anonymous 2004a). Of particular interest to this study are the associations between youth culture and music.

In addition, there are relevant behavioural factors related to social movements, such as violent crime, property destruction and sexual harassment. Other examples include stage invasions, general disorder from male patrons, and hysteria by female patrons associated with some artists (Upton 2004a, p.2). For example, violence has been associated with hip-hop performances (CMS 2002, p. 1). It has become common practice for members of these audiences to bring weapons to events. Consequently, risks associated with these events have been exacerbated by factors relating to improper or deficient security planning and controls, such as a lack of metal detectors (CMS 2002, p. 2). These behaviours are more likely in the presence of excessive consumption of alcohol and/or drugs and a predominance of young males (Van Stan 2003, p. 3; Vider 2004, p. 145).

According to Bennet (2002), there has been considerable interest in youth culture and music since the early 1970s. In 1972, research undertaken by Cohen discovered that youth culture was perceived to be highly influential in social change and threatened the traditional values of the ‘establishment’ (1972 in Forsyth, Barnard & McKeganey 1997, p. 1317). Adults have been and remain concerned that their youth will reject them and their values as they grow up. This concern is manifested particularly in views of their choice of musical interests (Bostic et al. 2003, p. 58). Bostic et al. (2003) maintain that adults generally respond to these concerns with defensive actions such as ‘grounding’, which often leads to retaliatory actions. It is because of parental and other societal pressures that youth pursue escape and freedom.

³⁷ The collective methods of expression and association by young people are known as *youth culture* (Anonymous 2004a).

The Ministry of Culture (2000, p. 8) in Denmark and Commons, Baldwin and Dunsire (1999, p. 434) both suggest that youth find escape and freedom at outdoor music festivals. Consequently, festivals are important cultural foci for youthful expression. Commons, Baldwin and Dunsire (1999, p. 435) suggest that outdoor music festivals encourage a sense of community for the patrons. It is through this sense of community that festival patrons gain the confidence to explore new behaviours and enjoy being entertained (Ministry of Culture 2000, p. 8).

However, it is possible for this youthful expression to become unruly or out of control (see, for example, Wertheimer 1993). Wertheimer maintains that crowds have a long history of unacceptable behaviour that dates back to the 1950s, particularly at rock and roll shows. At that time, rock music was first promoted as an anti-establishment youth culture and crowds were deliberately incited to demonstrative responses and very little has changed from those days (Wertheimer 2003a).

Youth culture is made up of numerous smaller social cliques often referred to as 'counter cultures'. Counter culture is a term used to describe a cultural group whose values and norms are at odds with those of the social mainstream (Anonymous 2004b). History has shown a succession of counter cultures or subcultures with close links to musical styles. Examples include the Mods, Hippies, Beatniks, Rappers, Punks, Skinheads, Disco and Ravers (Anonymous 2004c; Anonymous 2004b; Farlex 2004). Socialisation into counter cultures does not end here, with many having their own subgroups (Weir 2000, p. 1845). For example, the Rave music scene includes House, Happy Hardcore, Drum and Bass, and Trance (Weir 2000 p. 1844). Some of these subgroups are very specific. For instance, the band called the *Grateful Dead* created their subculture within their fans. These *deadheads*, as they were known, had their own unique form of culture and mores (Epstein 1994). Milsten et al. (2002, p. 157) found that countercultures like these have a significant effect on crowd mood, one of the factors known to affect crowd behaviour.

There has been considerable sociological research into the relationships between youth, style and musical taste. The findings from early studies considered this relationship to be mainly influenced by social class-related conditions (Cohen 1972 in Forsyth, Barnard and McKeganey 1997 p. 1317; Lack 1995; Stahl 2003, p. 140). Traditionally, membership of these groups provided a complete lifestyle option and included unique social structures, rules

and ethics. The majority of people attracted into these different groups were drawn by the lifestyle options on offer, such as being a 'punk' (Ambrose 2001) or being a 'hippy' (Farlex 2004).

Bennet (2002, p. 462), however, argues that this is no longer the case as findings from recent research reject the cultural connection. Bennet (2002) reminds us that musical taste is only 'one of a series of interrelated aesthetic values through which individuals both construct their own identities and identify with others who are seen to possess the same or similar values' (p. 462). For example, the rave scene has been described as the next counter culture. Priddle (2004) found 'ravers' or 'clubbers' only share attending rave events and taking ecstasy in common. Unlike the earlier groups, like the working class punks, these people come from all social divisions, classes, gender and age, and do not have the gang culture that was indicative of many other groups (Priddle 2004).

When managing risks at outdoor music festivals it is important, therefore, to understand the nature of the crowd demographic attending the event, and event organisers need to be aware of the types of crowds that performers attract (HSE 1999, p. 7). The greater the homogeneity in a crowd the greater is the cohesion in the audience (Tatrai 2001, p. 6). This homogeneity may be caused by gender, age bias or strong collective interest. According to Arbon (2002) and Milsten et al. (2002, p. 158), the impact of this homogeneity can be exacerbated by the consumption of alcohol and crowd mobility (e.g. large standing areas or mosh pits). Alternatively, encouraging a broad crowd demographic with a balance of gender and diversity of ages generally has a positive calming effect on crowds. Events such as folk festivals, for example, attract a broader demographic and have considerably fewer issues for crowd safety (Tatrai 2001, p. 6).

8. Legal liability of the promoter and risk management

Crowds at events like outdoor music festivals are the principal hazard that needs to be dealt with, and without effective management, can become a significant problem with serious consequences. While traditionally concert promoters and venue owners and/or operators have not considered crowd-related safety to be their responsibility but rather the personal responsibility of patrons (who are perceived to put themselves at risk by virtue of their attendance, zeal and behaviour), the legal reality is quite different, with promoters and venue owners/ operators subject to legal liability for compensation at common law and the threat of potential prosecution under Australian occupational health and safety laws.

Promoters expose themselves to legal liability through effectively controlling all aspects of production and staging of an event. Promoters select and engage the venue, arrange for the erection of temporary staging and other necessary infrastructure, make decisions regarding event capacity and liquor sales, engage food vendors, and select the performers. The latter is done with full knowledge of the effect the performers have on patrons attending the event. In addition, at contemporary concert events, crowd excitement levels can be maintained and even increased by the clever use of lighting, sound, special effects, and even the actions of the artist(s), to a point where a crowd mass can be manipulated to act irrationally.

When incidents have occurred, promoters and venue owners and/or operators have sought to rely on legal defences involving implied or voluntary assumptions of risk or contributory negligence by attendees participating in dangerous crowd-related activities and, in any event, consider that they can effectively transfer their liability through insurance. However, given that the typical behaviour of patrons is well known, accepted and even encouraged in some instances, courts are less likely to entertain such defences in common law actions for compensation, especially in Australia. Potentially, this leaves promoters liable to significant financial penalties in the event of an incident or fatality. While common law liability for injury can be managed through insurance³⁸, should there be an incident or fatality, the significant increased insurance premium cost and any associated reputational risk act as a strong incentive to undertake comprehensive and effective planning with a view to achieving optimum safety outcomes.

³⁸ However, this comes at a significant financial cost.

As well as common law actions for compensation for injury, legal liability for breach of work health and safety legislation³⁹, which imposes a statutory ‘duty of care’ on concert promoters and venue owners/operators to ensure that the safety of persons is not put at risk by the way they conduct their event, can result in the personal prosecution of promoters and venue owners/operators. Such liability is criminal in nature and exposes promoters and venue owners and/or operators to significant monetary fines (which cannot be insured against) and potential imprisonment in the event of a fatality. Compliance with the legislation requires a proactive approach by operators to identify all reasonably foreseeable hazards and take ‘reasonably practicable’ control measures to either eliminate the risk arising from the hazard, or, if this is not achievable, then to minimise the risk so far as is ‘reasonably practicable’.

8.1 Common law liability for compensation

In Australia, the UK and the US, a common law claim for compensation for negligence or occupiers’ liability will usually only succeed if there is some fault (i.e. blame, in legal terms) resulting in the breach of a duty of care owed by that person to another. Negligence actions require a person to have a duty of care, a breach by them of that duty, and that some form of injury (physical, emotional or economic) results from that breach of duty. Occupiers’ liability actions are similar in nature.

There are a number of defences available to duty holders in these cases – contributory negligence (which goes to apportion blame between the injured person and the duty holder), and voluntary assumption of risk, which acts as a complete defence thereby denying an injured person’s claim completely. However, there are differences in approach and the application of these defences in each of the jurisdictions mentioned, and these are now examined in turn.

The leading case on occupiers’ liability in the UK is the House of Lords decision in *Tomlinson v Congleton Borough Council and others*.⁴⁰ In this case a young man dived into a park lake where swimming was banned. His head hit the bottom, breaking his fifth vertebra and leaving him a tetraplegic. His claim under the UK *Occupiers Liability Act* failed. The Law Lords considered that Mr Tomlinson suffered his injury because he chose to indulge in an activity which had inherent dangers, not because the premises were in a dangerous state.

³⁹ See, for example, Queensland’s *Work Health and Safety Act 2011*.

⁴⁰ [2003] UKHL 47.

Lord Hoffman reiterated the basic common law proposition that ‘the law provides compensation only when the injury was someone else’s fault’, commenting that:

Mr Tomlinson was a person of full capacity who voluntarily and without any pressure or inducement engaged in an activity which had inherent risk. The risk was that he might not execute his dive properly and so sustain injury. Likewise, a person who goes mountaineering incurs the risk that he might stumble or misjudge where to put his weight. In neither case can the risk be attributed to the state of the premises. Otherwise any premises can be said to be dangerous to someone who chooses to use them for some dangerous activity. In the present case, Mr Tomlinson knew the lake well and even if he had not, ...it contained no dangers which one would not have expected. So the only risk arose out of what he chose to do and not out of the state of the premises...It follows that in my opinion, there was no risk to Mr Tomlinson due to the state of the premises or anything done or omitted upon the premises. That means that there was no risk of a kind which gave rise to a duty under the 1957 or 1984 [Occupiers Liability] Acts.

In so deciding, Lord Hoffman put a brake on the growing compensation culture in the UK by saying that what the court had to do was to look at the ‘balance of risk, gravity of injury, cost and social value’ of the facility provided, and noted that

...it will be extremely rare for an occupier of land to be under a duty to prevent people from taking risks which are inherent in the activities they freely choose to undertake upon the land. If people want to climb mountains, go hang gliding or swim or dive in ponds or lakes that is their affair. Of course the landowner may for his own reasons wish to prohibit such activities. He may think that they are a danger or inconvenience to himself or others. Or he may take a paternalistic view and prefer people not to undertake risky activities on his land. He is entitled to impose such conditions, as the Council did by prohibiting swimming. But the law does not require him to do so...there is an important question of freedom at stake. It is unjust that the harmless recreation of responsible parents and children with buckets and spades on the beaches should be prohibited in order to comply with what is thought to be a legal duty to safeguard irresponsible visitors against dangers which are perfectly obvious. The fact that such people take no notice of warnings cannot create a duty to take other steps to protect them.

Lord Hobhouse was equally forthright saying:

The fact [is] that it is not, and never should be, the policy of the law to require the protection of the foolhardy or reckless few to deprive, or interfere with, the enjoyment by the remainder of society of the liberties and amenities to which they are rightly entitled. Does the law require that all trees be cut down because some youths may climb them and fall? Does the law require the coast line and other beauty spots to be lined with warning notices? Does the law require that attractive water side picnic spots be destroyed because of a few foolhardy individuals who choose to ignore warning notices and indulge in activities dangerous only to themselves? The answer to all these questions is, of course, no.

In 2006, the *Forum* venue in Tunbridge Wells in the UK won a legal battle after a UK County Court judge dismissed a claim brought on behalf of a member of the audience who was injured while moshing at a *Raging Speedhorn* concert. A venue spokesman said that the

Forum successfully argued that the venue had a disclaimer about mosh pits printed on their tickets and on the venue walls (Music Law Updates 2006).

In the US, the courts have also readily applied the voluntary assumption of risk defence. For example, in 2003 the Manhattan Supreme Court held that a promoter was not liable for a plaintiff's alleged damaged hearing⁴¹, maintaining that the plaintiff (a lawyer) should have realised that loud music was played at rock concerts. Judge Martin Schoenfeld dismissed the claim that John Fogerty's music damaged a fan's hearing saying that '...if you don't like loud music, don't go to rock concerts', adding that 'Nobody is forced to attend rock 'n' roll concerts'. The judge found that nothing pointed to the music being unreasonably loud and that 'the doctrine of primary assumption of risk bars the instant action' (Challis 2005).

More recently, a lawsuit that blamed Apple's iPod music player for causing hearing loss failed before the Ninth Circuit Court of Appeals⁴² which upheld an earlier 2008 San Francisco District Court judgement that Apple was not liable for hearing damage, saying that a reasonable person could easily avoid hearing loss by turning the volume down, and that the iPod did come with a warning.

In relation to music events, a New York appellate has, for the first time, applied the doctrine of primary assumption of risk to a claim of injury sustained in, or in the vicinity of, a mosh pit. In *Schoneboom v BB King Blues Club*,⁴³ the Appellate Division First Department held that a club patron was barred by the doctrine of primary assumption of risk from seeking damages for injuries suffered when an identified person in a group of slam dancers slammed into him. The First Department decision affirmed the order of Justice Marcy Friedman of the Supreme Court, New York County, granting summary judgement. Justice Friedman had noted that the 36 year old plaintiff testified that he was standing in the vicinity of 'a lot of people bouncing around, bouncing off each other', but that he did not participate in the fun. Notwithstanding the claim, Justice Friedman held that the plaintiff, an experienced concertgoer, assumed the risk of being struck by a fellow concertgoer when, although conscious that an aggressive type of moshing was in progress, he deliberately placed himself in proximity to it.

⁴¹ *Powell v Metropolitan Entertainment Co. Inc.* 195 Misc.2d 847, 849 n.1 (NY Sup. 2003)

⁴² *Birdsong et al v Apple Inc.* (2010) U.S. Court of Appeals for the Ninth Circuit, No.08-18841

⁴³ 2009 NY Slip Op 08160

Justice Friedman had also rejected the plaintiff's contention that he did not consent to the risk because he did not actually participate in moshing, stating that 'it is well settled that a spectator generally will be held to have assumed the risk inherent in the game, including the specific risk of being struck'. Justice Friedman also rejected the plaintiff's contention that he did not assume the risk of an assault or that a triable issue of fact existed as to whether he was assaulted, noting that the plaintiff and his friends, all of whom submitted affidavits in opposition to the motion, did not claim that they made any complaint to security about 'assaultive behaviour'. In any event, Justice Friedman held that even assuming that the club owners had a duty to impose reasonable security measures to minimise danger, there was no evidence that it breached any such duty (Rosenfeld 2009).

Australian courts are not quite so ready to dismiss such actions by participants who are injured at music festivals. While recognising a degree of potential complicity in their own injuries, Australian courts prefer to adopt a contributory negligence approach where the quantum of compensation awarded to an injured plaintiff is reduced by a percentage for which the plaintiff is found responsible. In the Western Australian case of *Gibbings v Harris*⁴⁴ the plaintiff was drunk and lying on a roadway at a rock festival when he was run over by a truck and suffered injuries to his feet. The plaintiff sued the truck driver and the organisers of the festival. The festival was held on a 40 acre rural property and featured heavy metal music. It was billed as an opportunity to 'let your hair down, to get drunk, and generally behave in a fairly uninhibited manner' (Jackson J, p. 3). At each of the entrances to the property a clearly visible notice was posted saying 'Attention, the organisers and property owners accept no liability for damages or injury sustained on this property and each patron enters and remains on this property at own risk' (p. 4).

The plaintiff arrived at the main entrance in the back of a Combi van and did not see the disclaimer notice. The plaintiff and his friends consumed large amounts of alcohol on the Friday night and Saturday. On the Saturday night, the plaintiff sat at the edge of the service road whilst waiting for his friend to buy the next round of drinks. He was told to move by a security officer, but came back 20 minutes later and was then carried away by the security officer. When he returned a third time to sit on the road, his feet were run over by the first defendant - a truck driver making a delivery.

⁴⁴ (1995) 15 SR(WA) 1

The WA District Court found that the organisers had breached that State's *Occupiers' Liability Act 1985* (WA). It was reasonably foreseeable that, given the nature of the festival, the people attending would become intoxicated and would behave irresponsibly, such as in the manner described. The organisers needed to allow for the fact that they would be dealing with people affected by alcohol, and that those people could wander freely throughout the premises. In light of this, the organisers should have taken precautions to protect the attendees from vehicles on the property. The Court found that all vehicles should have been escorted for the full distance of their journey by people on foot clearing a path. The fact that the plaintiff had twice been warned to move away from the road only served to highlight the risk to the organisers and the fact that they should have taken such precautions. A finding of contributory negligence of the plaintiff was found of 20%. The disclaimer placed at the entrance to the property was found not to exclude liability. The Court found that the disclaimer had not been imported into the contractual relationship between the parties as the plaintiff had not been aware of it and could not therefore have agreed to it.

A recent Court of Appeal decision in the New South Wales case of *Newcastle Entertainment Security Pty Ltd v Simpson*⁴⁵ indicates that the duty to take precautions for patrons' safety at concerts does not amount to a non-delegable duty. In this case the plaintiff was at a *Pantera* concert in the Newcastle Entertainment Centre. As he was trying to leave the mosh pit he found himself involuntarily hoisted up by members of the crowd and passed over their heads, an activity known as crowd surfing. When he reached the barricade in front of the stage, he was dropped over it and sustained dental injuries. The plaintiff sued the Centre manager, the security firm and the promoter for negligence and was successful only against the security firm, which failed to catch him cleanly when he was dropped over the barricade.

The trial judge held that while the Centre manager owed a duty of care to the plaintiff, it behaved reasonably and should not and could not have taken any additional steps to fulfil its obligation to the plaintiff. It had fulfilled its obligations by relying on the expertise of the security firm. The security firm appealed against the trial judge's decision that they were liable for negligence to the plaintiff (first respondent) and sought an indemnity against the Centre manager and the promoter on the basis that each owed the plaintiff a non-delegable

⁴⁵ (1999) Aust Torts Reports 81-528

duty of care. In dismissing the security firm's appeal, the Court held that the security firm owed and breached its duty of care to the plaintiff.

In examining the nature of the duty owed by the organiser, Mason J examined the authorities, in particular *Northern Sandblasting Pty Ltd v Harris*⁴⁶ and thought:

...that the critical guidance for this Court is that the majority in **Northern Sandblasting** did not think that the authorities justified the imposition of a non-delegable duty of care upon the landlord with respect to the negligence of the licensed electrician engaged to fix the stove (p. 66,380).

He stated that:

Applying these principles I cannot see a proper basis for imposing a non-delegable duty upon either the centre manager or the promoter. Neither had exclusive control over the premises on the night in question. The centre manager had bargained away its right of exclusive control (p. 66,380).

This was found to be so even though the centre manager retained by contract the discretion to determine whether a supervisor was required for a specific concert, stipulated that two-way radios had to be provided for security use, and retained the final right to determine the number of security personnel to be engaged for a particular event. In addition, the evidence disclosed that the centre manager was, in fact, an active participant in the type and extent of the security arrangements put in place.

In any event, the fact that the manager was not in exclusive control was not the deciding factor. Mason J noted that:

...the nature and scope of the duty towards a patron cannot be governed, in the final analysis, by what steps it takes to discharge it.....The duty stems from the relationship between the defendant (in this case the centre manager and the promoter) and the plaintiff (p. 66,381).

His Honour commented that crowd surfing was a potentially dangerous activity, but probably no more so than an established contact sport like rugby. It is not enough to characterise the activity as one which could result in injury unless properly managed. This could be said of practically any activity, including activities that no one would suggest enlivened a non-delegable duty.

⁴⁶ (1997) 188 CLR 313

Sheller JA quoted the trial Judge's description of mosh dancing – 'Mosh dancing, as I understand it, involves simply a movement of one's body up and down and swaying from side to side which does not require the society of a partner' (p. 66,381). In examining the nature of the risk he concluded that:

Dancing has from time to time involved strenuous and risky movements, potentially more dangerous than crowd surfing. No doubt the person, in this case, the appellant, who supervised these activities was required, in performance of its duty of care to the participants, to recognise the degree of hazard and react accordingly. But this seems to me a far cry from saying that the third and second respondents as promoter of the concert and manager and operator of the venue had a personal duty to ensure that reasonable care was taken. In the absence of such inherent risk of injury in the activity itself, there was no other basis upon which a non-delegable duty of care to the participants could be imposed upon the promoter or operator (p. 66,383).

Neither the promoter nor the operator was found to have, as was suggested, a relationship analogous to that of a school authority to pupils. There was no special relationship founded on the undertaking of care, supervision or control or the assumption of particular responsibility by the one or the special dependence or vulnerability of the other. The relationship was no different from that of the licensor to the patrons of the licensee of an entertainment area to be used by the licensee for the purpose of providing entertainment: cf: *Calin v Greater Union Organisation Pty Limited*.⁴⁷

In a dissenting judgement, Beazley JA said that mosh dancing and crowd surfing were promoted as part of the evening's entertainment and given the nature of those activities (which were frenetic and could result in personal injury if not properly managed), the Centre manager and the promoter each owed a non-delegable duty of care to the plaintiff. He stated that a special relationship did exist between the Centre and the plaintiff as the manager was so placed to assume a particular responsibility for their safety. In contrast the attendees of the concert had no control over the numbers at the concert, the security, the size of the mosh pit, the lighting or other unruly patrons and their safety was dependent on the security arrangements made for the concert.

Liability at events is not limited to the mosh pit area. In the South Australian case of *Jones v Whyalla Basketball Association Inc*,⁴⁸ the Court found that the precautions which the occupier had taken in the circumstances were not enough because there were other

⁴⁷ (1991) 173 CLR 33

⁴⁸ unreported, South Australian Supreme Court, 22 April 1999

convenient precautions available which would have reduced the risk much further. In that case, the premises involved a stadium with parklands and car parks surrounding it. The plaintiff was injured upon leaving the stadium. A liquor-selling booth (a caravan) had moved from its usual position on one side of the stadium to a temporary site on the other side because of a dust storm. It set up in a picnic area alongside a handrail beside a path, so it could serve people standing on the path over the railing. The drawbar used for towing the caravan, protruded beyond the end of the handrail and into the area which was the natural pathway from the picnic area to the stadium entrance door. The extent to which it protruded could not be determined exactly, but the trial judge accepted that it was a foot or two, but not more than half way across the pathway. Realising the potential risk the drawbar posed, the organiser had orange bunting safety flags strung from the handrail to the bar so that people walking past had to deviate from the drawbar.

The trial judge found that the van could not have been positioned further along the handrail because this would have resulted in a lack of lighting and that therefore the occupiers had taken all reasonable steps to protect entrants from the danger.

On appeal, the Court examined the evidence and concluded that the organisers had not taken all reasonable precautions. The bunting was found to have been at a very low level and did not prevent someone coming into contact with the bunting and the drawbar at the same time. It was found that to move the van slightly away from the path would not have greatly reduced the light, and that even if it had, the reduced lighting would not have justified the failure to implement that simple and effective means of eliminating or minimising the foreseeable risk of harm. The Court also found that any award should be reduced by 40% for the plaintiff's contribution.

Unlike the UK or the US, civil liability in Australia for injuries sustained by patrons at music festivals is a matter that is very much alive in contemporary litigation. Even though any judgement or settlement will consequently be met through an insurance payment, there is a reputational risk that will invariably impact on a promoter's sustainability and 'bottom line'.

8.2 Liability under work health and safety legislation

In addition to common law liability for compensation in the event of injury, Australian State and Territory work health and safety legislation⁴⁹ imposes a statutory ‘duty of care’ on persons who conduct a business or undertaking to ensure, as far as is reasonably practicable, the health and safety of workers at work and that the health and safety of other persons is not put at risk from the way that the business or undertaking is conducted. This legislation forms part of the criminal law, imposing fines and terms of imprisonment on persons found in breach of it.

The concept of conducting a business or undertaking is extremely broad and certainly includes event promoters and organisers and venue owners and/or operators arranging and conducting music festivals (as was highlighted in the UK by Graham in 1993). The legal duty imposed by the legislation extends to protect anyone whose health and safety might be affected by the way the event is conducted, principally patrons attending the event. The legislation is performance-based and outcomes-focused and, while providing specific regulation of a number of the more common hazards and risks encountered at workplaces (such as noise, confined spaces, working at heights, for example), it also specifies a general risk management process to be undertaken⁵⁰, and a hierarchy of controls to be considered⁵¹, by business operators to identify and treat all relevant hazards and risks not specifically regulated to the extent that it is reasonably practicable to do so. Risk management is the mechanism for determining sufficient compliance with the law.

A key principle of the legislation is that operators have to ensure safety as far as is reasonably practicable. This is better known as the ALARP principle – keeping risks as low as reasonably practicable. In other words, the law does not require operators to do everything to ensure health and safety (i.e. it is not an absolute requirement); rather the ALARP principle serves to ‘qualify’ an operator’s safety duty; that is, in terms of what is reasonable and practicable to do⁵².

⁴⁹ See, for example, the Queensland *Work Health and Safety Act 2011*, which enacts nationally harmonised work health and safety laws.

⁵⁰ ss.34 and 35 *Work Health and Safety Regulation 2011* and the *How to Manage Work Health and Safety Risks Code of Practice 2011*

⁵¹ s.36 *Work Health and Safety Regulation 2011*

⁵² This principle was enunciated by Lord Robens in 1972, and is at the heart of UK and Australian work health and safety legislation.

But what does ‘reasonably practicable’ mean? Commentators such as Fife and Machin (1976), Cohen (1982) and Kletz (1982) endorse the following explanation by Asquith L.J. in the UK case of *Edwards v National Coal Board*⁵³:

‘Reasonably practicable’ is a narrower term than ‘physically possible’, and implies that a computation must be made in which the quantum of risk is placed in one scale and the sacrifice involved in the measures necessary for averting the risk (whether in money, time or trouble) is placed in the other, and that, if it be shown that there is a gross disproportion - between the risk being insignificant in relation to the sacrifice – the defendants discharge the onus upon them.

The test of what is reasonably practicable is an objective one – it is not what the duty holder knew about the risk and measures to respond to the risk, but rather what a reasonable person in the position of the duty holder would have known and done in response to the risk. By way of illustration, Goff LJ (at pp. 524-525) in *Austin Rover Ltd v Inspector of Factories*⁵⁴ noted that:

If, for example, the defendant establishes that the risk is small, but that the measures necessary to eliminate it are great, he may be held to be exonerated from taking steps to eliminate the risk on the ground that it was not reasonably practicable for him to do so...[The effect of the previously decided cases] is to bring into play foreseeability in the sense of likelihood of the incidence of the relevant risk, and that the likelihood of such risk eventuating has to be weighed against the means, including the cost, necessary to eliminate it.

Business operators then need to work their way down the hierarchy of control discounting higher-order controls only if it is not reasonably practicable to implement them. In *Finn v Devan Management Pty Ltd*⁵⁵, Hall P alluded to the need to consider control measures in accordance with the ‘hierarchy of control’ and observed that:

An employer who has not turned his mind to the question of whether other controls are available before adopting administrative controls has neither exercised proper diligence to prevent the contravention nor taken reasonable precautions to prevent the contravention (ie: has not done what it is reasonably practicable to do).

⁵³ [1949] 1 KB 704 at 712.

⁵⁴ [1989] 1 WLR 520

⁵⁵ Industrial Court of Queensland No C63 OF 2004, 29 November 2004

These English decisions have been confirmed by the Australian High Court. In *Slivak v Lurgi (Australia) Pty Ltd*,⁵⁶ Gaudron J at pp. 322-323 observed that:

The words ‘reasonably practicable’ have, somewhat surprisingly, been the subject of much judicial consideration. It is surprising because the words ‘reasonably practicable’ are ordinary words bearing their ordinary meaning. And the question whether a measure is or is not reasonably practicable is one which requires no more than the making of a value judgement in the light of all the facts. Nevertheless, three general propositions are to be discerned from the decided cases:

- the phrase ‘reasonably practicable’ means something narrower than ‘physically possible’ or ‘feasible’;
- what is ‘reasonably practicable’ is to be judged on the basis of what was known at the relevant time;
- to determine what is ‘reasonably practicable’ it is necessary to balance the likelihood of the risk occurring against the cost, time and trouble necessary to avert that risk.

And in *WorkCover Authority of New South Wales (Inspector Byer) v Cleary Bros (Bombo) Pty Ltd* (2001) 110 IR 182 paras [87] and [88], the NSW Industrial Court made it abundantly clear that

Where there is a known risk which entails the potential for serious injury to persons in the workplace, the defendant will generally have to demonstrate that the costs, difficulty or trouble occasioned by the measures significantly outweigh the risk.

This approach requires business operators to effectively manage their safety risks. Advice on how to do this is provided by the *How to Manage Work Health and Safety Risks Code of Practice 2011*. The code provides that a risk assessment involves considering what could happen if someone is exposed to a hazard and the likelihood of it happening. A risk assessment can help determine:

- How severe a risk is
- Whether any existing control measures are effective
- What action should be taken to control the risk
- How urgently the action needs to be taken.

This approach is consistent with the broader risk governance approach taken by the Australian, New Zealand and International Standard Organisation Standard on Risk Management, *AS/NZS/ISO 31000:2009 Risk management – Principles and guidelines*). The *AS/NZS/ISO 31000:2009* framework is set out in Appendix C.

⁵⁶ (2001) 205 CLR 304

9. Responses to legal liability - planning and risk management

There are many health and safety hazards and risks at outdoor music festivals identified in the literature (e.g. EMA 1999; HSE 1999; Arbon, Bridgewater & Smith 2001; Milsten et al. 2002; Milsten et al. 2003; Wertheimer 2000a; 2001a & 2002), and minimising adverse health and safety impacts is important to the delivery of safe events. Commentators (HSE 1992, p. 2; 1998, p. 8; EMA 1999; Wertheimer 2000a, 2001 & 2002) are of the view that only by undertaking detailed, comprehensive planning and preparation for each event can this be achieved. Undertaking risk assessments (HSE 1993, 1999) supported by comprehensive strategic⁵⁷ and operational⁵⁸ structures are considered crucial. Examples include *Toronto Rocks* and the *Roskilde Festival*.

The largest recorded, single day outdoor music festival, *Toronto Rocks*, was held in 2003 in Toronto, Canada, and featured the *Rolling Stones* (Feldman et al. 2004). The event ran for 12 hours and consisted of 15 musical acts performing at an operational airfield. Of the 450 000 people who attended the event, 1870 sought medical care. Fortunately, the event provided a very large integrated medical service staffed by paramedics, physicians and nurses and first-aid and care sites that included ambulances, medically-equipped all-terrain vehicles, bicycle paramedics, first aid tents and a 124-bed field hospital with a re-hydration unit. The provision of these facilities was hailed as a planning triumph (Feldman et al. 2004, p. 287).

The *Roskilde Festival* has run for some 30 years in Denmark, largely without incident. However, on 30 June 2000, a serious crowd crush incident resulted in the death of nine persons and 43 injuries. This was attributable to overcrowding in the front of stage area ('mosh pit') and inadequate barrier design and placement. For the next 12 months after the disaster, Danish media and government authorities, including a special safety committee, undertook separate investigations into the tragedy. Meanwhile, festival organisers, headed by Leif Skov, promised to recreate the festival as the safest festival in Europe. In 2001, major crowd management changes were introduced, including a detailed risk assessment and crowd management plan, a crowd barrier system to reduce crowd crush, a crowd surfing ban, a free crowd-safety brochure for Scandinavian concertgoers, a content-rich website and increased first-aid services.

⁵⁷ such as emergency response capabilities, for example (Davies 1998).

⁵⁸ such as security capabilities, for example (HSE 1993).

Event planning is a requirement imposed by local government authorities, which regulate outdoor music festivals through entertainment licensing⁵⁹, including compliance with conditions imposed by local authorities/councils in their permit to stage an outdoor music festival. The aim of these licensing programs is to ensure that event organisers deliver well-planned, safe events (MCD&EM 2003). Challis (2009) supports this type of approach rather than the development of any new and specific laws, suggesting that ‘...it is not the basic legislation or regulatory infrastructure that is at fault, it is the implementation (or lack of) and enforcement of those provisions that seem to be the root cause of the real problems’ (p. 92).

The *Glastonbury Festival* provides an excellent example of the effectiveness of this type of approach. The festival, held over three days in Somerset, England, is the largest outdoor music event in the UK, attracting crowds of up to 180 000 patrons (UK Music 2009). Towards the end of the 1990s the festival was plagued by over-attendance and safety problems. In 2000, the festival experienced the worst public safety risks in its history, caused by the inundation of unauthorised patrons into the event. After the event, the Mendip District Council (MDC), which licences the festival, prosecuted the event organiser and indicated that in order to secure another event licence the security of the site and security services would need to be drastically improved (MDC 2000).

In 2001, the festival ‘took a year off’ to work on a solution to the problems. The festival organiser, Michael Eavis, worked with a broad range of industry experts, the local authority, the police and others, and came up with a formula that cured almost all of the initial worries. Further improvements in 2002 included a new security fence to prevent unauthorised entry, a greater professional security presence and increased co-ordination between all government agencies involved and festival management. In 2003, in response to environmental issues, noise disturbances and security concerns for neighbouring villages, additional measures were introduced, including increased security and new environmental protection strategies to reduce water pollution. There were no significant breaches of the licence conditions in this year, except for some noise issues late at night (MDC 2003).

⁵⁹ Entertainment licensing essentially regulates environmental and public health matters such as noise management, food safety, the provision of potable water and sufficient toilets and showers and the provision of adequate waste management services.

Further changes in 2003 included:

- a widespread multi-media campaign to stop members of the public without tickets going to the festival
- a new and secure perimeter fence
- improved vehicle access to and from the site
- on-site vehicle curfews at night
- improved stewarding
- constant liaison with the police
- a carefully structured chain of command.

For the 2004 event, further improvements were introduced, including increased co-ordination for disabled services, increased cleaning services, improvements in the management of vehicle movements on the festival site, and the installation of permanent water pipes and more water reservoirs (MDC 2004a, 2004b). In 2004 the festival was recognised by the UK Parliament and rewarded with national and international awards (House of Commons 2004).

Earl, Parker and Capra (2005) conducted a study to trace improvements in the planning of the Glastonbury Festival for the period 2000 to 2004. In their view, central to this improvement has been the public entertainment licence program administered by the MDC, which now provides extensive pre-event consultation as part of the event licensing process and provides monitoring programs to ensure licence conditions are met during the festival. The monitoring program involves the assessment and collection of data on matters such as the number of patrons on site and in the camping areas, food-borne illness, sanitation, drinking water quality, solid waste disposal, noise complaints, injury statistics and crime data.

Allied to event planning has been the development and updating of guidelines for staging outdoor music festivals. While these guidelines are voluntary in nature, they nonetheless support the self-regulatory nature of work health and safety laws in Australia and the UK. They are also often included as conditions in the local authority permit to stage an event. Compliance with the guidelines, therefore, serves a twofold purpose – as a condition of the permit and as evidence of reasonable precautions and due diligence under work health and safety laws. In addition, adherence to permit conditions and published guidelines provides promoters and venue owners/operators with plausible defences in civil litigation.

9.1 Event planning for music festivals

Historically, there have been considerable variations in the planning of outdoor music festivals in Australia (Arbon 2004, p. 210; EMA 1999, xiii), and EMA (1999, xiii) argues that this has had a major effect on patrons' health and safety. Arbon (2002, p. 60) suggests that this inconsistency has been due in part to a lack of uniform standards used by local government authorities, largely as a result of a lack of knowledge and/or experience in the area⁶⁰. Minimising variations and inconsistencies within these planning processes is considered important to improving safety outcomes (Arbon 2004; EMA 1999).

In the past, event promoters and venue owners/operators have been largely unaware of their legal responsibilities in relation to crowd safety, and certainly unaware of the correct approach in developing appropriate and workable safety interventions as part of the planning process. For example, findings from an Australian study revealed gaps in knowledge of event planning within a group of event organisers on the Gold Coast in Queensland. However, this group nonetheless had the perception that they were still running their event at a satisfactory standard (Tavane & Johnson 2001).

An area of limited event planning and management that has been highlighted particularly in the literature is in relation to emergency planning for Australian outdoor music festivals (EMA 1999, xiii; Davies 1998, p. 14). Specifically, Davies (1998, p. 14) points out that there has been a lack of consultation on emergency management. EMA (1999, xiii) also notes that planning to respond to major incidents has not been occurring.

In addition, there is now concern about terrorism, with Weir (2002a, p. 1 & 2002b, p. 1) reporting that outdoor music festivals are seen as high profile soft targets. This concern is valid as there have been reports of terrorist activities in other countries with deaths and injuries being reported at a number of events (CMS 2002). An exercise testing emergency response capabilities, undertaken at a venue in Washington DC in 1998, where a mock bomb was detonated at a specially planned event and the response analysed, highlighted the need for further development in the response to this type of threat (CMS 1998, p. 2).

⁶⁰ Generally, local government authority strengths are in other areas such as food and water safety and noise management (eg: EMA, 1999; HSE, 1999).

9.2 Elements of event planning

Outdoor music events are complex events to plan, organise and run, with many having attendances that exceed the populations of small towns⁶¹. Planning for any event is undertaken to manage all hazards and risks associated with that event. Organisers need to consider the overall scope of the event - risks to spectators and participants, community impacts, contingency planning and all emergency support that might be required (FEMA 2003; Cross 2004). In particular, Davies (1998) has described the crowds at events like outdoor music festivals as the principal hazard that needs to be dealt with.

Davis, Yin and Velastin (1995, p. 38) have asserted that without effective management, crowds at outdoor music festivals can become a significant problem with serious consequences. Upton (2004a, p. 3) found that 5% of a crowd generates up to 75% of the energy released at an event. This 5% is generally made up of the patrons located at the front of the stage, or *mosh pit*. Based on Upton's findings, controlling the effects of that 5% becomes critical to improving safety. The HSE (1993) has asserted that the management of crowds carries a great deal of responsibility and is dependent on good systems and staff experience.

EMA (1999) suggests that the main sources of safety risks derive principally from the following three areas:

- (i) inadequate provision of infrastructure and services
- (ii) impacts of the natural environment and elements
- (iii) crowd characteristics, composition and behaviour.

In terms of improving the overall planning of outdoor music festivals, there are a number of recommendations from the literature that are considered likely to improve the consistency of event planning and assessment processes. These recommendations relate to:

- (i) carrying out extensive preparation prior to any event
- (ii) committing appropriate personnel and resources to support the event
- (iii) using good information to guide the decision-making processes (e.g. FEMA 2003 and HSE 1999 event planning guides) (EMA 1999; DoH 2004; HSE 1999; LLD 1999).

⁶¹ Attendances at the Glastonbury Festival in the UK, for example, regularly exceed 180 000 patrons: UK Music (2009).

9.2.1 Pre-event planning and preparation

Effective event planning also involves pre-event planning (Hanna 1995, p. 29), which will then inform the development of event management plans and/or risk management plans (DoH 2004, p. 28; LLD 1999, p. 4). A considerable number of resources highlight the importance of pre-event planning (e.g. DHS 2003; DoH 2004). This involves the clarification of matters such as:

- (a) access and egress
- (b) identification of hazards
- (c) crowd movement
- (d) public health issues
- (e) numbers and infrastructure needs for medical care, police and security.

Identification and collaboration with the key stakeholders associated with the event and the development of contingency plans is also important (FEMA 2003; Hanna 1995; LLD 1999). It is during the development of the contingency plans that the risk assessments are typically undertaken for the event (Bridgend Events and Safety Advisory Group 2002). Negotiating and securing licences and permits from the relevant authorities is also important in this process (DHS 2003). Finally, Curd (2004) also suggests that event promotion and media management need to be considered in this stage.

All the pre-event planning work is then documented in an event management plan. All events are different and have unique characteristics, and the structure of the event management plan should reflect these features. This plan should consider the licensing requirements and regulations that impact on the event, emergency response issues, and identify staff and agencies responsible for identified hazards and risks, resources, expenses and jurisdictions (FEMA 2003). These plans must be comprehensive and clear, set out well-documented operations and be widely distributed to staff (LLD 1999).

9.2.2 Appropriate personnel and resources

Essential to the success of managing the risks associated with outdoor music festivals is being able to ensure 'that the resources are on-hand to deal with virtually any reasonable risk at that event' (O'Connor 2003, p. 3). The management of crowds is dependent on good systems as well as staff training and experience. Commentators consider that success in crowd management includes being aware of all risks, undertaking an effective risk assessment and following up with appropriate management systems. Knowledge of the crowd demographics

and behaviours is important for both design and operational features for outdoor music festivals. The event planning capacity of organisers, therefore, is crucial.

There are two main groups involved in crowd management operations - these are trained security guards and stewards. For security providers there are operational standards and best practice approaches to security manpower ratios for events, requirements for training and experience, and stage barricades and related site infrastructure facilities (Tatrai 2001a). Good crowd management requires good communication and co-ordination between the event organisers and the operational security staff (HSE 1999, p. 97). Additionally, it is important that all staff be aware of the importance of maintaining crowd safety (HSE 1993).

The HSE (1993) has recommended that there needs to be adequate staffing capacity with:

- clear roles and responsibilities
- documentation and review of all crowd management systems
- adequately trained staff involved.

Crowd safety teams at outdoor music festivals should:

- (i) have gained an understanding of the implication for crowd demographics and be aware of expected behaviour
- (ii) undertake a risk assessment of crowd safety systems for appropriateness and effectiveness
- (iii) undertake regular audits of the crowd safety systems during the event and have contingency plans in place
- (iv) set targets for crowd management
- (v) have communicated and collaborated with key agencies such as the police and emergency services (HSE 1993).

Significant concerns have been expressed by commentators regarding the capabilities of event organisers and their staff (Au et al. 1993, p. 8; EMA 1999: xiii). For example, there is evidence that the provision of emergency management for events has been a particular concern (Davies 1998, p. 15). Davies (1998, p. 14) reported that this was the result of ad hoc and informal planning. EMA (1999, xiii) has noted that the occurrences of major emergencies were rarely considered within these planning processes, and Davies (1998, p. 15) has theorised that these issues are the result of limited understanding and commitment by event organisers to this area.

According to the findings of Au et al. (1993, p. 8), it is generally experience with event planning that has been relied on to organise these events. This has led Kemp, Hill and Upton (2004) to note that a lack of formal qualification requirements has meant that ‘...operational planning for crowd safety is largely a generic exercise that depends on the planner’s previous experience’ (p. 20). Reducing reliance on individual experience and providing detailed guidance notes are seen as good methods to reduce variations in event planning⁶². It is also important that the assessment processes through local government authorities are just as consistent. This is not to say that experience with these events is not important; rather, experience cannot be relied on as the sole resource in managing health and safety concerns at outdoor music festivals (Au et al. 1993, p. 8).

In addition to improving event planning in order to improve crowd safety, EMA (1999) and HSE (1999) have both recommended improvements in operations at outdoor music festivals. Au et al. (1993) have suggested improvements to a number of operational areas, particularly staff capacity. These authors suggest that all staff should have the skills to undertake assigned tasks and be aware of operational structures, the chain of command, the potential health and safety issues and their management strategies (Au et al. 1993). Wertheimer (2001b, p. 3) has added that experience is an important factor when dealing with crowd safety. The HSE (1997 in HSE 2003a, p. 19) also considers experience equally as important as knowledge.

Volunteers play an important role in the provision of services for many outdoor music festivals. Au et al. (1993, p. 86) believe that all event staff should be aware of emergency management and public health issues at events, and that the minimum expectation for all event staff should be:

- (a) adequate skills to perform designated tasks
- (b) awareness of problems that may arise and have some understanding of appropriate control measures
- (c) awareness of roles, responsibilities and contingency and emergency procedures.

⁶² However, based on comments by EMA in 1999, it would appear that little had changed since Au et al.’s 1993 report.

Yet many of these volunteers do not receive training to support their work at these events. This is the case despite evidence from the emergency management sector where training programs have been very successful for other volunteer groups such as volunteer fire (Hughes & Henry 2003a) and ambulance (Fahey, Walker & Sleigh 2002) services.

Wertheimer (2001b, p. 3) is particularly concerned about volunteers being involved in crowd management at outdoor music festivals. This problem was highlighted in 2000 during an incident at the Roskilde festival in Denmark when a number of patrons were killed and others injured in a crowd crush. Wertheimer (2001b, p. 3) commented that ‘...last year (2000) the Roskilde Festival organisers found that their crowd management volunteers – through no fault of the volunteers themselves – were overwhelmed when critical crowd safety skills were needed most’. While the festival organisers refuted this claim (Roskilde Festival Organisers 2001, p. 7), the following year they provided training organisers for volunteers. However, Wertheimer (2001, 2001b, p. 3) remained concerned at the inexperience of these volunteers. There does not appear to be any guidance on an acceptable or appropriate mix for experienced and inexperienced staff.

Earl and other researchers (Earl, Stoneham & Capra 2003; Earl, Parker, Edwards & Capra 2004; Earl, Parker, Edwards & Capra 2005) have conducted several studies investigating volunteers’ involvement in public health and emergency management at two large, multi-day outdoor music festivals. These studies assessed the level of involvement and awareness of volunteers in public health and emergency management and their relevant experience and skills by comparing volunteer capacity at the Woodford Folk Festival in Australia and the Glastonbury Festival in England. The organisers of the Glastonbury Festival had introduced training programs for volunteers, who demonstrated a much better knowledge than those in the similar Australian study. The findings of these studies support the need for volunteer training programs to improve emergency and public health management at outdoor music festivals.

9.3 Information to guide decision making

There are a number of resources available that provide good consistent advice that is useful for both event promoters and organisers and local government authorities (e.g. EMA 1999; HSE 1999; LLD 1999; DoH 2004). They include the following government publications (HSE 1999; CEC 2002; FEMA 2003; MCD&EM 2003; S0&DNH 1997; DOH 2005; DHS 2003; SafeWork Victoria 2006a, 2006b; LLD 1999), and materials from established health and safety and emergency management bodies (EMA 1999; BSC 1993; RoSPA 1983, 1992; NOEA 1993; Engineering Council 1993):

- (i) *Event Safety Guide* (HSE 1999) for use in the UK
- (ii) *Planning guide: events in Edinburgh* (CEC 2002) for use in Scotland
- (iii) *Special events contingency planning* (FEMA 2003) for use in the United States
- (iv) *Safety planning guidelines for events* (MCD&EM 2003) for use in New Zealand
- (v) *Safe and Healthy Mass Gatherings* (EMA 1999) for use in Australia
- (vi) *Guidelines for Concerts, Events and Organised Gatherings* (DoH 2009) and *Operational Guidelines for Rave Parties, Concerts and Large Public Events* (DOH 2005) for use in Western Australia
- (vii) *Guidelines for the management of public health and public events* (DHS 2003) for use in South Australia
- (viii) *Advice for Managing Major Events Safely* (SafeWork Victoria 2006) and *Crowd Control for Venues and Events: A Practical Occupational Health and Safety Guide* (Worksafe Victoria 2006) for use in Victoria⁶³
- (ix) *Code of Practice for Risk Management of Agricultural Shows and Carnivals* (Workplace Standards Tasmania 2004) for use in Tasmania
- (x) *A Planning Guide for Event Management – alcohol safety and event management*, Brisbane; Department of Tourism, Sport and Racing, (LLD 1999) for use in Queensland.

Guidance for music concerts first appeared in the UK *Code of Practice for Pop Concerts and Similar Events* (GLC 1975), (prompted by events at a David Cassidy concert in 1975) and later revised as the *Guide to Health, Safety and Welfare at Pop Concerts and Similar Events* (HSC 1993), developed by the UK Health and Safety Commission (HSC) following the 1993 Donington Monsters of Rock incident. Revisions of the guide, based on the recommendations of significant research (Au et al. 1994, 1998), have resulted in the development of the *Event Safety Guide* (HSE 1999). This comprehensive document is generally considered the international benchmark for event planning and is recognised in other documents around the world, such as the events guide for Scotland (CEC 2002). The document, commonly referred to as the ‘purple guide’, provides guidance on minimum standards for structures, sanitation,

⁶³ Victoria is also the only State or Territory in Australia to have public event crowd management legislation – see the *Major Events (Crowd Management) Act 2003*.

waste management, sound, noise and vibration, food, drink and water, requirements for people with special needs, and risk assessment (HSE 1999).

Specific guidance also exists for fairgrounds and amusement parks (HSE 1997; Tasmanian CoP). By and large, the guidance in these documents is consistent. The main source of this guidance can be traced back to two UK publications – the MHSWR ACoP, which sets out the risk assessment principles, and the HSE booklet, *Five Steps to Risk Assessment* (HSE 1994) which outlines the risk assessment framework.

The information contained in the ‘purple guide’ has been largely replicated in Australia (EMA 1999; DoH 2004, 2005; DHS 2003; SafeWork Victoria 2006a, 2006b; LLD 1999). EMA (1999) has developed guidelines that are generally seen as the current national benchmark. This manual provides a comprehensive overview of the issues to be addressed during the planning, management and operation of these events (DHS 2003). The document contains a number of checklists that are useful for promoters, licensing authorities, food vendors and catering staff, for example, to assist with event management to ensure that planning is comprehensive (EMA 1999).

Australian States have also produced guidance documents for this type of event (DHS 2003; DOH 2004, 2005; SafeWork Victoria 2006a, 2006b) and Victoria has enacted general event crowd management legislation – see the *Major Events (Crowd Management) Act 2003*. In Queensland, a publication by the Liquor Licensing Division (LLD) (1999) is considered the state benchmark. The principal purpose of this document focuses on the development of risk-based management plans for each event. The management plan framework addresses issues such as venue selection, safety regulation, public liability, event promotion, security, medical services and the management of alcohol. However, the document does not contain a great deal of detail and should be supported by more detailed guidance documents such as the one produced by EMA (1999).

In the U.S., the music industry has resisted periodic efforts to standardise concert safety requirements. The International Association of Auditorium Managers and the North American Concert Promoters Association, and others, have repeatedly claimed that creating guidelines such as those in the UK could not be done (Wertheimer 2003). The closest that America has come to proposing concert standards occurred after the 1979 *The Who* concert

tragedy. Following the incident a citizen task force was commissioned by the City of Cincinnati to propose safety standards.⁶⁴ Although not adopted in any official way, the taskforce report has become a de facto industry standard in North America (Wertheimer 1980), along with guidelines for the safe conduct of live performances published by Wertheimer and presented to the International Association of Assembly Managers International Crowd Management Conference in 1994 (Wertheimer 1994). Also useful are the special events contingency planning guidelines developed by FEMA (2003).

In addition to government publications, guidance on risk assessment can also be found in publications by safety and professional bodies (e.g. British Safety Council 1993; Engineering Council 1993), emergency management bodies (e.g. EMA 1999; FEMA 2003), and training courses provided by professional and trade associations and commercial bodies, such as the UK National Examination Board in Occupational Safety and Health (NEBOSH). The information given in these publications and course materials is similar to that provided in government publications. Although in some cases extra advice is given and techniques are suggested to provide further help to assessors, they are intended for typical workplaces such as offices, shops, retail premises and factories. There is very little information that is relevant to how risk assessment could be applied to crowd safety.

A review of the literature on how crowd safety is assessed, particularly at music festivals, has yielded few positive results⁶⁵, supporting Arbon's (2002) claim that this is a new area of inquiry. Some insights are provided by public enquiry reports on serious crowd safety related incidents (eg: Bokhary 1993; Funnell 1988; Taylor 1989, 1990), but these only represent a small sample of public venues (mainly football stadia) where things went badly wrong, especially in the 1980s and earlier. Furthermore, where bad practices were identified, they concerned inadequate safety management systems and operational blunders (e.g. poor safety culture, inadequate training, sending people to the wrong escape routes, etc.).

⁶⁴ In addition, Cincinnati banned all shows that allowed general admission or festival-style seating: Cincinnati, Ohio, Code 865-29 (1979) (prohibiting festival and general-admission seating in Cincinnati); see also Cincinnati, Ohio, Code 865-31 (1979) (clarifying the emergency on-the-scene authority of the Safety Department to order precautionary measures); Cincinnati, Ohio, Code 865-33 (1980) (prohibiting sale of tickets beyond capacity levels).

⁶⁵ See the reports produced by Au et al. in 1993 and 1998 which formed the basis of the redevelopment of a comprehensive, international event management guideline published by the HSE (1999) in the UK (The Purple Guide), the study by Au in 2001 to develop a methodology for assessing crowd safety risks, and the study by Mahudin in 2003 suggesting the development of a crowd stress index.

There are also a limited number of research studies focusing on outdoor music festivals or music events. One such example is a study by Commons, Baldwin and Dunsire (1999) that attempts to better clarify the issues related to crowd surfing and moshing and attempts to offer some appropriate solutions. Other work undertaken by Davies (1998) identifies a lack of emergency management planning and legislation for mass gatherings, while Vider revisited the violence that occurred at the Woodstock 1999 festival.

The majority of the literature can be classified into medical and emergency management and volunteer participation and guidance. Examples include:

- Arbon (2002), who reported on a predictive method for determining injuries and proposed a proximity model for ‘mass gathering’ health care
- Milsten et al. (2002), who reported on the main factors that affect the number of presentations at mass gatherings
- Jardine et al. (2003), who carried out a very extensive review of risk management frameworks
- Hughes and Henry (2003a), who were looking for volunteering retention ‘sweet spots’
- Earl et al. (2003, 2004 & 2005), who investigated and assessed the level of involvement and awareness of volunteers in public health and emergency management and their relevant experience and skills
- Zeitz et al. (2005, 2007, 2009) who investigated the significance of crowd mood in predicting medical workload at mass gatherings
- Hutton et al. (2010, 2012, 2013), who reported on the trialling of a method to predict ‘mass gathering’ emergency response based on crowd type and mood parameters.

In addition, the literature on event planning is principally limited to the following three main topic areas:

- planning for emergency medical services at mass gatherings (e.g. Arbon 2003)
- criticisms of current event planning (e.g. Davies 1998; and most of the literature by Wertheimer)
- guidance material and advice (e.g. HSE 1999; EMA 1999).

Where guidance is intended for public venues, it is either presented merely as an initial suggestion (Au et al. 1993) or simply echoes what has been said in the UK MHSWR ACoP or its Australian counterpart, the *Code of Practice for the Management of Workplace Risks*, and the *Five Steps to Risk Assessment* booklet (e.g. HSC 1993; HSE 1994). In its guidance for fairgrounds and amusement parks, the HSE (1997) has made an attempt to adopt the ‘Five Steps’ method into something that is more appropriate for fairground/amusement park operations. This includes the provision of a list of ‘foreseeable misuse’ of ride equipment, data on main sources of accidents on fairgrounds and amusement parks, and an example of a

suggested risk assessment. While useful for owners of such venues, the method adopted focuses largely on ride accidents and is of little relevance to other public venues.

Although the existing guidance does provide useful references to promoters and venue owners and/or operators, it does not appear to be enough to address their specific needs. As already pointed out, contemporary music concerts and public venue operations are very different from the work activities in other workplaces, and so are the risks involved. Furthermore, public venue operations involve dealing with people, sometimes in very large numbers. Consideration should, therefore, be given to crowd behaviour and their interactions with the physical environment and the circumstances. These safety factors are unique to venue operations and what is needed in public venues is something that can inspire assessors to think about these factors.

The risk assessment guidance given in the HSE's *Managing Crowds Safely* booklet (HSE 1996) has moved some way towards achieving this. As in the fairgrounds guide (HSE 1997), this document has incorporated some of the crowd safety issues and hazard contributory factors into the risk assessment framework outlined in the *Five Steps* booklet. It gives examples of the hazards which the venue and the crowd may present. This guidance document provides useful and more relevant help, especially to owners and/operators of smaller venues. However, it is suggested that the examples are not exhaustive enough and it is too crude for complex crowd safety problems that often exist at the larger concerts and in the larger venues. At these events and in these venues, tens of thousands of patrons or more can be expected and the operations can be very large and complex. Further assistance is required for such venues.

While Arbon (2004, p. 210) reports a lack of uniform standards in mass-gathering health and safety guidelines, a review of the key documents reveals considerable shared content and direction. All documents recommend the use of risk management in the planning and operation of outdoor music festivals (e.g. CEC 2002; MCD&EM 2003; EMA 1999; HSE 1999; LLD 1999; DHS 2003) and comprehensive consultative processes with local government authorities, state emergency services, police, fire, medical and security services (DoH 2004). The integration of risk assessment and management principles into the event planning process is seen as critical to guide the selection of strategies used at outdoor music festivals (HSE 1999, p. 8).

10. Current practice in the assessment of crowd safety risks – results of interviews with music promoters and public venue owners and/or operators

A survey of festival safety personnel/promoters and public venue owners/operators was conducted to find out how crowd safety is assessed in practice, what sorts of constraints and difficulties assessors face and what techniques or tools are used in the assessment process. The purpose of the survey was to get a picture of current practice, to establish a better understanding of the assessors' needs and how the crowd safety risk assessment method could meet such needs, and to identify good practice, which can be incorporated into the method. Details regarding the appropriateness of the survey and development of the survey instrument have been previously discussed (see Chapter 2, section 6.2.2). This section presents and discusses the survey findings.

Past experience suggests that public safety can be a sensitive issue to many promoters and public venue managers. In order to encourage more people to take part and for them to be more forthcoming with information, it was decided that the surveys should take the form of informal interviews guided by an open-ended questionnaire (i.e. semi-structured interview). This would also enable details and the rationale behind current practice to be discussed and explored in the interviews. Gray suggests that '[i]f the objective of the research...is largely exploratory, involving, say, the examination of feelings or attitudes, then interviews may be the best approach' (p. 214). Arksey and Knight (1999) suggest that '[i]nterviewing is a powerful way of helping people to make explicit things that have hitherto been implicit – to articulate their tacit perceptions, feelings and understandings' (p. 32).

Because the use of semi-structured interviews also allows the researcher to 'probe' for more detailed responses where the respondent is asked to clarify what they have said (Gray 2004), the survey instrument, which is set out in Figure 4.7, was open-ended. This approach is supported by Gray (2004, p. 188) who suggests that:

...in a case study that involves seeking in-depth opinions and perspectives of a small number of respondents, a highly structured questionnaire might be completely inappropriate. Here you might want to construct an interview schedule containing open-ended questions, adopting a descriptive approach.

Figure 4.7: Survey to determine how crowd safety is assessed**Venue Owner/Operator Interview Questionnaire****A. Current Practice**

1. What are your main operational/safety concerns (eg: congestion, overcrowding, emergency evacuation, other aspects of safety, public disorder, crime, etc)?
2. How did you arrive at the above?
3. What plans and procedures do you have in place to address crowd safety concerns (eg: congestion, emergency response, etc)?
4. Please describe your safety assessment and planning process.
5. How is information (eg: from existing guidance, discussion with others, comments from staff and visitors, past incidents, exercises, etc) fed into your assessment and planning process?
6. What do you do to achieve the following (eg: the approach adopted, any specific techniques or tools used, etc):
 - to identify safety hazards;
 - to determine whether or not they are significant. What are the criteria, acceptable risk level, etc?
 - to determine whether existing measures and plans are sufficient;
 - to identify any additional measures required (including modification of plans) and things that need to be improved; and
 - to meet any safety related terms and conditions specified by the licensing authority (if any). What are they?
7. In your opinion, what are the benefits and pitfalls of the assessment method(s) mentioned above? Have you considered doing the above in any other ways?

B. Risk Assessment

8. From your experience, what are the constraints and problems associated with conducting crowd safety risk assessment in public venues such as yours?
9. How did you decide what is a suitable risk assessment for your specific venue(s)?

In addition, what do you think is a suitable and sufficient risk assessment for public venues which, on the one hand, can enable assessors to address crowd safety problems and, on the other hand, is simple and easy to use?
10. To what areas do you think the crowd safety risk assessment methodology should pay more attention in order to best address your needs?
11. What support or assistance in the form of assessment techniques and guidance would you like to see?
12. Do you have any other comments on crowd safety risk management?

A total of fourteen surveys were administered. Personnel surveyed were safety officers and/or managers from promoters of outdoor music festivals or from major venues that handle large numbers of visitors. They included seven outdoor music festival promoters, two general purpose public venues (both of which host outdoor music festivals among other activities), three sports venues and two entertainment venues. Together they covered a number of different types of events; however, what links them is the presence of large and often demonstrative crowds. All responses were recorded in writing by the interviewer during the course of the interview. As a commitment was given to maintain anonymity, the names of the festivals, promoters and venues are not disclosed, but referred to by letter designation (e.g. AAA, BBB, etc.)

Although the sample size was small, it was representative and the survey generated valuable information for the study. The survey highlighted a number of problems associated with current practice in crowd safety assessment, thereby confirming the continuing existence of the problem which this study seeks to address, and identified the constraints and difficulties facing assessors. Consequently, it gave a good insight into the needs of risk assessors and the help and assistance they require in order to conduct suitable risk assessments for crowd safety. The survey also represents what is probably the best that can be achieved in data gathering given the research constraints.

Crowd safety and related problems are the most important operational concerns for the participating promoters and venue owners/managers. Crowding, in particular, is the most mentioned concern. Past and existing problems are the main prompter for this concern. This finding serves to confirm the important role that previous experience has played in assessment and planning for outdoor music festivals and public venues in general. Further examination suggests that the types of hazards that give rise to concerns include the mismatch between venue capacity and crowd size, visitor behaviour, inadequate venue design and problems concerning the movement of crowds and the pinch points and obstructions created by them. These findings highlight the types and nature of crowd safety hazards that could arise in public venues. What is also of interest is that the vast majority of the hazards that give rise to the interviewees' concerns over crowd safety are those associated with the presence of large crowds rather than physical hazards. Yet, as shown in the later part of the survey, it is hazards due to the presence of large crowds that assessors find most difficult to assess.

Of the fourteen promoters and venue owners/operators surveyed, 8 indicated that they assess crowd safety in a manner largely consistent with traditional risk assessment principles.

However, of these, only 5 indicated that they attempted to assess crowd-related safety risks as outlined in Tables 4.2, 4.3 and 4.4.

Table 4.2: Outdoor music festivals

Festival	Method	Consider crowd-related risks
AAA	Risk assessment	Yes
BBB	Risk assessment	Yes
CCC	Experience	No
DDD	Experience	No
FFF	Experience	No
HHH	Experience	No
III	Experience	No

Table 4.3: Sports venues

NNN	Risk assessment	Yes
OOO	Risk assessment	Yes
PPP	Risk assessment	Partly - identification only

Table 4.4: General purpose and entertainment venues

General purpose venues		
JJJ	Risk assessment	Yes
KKK	Experience	No
Entertainment venues		
LLL	Risk assessment	No
MMM	Risk assessment	No - building only

However, although the number of interviewees who adopted a systematic risk assessment approach (i.e. 8) is greater than those that use the experience-based approach (6), a significant proportion of them (3) could only manage a partial assessment. For example, in one venue, assessment was made on the building only. This does not assess adequately all crowd-related safety risks (such as those resulting from undesirable behaviour). In another venue, it was reported that the crowd safety part of their risk assessment could not proceed beyond the hazard identification stage. The availability of health and safety expertise to the promoter or venue owner/manager appears to be a factor. Not all promoters or venues use qualified health and safety practitioners, who will generally adopt a risk assessment approach. In many cases (particularly among the promoters) assessments are carried out by operational personnel (site or event managers) whose background, experience and expertise are not in safety and who have minimal, if any, training in safety or risk assessment. This may well have a significant bearing on assessors' needs from the crowd safety risk assessment viewpoint.

Discussions with the interviewees also revealed that there appears to be a lack of, or incorrect, understanding among many of what risk assessment is. The experience of one of the interviewees, in particular, serves to confirm this view. Responsible for all safety and risk matters in an organisation that owns/manages a number of public venues, this interviewee reported that the greatest difficulty was to make his venue managers understand risk assessment and to deal with misconceptions.

The experience-based approach that relies on individuals' local knowledge, experience and information on past problems has been the traditional method for assessing crowd safety. No evidence was presented during the interviews that assessments made in this way were anything other than ad hoc in nature. From talking to the interviewees, it was noted that these considerations are important not only to the experience-based approach but also to risk-based assessment as well, especially given that there is no data or universally-applicable guidance or evidence on how large crowds and visitor behaviour may contribute to crowd safety risks. This reinforces the thesis proposition that what is required is an assessment method that enables assessors to capitalise on their knowledge and experience about their specific events and venues in a systematic and comprehensive manner.

Among the 8 venues that carried out risk assessment on crowd safety, the vast majority of them used methods that are in line with those recommended for industrial workplaces. Many reported problems concerning hazard identification and risk evaluation. For hazard identification, the main problem is that, by and large, the emphasis of the assessment has been on physical hazards (i.e. those associated with buildings and structures, hazardous materials/substances/items, etc.). Interviewees generally found it difficult to account for the hazards associated with the presence of crowds. The behaviour of the visitors is a particularly difficult area to address, with 60% of those who said that they had experienced difficulties in hazard identification explicitly pointing to behaviour. Only one of the 8 festivals/venues that carried out risk assessment explicitly considered visitor activities during hazard identification. This is perhaps a further indication that the existing risk assessment methods are not suitable for crowd safety.

Many interviewees reported that although they recognised the inadequacy of their methods, they were unable to find a better solution. Their main concern was with omissions. Any hazards that are not identified will not be assessed, thereby leaving a gap in the assessment

resulting in necessary remedial actions not being taken. Another danger is that omissions in risk assessment may give a false sense of security to promoters, venue owners/managers and operational staff. This could well make them ill-prepared for the hazards associated with behaviour and hence could be wrong-footed should visitor behaviour become problematic.

In terms of risk evaluation, what is of interest is that all except one promoter/venue evaluate risk qualitatively by means of a rating. The remaining promoter/venue reported that they were unable to assess crowd safety risks further than hazard identification. Beyond that, however, there is little agreement between promoters/venues on which rating regime is most appropriate. One method is to categorise risks into three rating levels (e.g. high, medium or low risk). Once again, this is in line with guidance given for industrial workplaces. Other venues have expanded their rating scale to four or five points to reflect the complexity of the problems involved. The main concern about these methods is that they do not require assessors to consider likelihood and severity explicitly. Given the problem reported earlier on people's misconceptions over risk and risk assessment, a single rating scale for the overall risk could be a recipe for human error. In fact, the survey has found that, at least for one venue, risks were definitely expressed in term of likelihood only, thereby failing to comply with the recommended risk assessment principles.

Another concern associated with a single rating scale for risk is demonstrated in the survey where interviewees reported that they had problems dealing with hazards that have low likelihood and high severity. However, this should not be a problem if risk evaluation requires the assessors to devise risk through estimating likelihood and severity separately. This way, the final risk, devised from both estimates, should be able to cater for a whole range of likelihood and severity levels. This problem also serves to reinforce the argument that crowd safety risk assessment needs to be more vigorous than what the existing guidance, which is intended for industrial workplaces, has provided. While a single rating scale may be appropriate for many workplaces, a more sophisticated method is required to cater for the more 'extreme' cases that may occur at music festivals or in public venues.

Table 4.5 summarises the problems and constraints experienced by the interviewees, and highlights some of the good practices revealed in the course of the survey. It also identifies what assessors need in order to overcome the problems and constraints in different parts of risk assessment.

Table 4.5: Summary of problems, good practice and assessor needs

Assessment stages	Problems and constraints	Good practice	Assessor needs
Overall	To set aside the time for the assessment. This is especially so for those who have to carry out the assessments in addition to their normal duties, e.g. to manage venues.	A 'two-tier' approach to risk assessment or carry out assessments during quieter periods.	A simple assessment method that is not too time-consuming to do.
	Heavy reliance on past problems.	Brainstorming.	A proactive method that encourages users to exercise imagination and prompt thoughts on what could go wrong.
	Failure to understand or misconceptions over the concepts of risk and risk assessment.		Training/explanations of the concept of risk and risk assessment principles. A step-by-step guide to risk assessment.
	A lack of guidance/data on how large crowds and behaviour could affect safety.	Information gathering methods, e.g. debriefing, brainstorming, venue inspections, monitoring, comments/complaints from front-line staff, exchange information with relevant bodies and agencies, incident reporting, etc.	A method that enables users to utilise better their local knowledge and experience.
Hazard Identification	Omissions, especially hazards associated with large crowds and behaviour. Emphasis is on physical hazards only.		A method appropriate to the types of hazards encountered in public venues and at outdoor music festivals. Some form of crowd dynamic and behavioural hazard 'prompters'.
	Different venues face different hazards.		A flexible method that caters for different types of events and venues.
Risk Evaluation	Some tend to equate risk with chance.		Training/information on the concept of risk. To consider likelihood and severity explicitly.
	Problems dealing with 'low likelihood' but 'high consequence' hazards.		Estimate likelihood and severity separately to devise the overall level of risk.
	Ad hoc judgments on the significance of problems and what needs to be done.	Some consider factors such as cost, value for money, what effect the actions may have on other parts of the venue, etc. Benchmarking.	Guidance/principles for risk prioritisation, e.g. ALARP. To consider tackling the causes of hazards or their consequences.

11. Summary

Outdoor music festivals are an increasingly popular form of entertainment for people, particularly young people, around the world. While the dominant reason for attending relates directly to the theme of each and the specific artists and attractions on offer, event socialisation is also an important factor. At a more fundamental level, identity affirmation is a key motivator for members of those subcultures associated with the music genre which is the theme of the festival or subcultures allied to the specific forms involved. Attendance at a festival is interpreted as an act of pilgrimage even a 'rite of passage' for many young people.

While such events play a role in providing entertainment and maintaining social cohesion, confidence and pride, they can also act as an attraction for anti-social, irrational and unsafe behaviour. The encouragement of such behaviour historically has, to some extent, been a deliberate strategy of the part of music promoters and press agents, resulting in patrons attending music events becoming more aggressive and violent. In fact, it might even be considered to be part of the attraction of attending.

The consequence of such behaviour is exacerbated by the physical environment and, particularly, the movement of people in high-density environments. Crowds at outdoor music festivals tend to be emotionally-charged, highly-motivated and somewhat unpredictable. Behavioural problems can typically result when there are disruptions in the flow of pedestrian traffic caused by obstructions such as queues forming in their path, because of a perceived threat such as a crowd crush, or during a competitive rush for prime position or prized item (i.e. a crowd craze). The behaviour change process in a crowd commences with the failure of some aspect of the social system affecting the crowd, such as running out of alcohol or a power failure resulting in an interruption to the music.

Traditionally, concert promoters and venue owners and/or operators have not considered crowd-related safety to be their responsibility but rather the personal responsibility of patrons, who are perceived to put themselves at risk by virtue of their attendance, zeal and behaviour. In terms of exposure to legal liability for compensation at common law, they have sought to rely on legal defences such as *voluntary assumption of risk* and *contributory negligence* by patrons at events. However, the legal reality is quite different, with Australian courts reluctant to entertain these defences in circumstances where promoters and venue

owners and/or operators effectively control all aspects of the production and staging of an event. In addition, the threat of prosecution under Australian occupational health and safety laws provides a powerful incentive to undertake effective planning and adopt a risk management approach,

Effective planning is critical to ensure the provision of good management strategies resulting in improved health and safety outcomes at outdoor music festivals. Planning is required by local government authorities, which 'regulate' these events through entertainment licensing permits and is guided by a considerable number of publications that provide good consistent advice useful for event promoters, venue owners/operators and local government authorities. These publications all recommend the use of risk management in the planning and operation of outdoor music festivals. The integration of risk assessment and management principles into the event planning process is seen as critical to guide the selection of strategies to achieve safe festivals.

However, the quality of risk assessments at outdoor music festivals, both in Australia and internationally, has been heavily criticised. Risk assessments for music festivals and mass gatherings generally tend to deal with the traditional hazards and risks found at most workplaces, without taking into account the dynamics of the crowd or those factors that influence its behaviour. While the physical hazards and risks associated with staging an outdoor music festival are generally well-managed, influences on crowd behaviour are little understood and generally ignored, leaving a significant source of risk at this type of event unaccounted for.

Since human emotions are at play here, understanding the variables that can influence the psychology of a crowd (and the extremes of behaviour that can result) becomes equally as important as understanding the laws of dynamics. A number of commentators have argued that insufficient attention to the way that people behave in a crowd and the relationship between behaviour and systems design are major factors in crowd disasters. In order to develop an appropriate risk management method, it is necessary to include those factors which impact on the behaviour of crowds at this type of event and extend the traditional risk management methodology to integrate psychological and engineering frames of reference.

CHAPTER 5

MONITORING AND ASSESSING BEHAVIOURAL RISK AT OUTDOOR MUSIC FESTIVALS

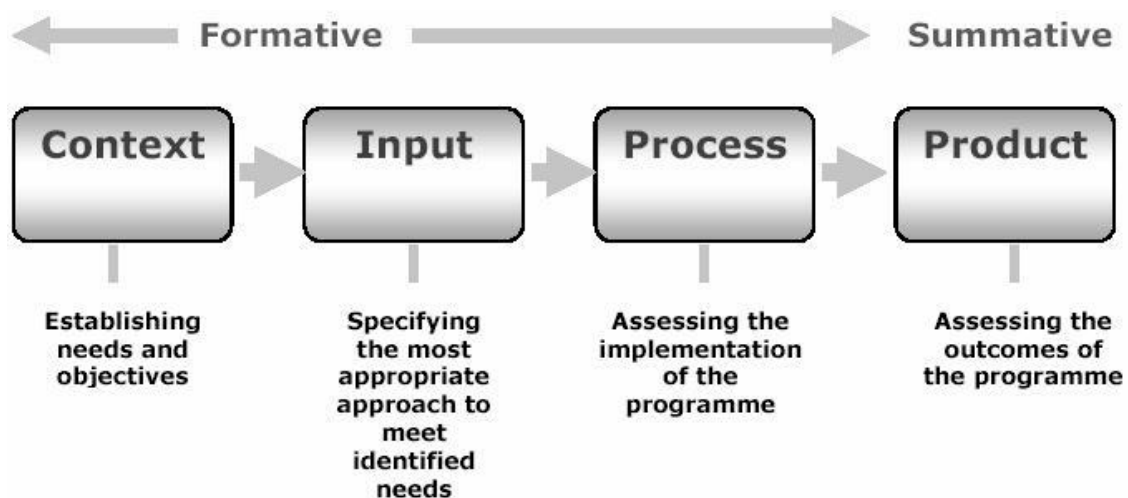
‘You can analyse the past, but you need to design the future’
Edward de Bono (1933 -)

Chapter Content

1. Introduction
2. Background
3. Current models of risk assessment for crowd safety
4. Measuring crowd behaviour
5. A model of crowd behaviour
6. An instrument to monitor and assess behavioural risk
7. Summary

1. Introduction

This chapter outlines and examines current approaches that have been suggested to date to address the problems and issues identified in Chapter 4, including the development by the author of a conceptual model and instrument to monitor and assess behavioural risk at outdoor music festivals. It comprises the Input phase of the study as outlined in the CIPP model adopted as the research design framework, as set out in the following diagram:



Section 2 outlines the major characteristics that have been identified as contributing to health and safety risks at mass gatherings, and outdoor music festivals in particular. Because crowds are the major risk at events and mass gatherings, planning needs to incorporate appropriate assessment of crowd safety risks and needs to contemplate crowd behaviour under varying conditions.

Section 3 examines attempts that have been made over the last twenty years or so to develop an appropriate methodology for assessing crowd safety at mass gatherings. The earliest work by Au, Carey and Whalley (1993), commissioned by the UK HSE, formed the basis for publicly issued guidance material⁶⁶. The report identified major crowd-related hazards and risks at mass gatherings, their immediate consequences and other possible outcomes, along with major contributing factors. Subsequent work by Au (1999, 2001) to develop a methodology, however, resulted in a substantial and detailed document which outlined a rather cumbersome method which was not progressed by the HSE. Subsequent contributions include the Crowd Stress Index (CSI) developed by Mahudin (2003) and the work of Keith Still (2009, 2014) who has developed a framework for the consideration of crowd safety risk during various phases of operation (the DIM-ICE model), and his recommendations and approaches regarding risk mapping and crowd flow representations.

Section 4 outlines the work of Arbon (2004) and associates, which holds the greatest promise in relation to the development of a new method to monitor and assess the behavioural dimension of risks encountered at music festivals.

Section 5 sets out a model, developed by the author, showing the factors that act on, and influence, the translation of individual to collective behaviour at music festivals. This model, developed largely from the work of Arbon (2004) and associates, provides the basis for the development of a new method to monitor and assess behavioural risk. Finally, Section 6 sets out the method developed by the author to monitor and assess behavioural risk at music festivals.

⁶⁶ *Guide to Safety and Welfare at Pop Concerts and Similar Events*, HS/Scottish Home Office 1993; see also *Managing Crowds Safely* HSE, 1996 and *The Event Safety Guide*, HSE 2000 (the 'purple guide').

2. Background

Davies (1998) has described the crowd itself at events like outdoor music festivals as the principal hazard that needs to be dealt with. Dickie (1995) has stated that ebullient crowds coupled with inadequate management have within them their own seeds of disaster. Both the HSE (1993) and Upton (2004a:5) have indicated that knowledge of the crowd demographics and behaviours are important for both design and operational features for outdoor music festivals.

A crowd is not just a group that is comprised of a large number of persons gathered closely together. The uniqueness of crowds is the fusion of individuals into a common kind and emotion, which can be spontaneous, anarchic or sporadic (Le Bon 1895, reprinted 1960). Musse and Thalmann (1997) define a crowd as a set of individuals in the same physical environment who share a common goal. Macionis (2004, p. 605) describes a crowd as ‘a temporary gathering of people who share a common focus of attention and who influence one another’. Each crowd has a life of its own. While some may be closely related, each crowd is relatively distinct from another.

Research on a variety of different types of mass gatherings⁶⁷, including sporting events in particular, has identified a number of characteristics that contribute to health and safety risks at these events (e.g. Arbon, Bridgewater & Smith 2001; Earl et al. 2004b; Milsten et al. 2002, 2003; Zeitz et al. 2002). Arbon (2004) has provided the most recent and complete list of these characteristics, which include:

- (i) the weather (temperature and humidity)
- (ii) duration of the event
- (iii) whether the event is predominantly an outdoor or indoor event
- (iv) whether the crowd is predominantly seated or mobile
- (v) if the venue is bounded (fenced and secured) or unbounded
- (vi) the type of event
- (vii) the crowd mood
- (viii) availability of alcohol and drugs
- (ix) crowd density
- (x) the geography of the event (topography and locality)
- (xi) average age of the crowd.

⁶⁷ Mass gatherings have been defined as organised events taking place within a defined space, attended by a large number of people (usually 25,000 or more): Arbon 2007.

A study by Earl et al. (2004a) found that while outdoor music festivals are different from many mass gatherings⁶⁸, nevertheless all of the characteristics identified by Arbon (2004) relate to outdoor music festivals (Earl et al, 2005), and associations between youthful expressions and health and safety risks at music events have been identified in the literature (Bennet 2002). In particular, Arbon (2002) found there were links between increased health and safety risks and rock music events, particularly outdoor music festivals.

Other factors identified as key influences on crowd behaviour include the nature of the activity, the motivation of the crowd, the presence and nature of security interventions, weather conditions and the density of the crowd (Milsten, Maguire, Russell & Seaman 2002; Arbon 2007). Additional factors include the attendance of predominantly young males, overcrowding of venues, lack of appropriate emergency management planning, and insufficient numbers of trained, experienced security staff (Earl et al. 2004a).

Examples of some of the information required to assist in crowd management include:

- (i) age and gender (Arbon 2004; Milsten et al. 2002)
- (ii) types and compatibility of social movements or cliques expected to attend (e.g. moshing at punk events (Ambrose 2003, p. 35; Keithley 2003, p. 125) or conflicts between punks and skinheads (Kleg, 1993, p. 74))
- (iii) illegal drug or alcohol use – different social movements have their drugs of choice. For example, punks and glue sniffing or heroin; hippies and cannabis; ravers and ‘ecstasy’ (Forsyth, Barnard & McKeganey 1997, p. 1317; Priddle 2004).

These impacts have considerable implications for police, security, first aid and medical services at outdoor music festivals. For example, at rave events, while drug overdoses have occurred, they are socially heterogenic and are generally free from violence (Parker & Auerhahn, 1988, p. 78; Weir 2002). While there are potentially major impacts for the first aid and medical services, there is a considerably reduced impact on security services at these events. Alternatively, punk events have major implications for both medical and security services.

⁶⁸ These differences are attributed to the large crowds in attendance, the influence of music on those attending and crowd mood (usually volatile with greater security demands) and demographics (often younger patrons): Earl et al. 2004.

Crowd management strategies are essential, therefore, in reducing crowd-related safety risks (Upton 2004, 2008; Wertheimer 1980, 1994, 2003; Raineri 2004; Raineri & Earl 2005; Kemp et al. 2004). Authors such as Davies (1998) and Hanna (1995) and public health and safety organisations such as EMA (1999), HSE (1999) and the Queensland Liquor Licensing Division (1999) argue for improvements in crowd management at outdoor music festivals.

Fruin (2002) describes crowd management as ‘the systematic planning for, and supervision of, the orderly movement and assembly of people’. Davis & Associates (2003, p. 28-29) maintain that the primary objectives of crowd management are to:

- understand the potential dangers and problems that can arise from crowding
- provide appropriate management structures
- develop and maintain the integrity of a safe system of crowd management
- ensure there is a continuous focus on the analysis and improvement of crowd safety provisions.

Wertheimer (2000b, p. 4) maintains that crowd management for events covers risk assessment, event promotion, anticipated crowd behaviour, ingress, egress, public amenities, emergency assistance, first aid, crowd capacity and configurations, artist responsibilities, concessions, public safety, security and the establishment and enforcement of safety rules. Additionally, crowd management must be both proactive and reactive, involve ongoing development and the continued co-operation of staff and management (Wertheimer 2000b, p. 4).

Tatrai (2001, p. 6) considers that success in crowd management includes being aware of all risks, undertaking an effective risk assessment and following up with appropriate management systems, and suggests that successful crowd management should consider:

- (i) design features
- (ii) understanding crowds
- (iii) crowd management operations.

Without understanding crowds and crowd behaviour, Berlonghi (1995) argued that we are left with random attempts at crowd control and crowd management which may result in serious losses of life, health, property and money. He emphasised that those involved in crowd management and crowd control must foresee the nature of the crowd that will be in attendance and must be able to observe the behaviour of a crowd while an event is taking place and make timely decisions for effective action.

3. Current models of risk assessment for crowd safety

A number of attempts have been made over the last twenty years or so to develop an appropriate methodology for assessing crowd safety at mass gatherings. As Mahudin (2003) notes, ‘... in previous crowd research, the empirical measurements were concerned with issues such as crowding experience, territoriality, density level or spatial behaviour. Efforts to construct an instrument to measure the effects of the crowd itself are very few or almost non-existent’. While these were not developed specifically in the context of outdoor music festivals, they are, nonetheless, a very useful starting point for the purposes of this study.

3.1 RM Consultants Limited - Au, Carey & Whalley (1993)

In 1991, in response to a growing concern from the public and government (particularly in the aftermath of the Hillsborough disaster in 1989), and the increasing number of large-scale outdoor events (e.g. pop concerts, raves, festivals, etc.), promotions within venues (e.g. celebrity visits, shows within shopping centres, etc.), street events and multipurpose venues, the UK Health and Safety Executive (HSE) commissioned RM Consultants Limited to develop guidance for HSE inspectors and venue owners and managers on the management of crowd safety in public venues. The report produced by the consultants (Au et al. 1993) provided the basis for the *Guide to Safety and Welfare at Pop Concerts and Similar Events* (HSE/Scottish Home Office 1993)⁶⁹. The recommendations also provided the basis for the more general *Managing Crowds Safely* (HSE 1996).

Au et al (1993) suggested that risk assessments for crowd safety risks could be undertaken by examining the human activities involved (and their interaction with such factors as venue design, crowd management, the specific circumstances of an event, etc.) in a manner similar to task analysis for human operations. This suggestion is premised on the notion that patrons’ activities and behaviour are the principal factor affecting crowd safety, just as operator activities and human error are to safety in an industrial workplace. The Au et al (1993) report provides recommendations in relation to minimising and managing crowd-related safety risks to:

- arriving crowds (ingress)
- crowds at the venue (circulation)
- departing crowds (egress).

⁶⁹ This document has been superseded by *The Event Safety Guide* (HSE 2000), known colloquially as the Purple Guide.

3.1.1 Managing the safety of arriving crowds

During the arrival and entry phase, the prime objective is to minimise crowd-related safety risks at transport terminals/stations and drop-off points, parking facilities, on the pedestrian approach routes, at the entrances and in the adjacent areas. Issues of prime importance during this phase are:

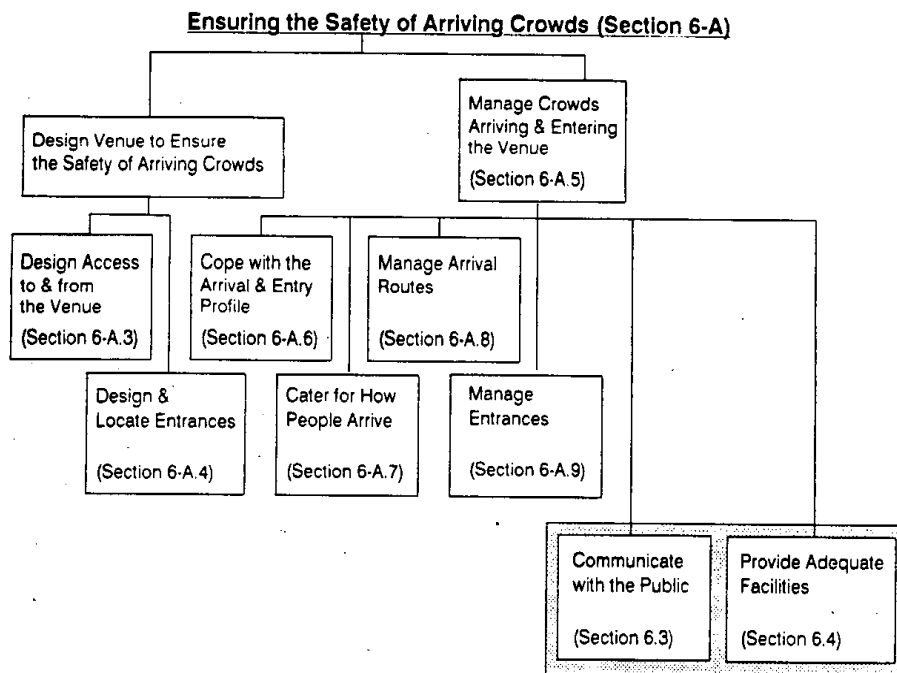
1. The time period over which people arrive – given a certain number of patrons, the shorter the time period over which they arrive, the greater the number of people who will be present at transport terminals, parking facilities, on arrivals routes and at the entrances within the period concerned. Depending on the type of venue, crowding problems can also arise even when people arrive over a long period of time. For example, if large numbers of people are arriving at a venue at the same time as others are leaving, conflicting flow directions can result in significant cross flows and reverse flows. This can significantly reduce flow rates and movement and subsequently lead to crowding problems.
2. The means of arrival (i.e. the forms of transport people use) - how people arrive can affect the crowding level at transport terminals and parking facilities, on the related arrival routes and at the related entrances. In general, the risk of crowding at these places will be higher if the majority of people arrive by the same one or two modes of transport. In addition, the level of provision of transport and parking facilities could perhaps have a less direct, but equally important, effect on crowding and safety. For example, insufficient parking spaces may lead to illegal parking such as parking on the pavements or outside emergency exits. This would not only lead to traffic congestion, but would also (i) reduce the capacity of the arrival routes and hence increase the risk of crowding, and (ii) block or reduce the capacity of emergency escape routes and subsequently lead to the risk of crowding during emergency evacuation.
3. The arrival routes and entrances – the amount of space available and the number of people using them at any one time are obviously two important factors. In general, the risk of crowding on arrival routes and at entrances is high if either they have only limited space for the patrons, their belongings and their likely activities, or if people concentrate on the same route and at the same entrance.

Crowd control at the arrival and entry phase can be undertaken by the combination of appropriate venue design (including design and placement of temporary infrastructure and modifications), making suitable arrangements in advance, and taking appropriate actions at

the time (as outlined in Figure 5.1). For example, prevention of crowding problems on a particular popular arrival route can be achieved by a combination of:

- designing or modifying a route to provide sufficient capacity
- making arrangements to introduce a one-way system
- setting up barriers in advance and separating arriving and leaving flows
- diverting people to use alternative routes

Figure 5.1: Managing the safety of arriving crowds (Au et al. 1993)



3.1.2 Managing the safety of crowds within the venue

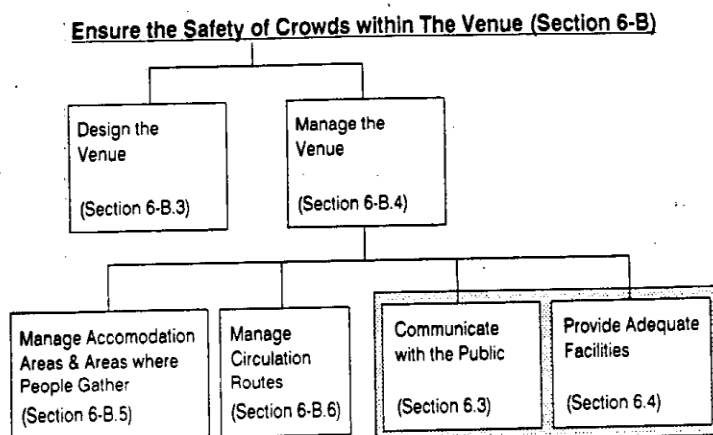
Key issues of prime importance in this context are:

1. the distribution of people inside the venue – where people gather and which circulation routes people use can affect the crowding level at various parts of the venue. In general, the distribution of people over the spaces available should be as even as practicably possible. The less even the distribution of people, the higher the risk of crowding at particular points of the venue. Usually, main circulation routes or parts of the venue where there are some form of attraction or amenity are likely to be particularly popular and, hence, may lead to problems. However, depending on the layout and design of the venue, crowding problems can also occur in less frequented locations due to, for example, diversions, the presence of pinch points, bottlenecks or dead ends.

2. The nature of the flows inside the venue – cross flows and reverse flows in crowded areas can significantly increase the potential for crowding problems and at the same time reduce flow rates. This requires attention to the careful design of flow routes, control of queuing and stationary crowds, and flow segregation.
3. The organisation of static crowds and queues – crowds and queues in their own right can lead to serious crowding problems if the potential for surges, pushing and access through crowds is not considered and controlled. This may require attention to, for example, the metering of people into vulnerable areas, provision of crush barriers, active control of crowd behaviour or even the introduction of seated accommodation.

Again, appropriate venue design (including design and placement of temporary infrastructure and modifications), making suitable arrangements in advance, and taking appropriate actions at the time (as outlined in Figure 5.2), are appropriate.

Figure 5.2: Managing the safety of circulating crowds (Au et al. 1993)



3.1.3 Managing the safety of departing crowds

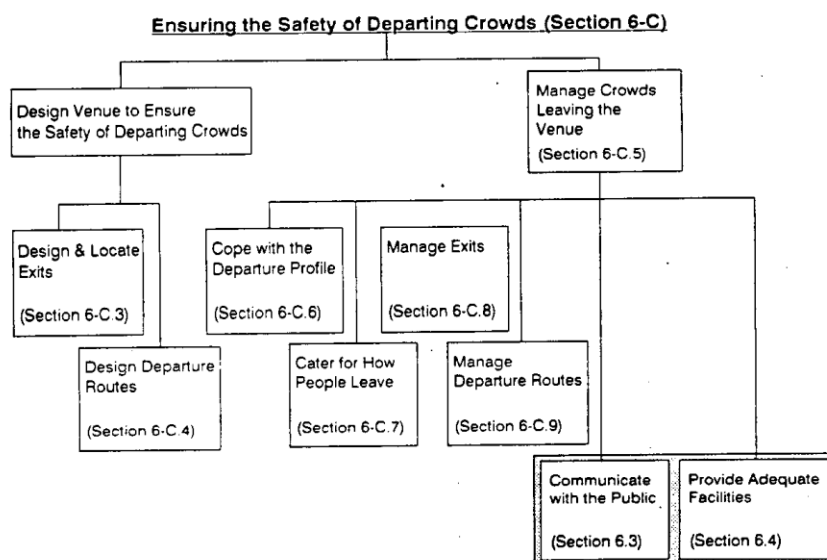
Similar to that related to the arrival and entry phase, the prime objective at the departure phase is to minimise the risk of crowding at exits, in areas adjacent to exits and at transport and parking facilities. In addition to relevant factors outlined for the arrival and entry phase, the following matters (see Figure 5.3) are also of prime importance during this phase:

1. The time period over which people leave – problems can arise in venues where a large number of people choose to leave over a short period of time. This is of particular importance for events where all of the people attending the event are likely to want to leave following the end of a particular performance or show. Hence, maintaining smooth

and orderly flows at and near the exits, on the pedestrian routes and at the transport and parking facilities, is of particular importance.

2. The means of transport used for departure – people leaving the venue do not necessarily use the same means of transport as they did for their arrival. Therefore, there is a need to consider separately how people arrive and how people leave. Similar to the arrival and entry phase, this helps to determine the transport facilities required, and the capacity of the related route and exits. It also helps to identify where the main flows are likely to be and hence determine the measures and resources required at each transport/parking facility, route and exit.
3. The exits and departure routes – see comments already made regarding arrival and entry.

Figure 5.3: Managing the safety of departing crowds (Au et al. 1993)



In addition, the report identified the major crowd-related hazards and risks at mass gatherings and their immediate consequences and other possible outcomes (Table 5.1), along with major contributing factors in the areas of design, equipment failure, undesirable circumstances, staff errors and other circumstances (all set out in Table 5.2 (a) – (e)). These factors provide a comprehensive, relevant and useful set of considerations around which to build an appropriate risk assessment methodology. Finally, the report contains a series of useful checklists to assist in the risk assessment process – these are included in Appendix E.

Table 5.1: Summary of Hazards/Risks

Hazards		Possible consequences	
		Immediate consequences	Other possible outcomes
1	Overcrowding <i>Build-up of internal crowd pressure as a result of too many people in a limited space</i>	Anxiety, physical discomfort, minor or major injury, death	
2	Crushing <i>Build-up of crowd pressure against a fixed object, wall or fence</i>	Anxiety, physical discomfort, minor or major injury, death	
3	Impact/Collision <i>Impact with moving objects (e.g. people, animals, vehicles, etc.)</i>	Anxiety, physical discomfort, minor or major injury, death	
4	Pile-Up <i>Crushing due to people falling on top of one another</i>	Anxiety, physical discomfort, minor or major injury, death	
5	Trampling <i>Crushing under the feet of people or animals</i>	Anxiety, physical discomfort, minor or major injury, death	
6	Surging <i>Pressure wave caused by crowd movement</i>	Anxiety, physical discomfort	Overcrowding, crushing, impact/collision, pile-up, trampling
7	Pushing <i>Sudden pressure exerted against individuals or thrusting one's way through a crowd</i>	Anxiety, physical discomfort	Overcrowding, crushing, impact/collision, trampling
8	Swaying <i>Lateral crowd movement</i>	Physical discomfort	Crushing, pile-up
9	Rushing <i>Rapid movement, running</i>		Crushing, impact/collision, trampling
10	Falling <i>Falling to a lower level</i>	Minor or major injury, death	Impact/collision (due to falling onto crowd), pile-up, trampling
11	Tripping <i>Falling on same level (e.g. slip, stumble, leading to falling onto ground or against objects)</i>	Minor or major injury, death	Overcrowding (among the crowd behind), impact/collision, pile-up, trampling

Table 5.2: Summary of contributing factors**(a) design limitations**

1. Capacity		2. Design Effects		3. Safety	
1.1	Area with limited space	2.1	Pinch points or bottle-necks	3.1	Steep slope, especially towards fixed objects
1.2	Access route with limited space	2.2	Funnelling effects	3.2	Unguarded bank or edge
1.3	Limited number of access routes	2.3	Convergence of several routes into one area with limited space	3.3	Lack of supports (e.g. handrail)
1.4	Entry/exit points with limited access	2.4	Dead end/blockage/locked gate or door	3.4	Protruding object (e.g. barrier with protruding bolts/legs/base/guy ropes)
1.5	Limited number of entry/exit routes	2.5	Popular places, facilities and/or attractions next to or too close to each other (e.g. ticket counters and entries, information display board and main flow path, etc.)	3.5	Unprotected/unguarded sharp object, edges, corner, etc.
1.6	Narrow stairway, gangway, escalator, etc.	2.6	Popular places/facilities/attractions located at junction/crossroad	3.6	Insecure structure
1.7	Limited number of stairways, gangways, escalators, etc.	2.7	Proximity of venue to other popular attractions	3.7	Uneven flooring/steps
1.8	Elevator with limited spaces	2.8	Limited or no alternative access route or facilities	3.8	Slippery flooring
1.9	Limited number of elevators	2.9	Limited number of entry and exit points	3.9	Step(s) or steep slope (especially downward slope) immediately after entry/exit point
1.10	Facilities (e.g. food vending points, toilets, etc.) with limited space	2.10	Limited signposting	3.10	Unsafe/unguarded electric wiring or equipment
1.11	Limited facilities	2.11	Unclear/conflicting/confusing signposting		
1.12	Limited number of counters (e.g. ticket, check-in, check-out, etc.), ticket machines, etc.	2.12	Insufficient lighting		
		2.13	Limited space between exit, stairway, bottom of downward escalator, etc. and fixed object (e.g. wall, fence, barrier, etc.)		
		2.14	Unrestricted access within large area/accommodation		
		2.15	Traffic, animals, etc. not separated from people		
		2.16	Maintenance or construction work blocking access or obstructing flow path		
		2.17	Complex or confusing layout		

(b) equipment failures

	Equipment	Failure
1	Gates	Blocked, stuck open, left locked, opened early, jammed shut
2	Turnstiles	Blocked, jammed, jammed open
3	Exits	Blocked, stuck open, left locked
4	Route(s)	Becomes blocked
5	Escalator(s)	Slides back, stops, traps soft objects
6	Stairs	Slippery, blocked off, obstructed, collapsed
7	Lift(s)	Stuck, doors will not open, opens on wrong floor, slow arriving
8	Transport	Fails to stop, fails to arrive
9	Signs	Missing, vandalised, not conspicuous enough, erased, conflicting information
10	Lighting	Fails, comes on too early, comes on too late
11	Generators	Fail to operate, fugitive emissions
12	Structures (e.g. stand, seats)	Collapse, inadequate exits too close together
13	Barriers	Inappropriate design, inappropriate layout, break under strain, pinch points
14	Fire extinguishers	Not in place, do not work, vandalised
15	Fire blankets	Not in place, do not work
16	Smoke detectors	Not in place, do not work
17	Sprinklers	Not in place, do not work
18	Alarms	Not in place, do not work, too quiet, inconspicuous, confusing
19	CCTV	System fails, not visible on screen, incorrect shot, scanning system breaks, comes on too late
20	PA system	Not in place, does not work, distorted, not powerful enough, does not reach all areas of the venue
21	Telephone	Not in place, does not work, becomes jammed by calls
22	Radio	Not in place, does not work, noise, interference, distortion

(c) undesirable circumstances (Au et al. 1993, p. 5.15)

1	No means of controlling the number of people being admitted (e.g. street, open event)
2	A significant number of people with forged tickets
3	A significant number of people turn up 'on spec' (i.e. with no tickets)
4	Touts (including ticket touts, persons touting for services, overnight accommodation, etc.)
5	Competitive elements, rivalry, conflict between groups, etc.
6	Attractions move from one location to another resulting in large crowd movements
7	Seasonal effects
8	Holiday effects
9	Weather conditions
10	Special occasions (e.g. celebrity visits, signings, etc.)
11	Delay to services
12	Problems or accident nearby

(d) staff errors (Au et al. 1993, pp. 5.13-5.14)

1	Lack of staff
1.1	Less staff than required
1.2	Staff not available
2	Monitor crowd and detect problems
2.1	Fail to monitor crowd or detect problems (e.g. due to distraction, chatting with colleague(s), performing other tasks, engaged in answering questions, assisting individual members of the public, misunderstanding of role and responsibility)
2.2	Staff do not attempt to monitor crowd properly (e.g. due to low morale)
2.3	Staff monitor crowd less frequently than required
2.4	Staff underestimate the problem or its possible effects
2.5	Staff overestimate the problem or its possible effects
2.6	Staff incorrectly interpret the situation as not problematic (i.e. do not think there is a problem when there is)
2.7	Staff incorrectly interpret the situation as problematic (i.e. think there is a problem when there is not)
2.8	Staff recognise a problem too late
2.9	Staff give the wrong priority to the problems detected
2.10	Staff only detect part of the problem
2.11	Staff monitor fewer areas or activities than required
3	Control crowds
3.1	Fail to control crowds (e.g. due to performing other tasks, in another area, misunderstanding of role and responsibilities)
3.2	Staff do not attempt to control crowd (e.g. due to low morale, overwork, etc.)
3.3	Staff impose less control than required (e.g. restrict admission rather than stop admitting people)
3.4	Staff impose too much control (and are, therefore, unable to cope with all the tasks given or create problems elsewhere)
3.5	Staff use the wrong crowd control strategy
3.6	Staff impose control too late
3.7	Staff give the wrong priority to the various crowd control needs
3.8	Staff fail to perform some of the crowd control tasks (e.g. divert people without explaining why, open gate without informing colleague)
4	Give instructions or directions
4.1	Staff fail to, or do not, attempt to give instructions or direct people (e.g. due to low morale, misunderstanding of role and responsibilities)
4.2	Staff give less instructions or directions than required (i.e. do not give enough instructions or directions to enable people to act appropriately)
4.3	Instructions or directions, or the manner in which they are given, are unconvincing and hence people do not comply (e.g. instructions not firm enough)
4.4	Staff give the wrong instructions or directions
4.5	Staff give instructions or directions too soon (hence, for example, leading to confusion or creating problems elsewhere)
4.6	Staff give instructions or directions too late
4.7	Staff give instructions or directions in the wrong order
5	Enforce rules and prohibitions
5.1	Staff fail to, or do not attempt to, enforce rules and prohibitions (e.g. due to low morale, misunderstanding of role and responsibilities, misunderstanding of, or unawareness of, certain rules and prohibitions)
5.2	Some rules and prohibitions not enforced
5.3	Staff enforce the wrong prohibitions
5.4	Staff enforce rules and prohibitions too late
5.5	Staff misinterpret rules and prohibitions
5.6	Staff give the wrong priority to the enforcement of various rules and prohibitions

6	Attend to problems
6.1	Staff fail to, or do not attempt to, attend to problems (e.g. due to breakdown of communication, misunderstanding of roles and responsibilities, etc.)
6.2	Problem not properly attended to/staff give less attention to the problem than required (e.g. could lead to the same or similar problem emerging later)
6.3	Problem receives too much attention/more staff and equipment than required are called up to attend to the problem (e.g. having less staff available in other areas, leading to more disruption than necessary)
6.4	Staff arrive at the wrong place or misunderstand the problem (e.g. bad communication)
6.5	Problem is attended to too late
6.6	The task of attending to the problem is not completed (e.g. the person injured is taken care of but the place is not cleaned up and opened again for public access)
7	Use of equipment (e.g. using firefighting equipment, handling hazardous chemicals)
7.1	Staff unable to use equipment (e.g. due to lack of training)
7.2	Equipment is not used properly
7.3	Wrong equipment is used
8	Communicate with/alert colleague(s)
8.1	Breakdown of communication, colleague(s) not alerted
8.2	Information given to colleague(s) is not enough/incomplete
8.3	Too much information is given to colleague(s)
8.4	Wrong/incorrect information is given to colleague(s)
8.5	Information is not given or colleague(s) alerted too late

(e) combined activities (Au et al. 1993, p. 5.15)

1. Flows		2. Behaviour		3. Public order	
1.1	Heavy flow/large movement	2.1	People attempting to rush to the gate, climb over perimeter fences	3.1	Mobbing
1.2	A number of flows combined into one	2.2	Large number of early arrivals	3.2	Aggression/threatening behaviour
1.3	Reverse flows or cross flows	2.3	Large number of late arrivals	3.3	Fighting/missiles being thrown
1.4	Flows obstructed by queues, gathering crowds, etc.	2.4	People competing for a limited number of tickets, seats, vantage points, etc.	3.4	Mass disorder
1.5	Rapid flows/fast moving crowds	2.5	Excitement		
1.6	Pedestrian flows mixing with animals and/or traffic flows	2.6	Mass hysteria		
1.7	Moving attraction(s) within large crowd (e.g. carnival procession, celebrity on 'walk about')				

3.2 RM Consultants Limited (1998) and Au (2001)

The consultants were subsequently engaged by the HSE to develop an appropriate risk management methodology (Au 1998, 2001). The final version of the methodology (see Appendix F), which adopts a qualitative assessment approach, is designed to encourage a structured and robust assessment, and contains key features such as:

- (a) generic keywords for behavioural-related and physical hazards that can arise in public venue environments
- (b) a risk rating regime consisting of separate ratings for likelihood and severity, and a likelihood-severity matrix for determining the extent of risk.

The keywords are similar in nature to the HAZOP⁷⁰ keywords; they are designed to be thought-provoking and to provide a structured approach for hazard identification. The risk rating regime is designed to allow a wide spectrum of risks, ranging from high consequence low probability to low consequence high probability, to be accounted for while limiting each rating scale to a manageable size (Au, Gilroy, Livingston & Haslam 2004).

In discussing whether to adopt a quantitative or qualitative approach to risk assessment, Au (1998, 2001) notes that, even though qualitative risk assessments tend to have a much wider application, it is the quantitative risk assessment (QRA) methods that have received much of the attention in the literature. Compared to qualitative risk assessment, QRA is much better established and substantially more effort has been devoted to the development of QRA techniques and tools. While much of this effort has been devoted to the high-hazard industries, other applications have included the fatigue failure of highway bridges, the delivery of poultry products, the enactment of the air bag standard for new cars, human-robot systems and the assessment of pollution (e.g. Yazdani & Albrecht 1988; Kumamoto et al. 1988). Qualitative risk assessment, on the other hand, is much less well-documented.

There are, however, a number of drawbacks to a quantified risk assessment (QRA). Firstly, while the quantified approach may appear more attractive in the long run, some argue that reducing everything to x to the power of 10 is far too complex for many sectors (Kazer 1992). Secondly, because engineering reliability is often data-based, for many workplaces QRA is not practicable because of the lack of failure data.

⁷⁰ HAZOP stands for Hazard and Operability Study. It is a technique widely used in the high-hazard industries for hazard identification.

Thirdly, from a practical viewpoint, the risk quantification approach tends to require a substantial amount of expertise and effort. In the high-hazard industries where such an approach is more widely used, the level of health, safety and environmental risks they pose can justify the cost of conducting quantified assessments. The cost of the assessment is also very small for industries that require huge investment and high operating costs.

Fourthly, QRA is usually carried out by technical risk analysts or other risk 'experts' who often fail to include due allowance for other equally important factors (Waring & Glendon 1998). Toft (1996) and Toft and Reynolds (1994, 1997), quoting examples such as the incident at Three Mile Island in the US, argue that a purely rationalistic approach to hazard identification cannot identify all pertinent causes of disasters. Waring and Glendon (1998) suggest that quantified risk assessments are not capable of a complete and convincing assessment of risks to safety arising from organisational culture, ideologies, power relations, motivations, attitudes or perceptions; a view supported by ACSNI (1991) and Douglas (1992, 1994).

Finally, allied to this caveat is the failure in risk assessment to recognise the relevance of individual heuristic risk assessments, whether among those subject to risk, those engaged in risk decisions, or those used by individual 'experts'. Waring and Glendon (1998) note there is a tendency to regard simple heuristic approaches to risk assessment as inherently inferior to sophisticated scientific approaches. Both Toft (1993, 1996) and Waring (1996) argue that such a view is unwarranted and is based on a failure to recognise that all risk assessment, however sophisticated the mathematics involved, is inherently value-laden. For example, the detailed, but nonetheless narrow, base of technical knowledge on which many quantified risk assessments are made may create a false, reduced picture of real-world settings in which risk behaviour is actually much more complex.

In addition, in the high-hazard industries, where QRA is most widely used, there is often a need to cohere human reliability with engineering reliability so that they can be assessed together as one man-machine system. Human Reliability Assessment (HRA) can be regarded as the human factors version of QRA where human error probability is quantified. In the early years of HRA, attempts were made to create a human error data bank, but it was soon realised that the data bank approach was not working for human errors (Kirwan 1994). Instead, current HRA techniques such as HEART (Williams 1988) are risk-based; i.e.

quantification is made based on the estimation of how much effect various performance-shaping factors (or error-producing conditions, etc.) have on the human error of concern. Human error probabilities are estimated using a series of mathematical formulae to take into account the various error-contributory ergonomics factors (such as the work practice, the work environment, the nature of tasks, etc.) that come into play. Although they do not rely directly on hard data because of the relative unpredictability of human activities and human behaviour, these formulae were, nevertheless, based on historical data and experience about what factors tend to contribute most to human error in particular industries.

As a consequence, Au (1998, 2001) concluded that a quantified risk assessment (QRA) approach is unsuitable for crowd safety for two reasons. Firstly, crowd safety is very much about human beings and their interaction with each other in public venue environments. The interaction of human beings and engineering systems in crowd safety is minimal. As such, there is no need for (and no pressure on) crowd safety to cohere with any better-developed data-based assessments.

Secondly, the risk quantification approach requires a good understanding of the risk factors involved and the extent of their effect on safety. In industrial environments, years of effort have been devoted towards achieving this. Crowd safety, however, is still a very young discipline, requiring much more research. Also, the factors affecting crowd safety can vary from venue to venue and under different circumstances (Au et al. 1993). Furthermore, there are fewer constraints on human behaviour among visitors than employees in a workplace. Under the circumstances, it is not possible to develop a credible risk factor based approach that is suitable for all public venue types.

Furthermore, even if such a technique were developed, it is doubtful whether it would be as useful as it might appear to be. Experience in QRA suggests that despite the sophisticated-looking formulae and figures, it is fundamentally a subjective method and the accuracy of its findings cannot be validated.

3.3 Mahudin – Crowd Stress Index (2003)

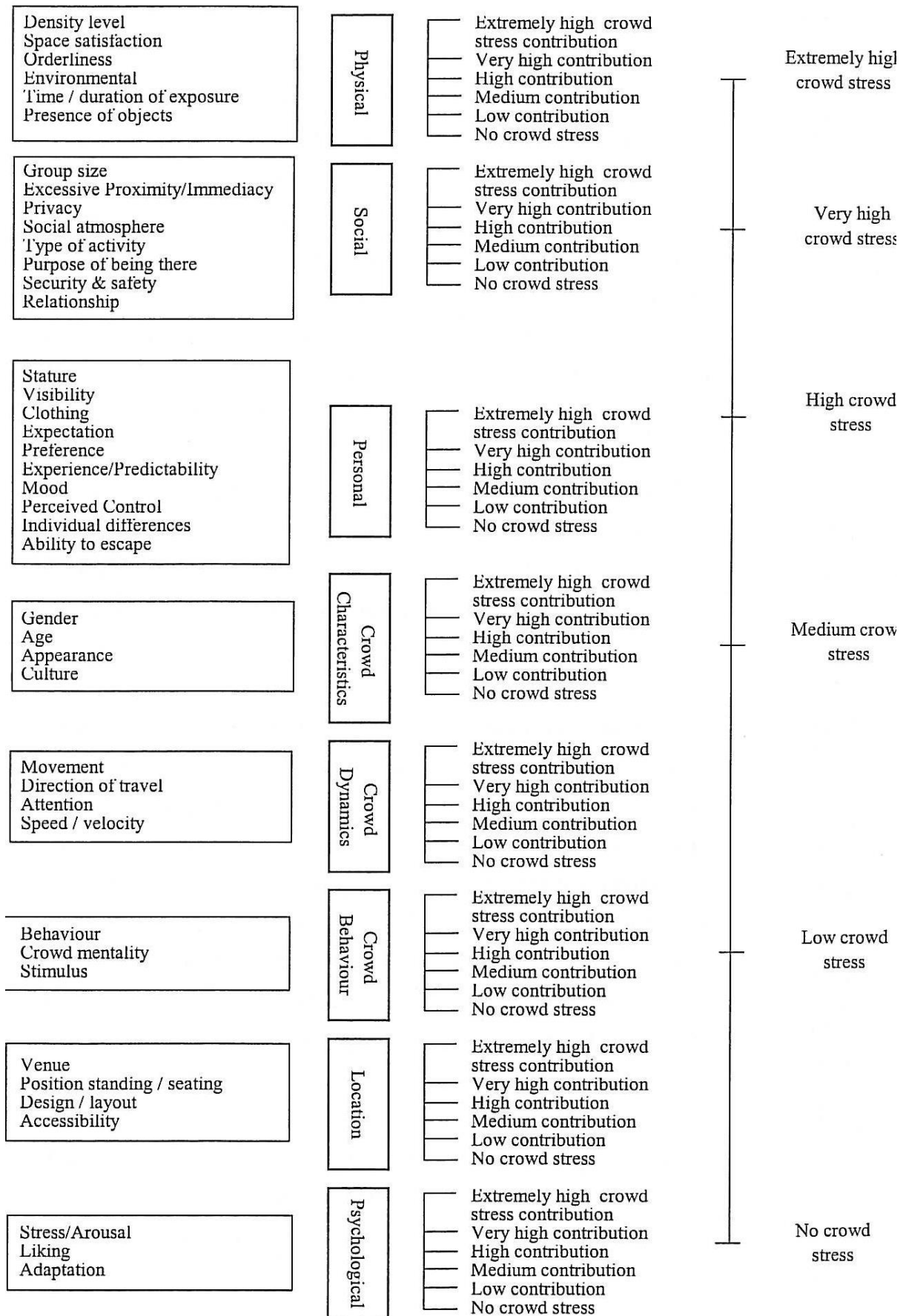
Mahudin (2003) has developed a Crowd Stress Index (CSI) for use in the assessment of crowd safety risks. She notes that crowding has become a complex research area, extending beyond the simple manipulation of objective measurements (such as density) to the more cognitive-perceptual experience. While evidence regarding the role of subjective measures exists, such as studies by Loo (1973), Rapoport (1975), Saegert (1978) and Stokols (1978), assessment of the range of dimensions has been limited. One of the common recommendations found in the crowding literature is to develop new lines of thinking about crowding. Mahudin (2003) suggests that this includes formulating a methodological strategy of multiple dependent measures which can be examined in terms of patterns or profiles. Altman (1978) predicted that one result of this strategy would be a better understanding of crowding as well as a more holistic understanding of the impact of crowding on intact individuals and social groups.

The Crowd Stress Index (CSI) developed by Mahudin (2003), set out in Figure 5.4, identifies twenty-four factors across eight components (or identifiers) that can contribute to crowd stress, and proposes a method that integrates them into a single number that relates to the magnitude of that stress, and, therefore, the likely physiological and psychological strain that can range from discomfort and dissatisfaction to concern, panic and death (Parson & Mahudin 2004). Mahudin defines crowd stress as ‘the feeling of having insufficient space due to the proximity of other people’ (Parsons & Mahudin 2004, p. 411).

The rationale for a crowd stress index (CSI) is that it will predict the extent to which a person in a crowd will feel that they have insufficient space due to the proximity of other people. A high CSI value will, therefore, predict high levels of strain with consequences such as panic, injury and death. A low CSI value will predict low levels of strain and no unacceptable consequences.

Of the eight components (or identifiers) identified by Mahudin, three (i.e. physical, location and crowd dynamics) relate to the physical environment, while the remaining five (i.e. personal, social, psychological, crowd characteristics and crowd behaviour) all relate to the psychosocial dimension, and might, therefore, be useful factors to consider in this study.

Figure 5.4: Mahudin Crowd Stress Index



3.4 Still (2009, 2014) – the DIM-ICE model

Still (2014) suggests that conventional risk assessment documents, particularly those that relate to crowd safety, are fundamentally flawed for a number of reasons. First, the method is biased towards overestimating risk. Second the process is usually carried out as a form-filling exercise, with writers taking a ‘cut-and-paste’ approach to the development of their risk assessment. Finally, and most importantly, a person reading a risk assessment does not have enough information to address relevant crowd safety issues owing to the condensed format of the typical risk assessment report. As a consequence, Still comments (2014, p. 48) that the standard crowd risk analysis process of multiplying the likelihood of the risk occurring and the consequences of that risk, fails the basic principles of Information Theory (Shannon 1948) in that it is impossible to reconstruct the conditions that give rise to many crowd-related risks, especially those which are dynamic in nature.

Still (2009, 2014) suggests that there are three fundamental categories of systemic failure common to all crowd-related incidents – design, information and management related failures, and that there are three main phases of concern when considering the movement of people in high density environments - ingress, circulation and egress. Ingress relates to the period prior to the event, circulation typically relates to movement within the venue, and egress relates to leaving the event. Still (2009, 2014) combines these into a model, the DIM-ICE model, which is used to compare the situation during normal and emergency conditions for each phase and influence. The model, which is outlined in Figure 5.5, does not replace conventional risk assessment or event planning, but rather provides a framework for evaluating crowd influences and behaviours. Figure 5.6 outlines the types of considerations that need to be addressed regarding each component in each phase.

Figure 5.5: DIM-ICE Model (Still 2009, 2014)

Normal	Ingress	Circulation	Egress
Design			
Information			
Management			

Emergency	Ingress	Circulation	Egress
Design			
Information			
Management			

Figure 5.6: DIM-ICE Model (Still 2009, 2014) outlining relevant considerations

NORMAL	Ingress	Circulation	Egress
Design	Elements of the design that influence the crowd during ingress – this specifically relates to the elements of the design (such as barriers, local geometry, width of routes, paths and stairs, entrances, turnstiles, etc.)	Elements of the design that influence the crowd during circulation (this relates to ‘mid-event’ – moving around) such as route widths, stairs, layout and facilities management, concessions, etc.	Elements of the design that influence the crowd during egress (getting out) – specifically the egress capacity, route complexity and geometry (stairs, corridors, doors, gates, etc.)
Information	Prior to the event a lot of things can influence the crowd behaviour such as advanced notifications, media coverage, tickets and posters, local knowledge, previous event history, nature of band, weather forecasts. Assess how the information prior to the event, near the event, on the way to the event and at the venue could influence the crowd – specifically signage and information systems.	Mid-event there could be a lot of conflicting information; the performance, the concessions, signage, PA announcements, stewards, information points. Assess how this influences the crowds and how best to inform the crowd of the facilities.	Signage and PA announcements for departure (non-emergencies) influence not only the direction but the distribution of the crowd. Ensure that all routes are clearly signed – checking for lines of sight to ensure all exit routes are visible.
Management	Stewards, security and police management can divert the crowd to the most appropriate areas but they also influence the crowd’s behaviour (such as reducing the element of hooliganism by increasing the visibility of police – this is also information). Queues can be actively managed and evenly distributed if approach routes allow good sight lines.	During the event the stewards can actively manage queues and crowd movements.	During egress departing crowds can be actively managed - specifically car parks can be made more efficient if actively managed (rather than allowing a free-for-all dash for the exit).
EMERGENCY	Ingress	Circulation	Egress
Design	How does the ingress system cope during an emergency – you may need to consider a ‘stay out’ strategy and assess how the design copes with turning the crowd back from (say) an internal threat.	Mid-event; how quickly can this site evacuate – this is typically the type of calculation a fire/safety officer would perform to ensure the site had sufficient egress routes and capacity for clearance.	How does the egress system cope during an emergency – you may need to consider a ‘stay put’ strategy and assess how the design copes with holding the crowd back from (say) an external threat.
Information	During ingress, how would the crowds be informed of an emergency? What type of information, in what form and content is required?	Mid-event, how would the crowds be informed of an emergency? What type of information, in what form and what content is required? Ensuring the crowd moves away from the threat requires more than just a ‘please leave’ announcement.	During egress, how would the crowds be informed of an emergency? What type of information, in what form and content is required? For this you need to consider the crowd in the process of normal egress.

Management	During ingress there may be more people trying to gain entry than is physically possible (for example a ‘free’ event). The crowds may need ACTIVE management to prevent overcrowding in the event space. This would be considered an emergency situation as there is a risk of crushing if the event does not have an active management system.	During the event the crowd may need to be managed (directed) away from threat. Consider the information (above) and the management of the egress for direction that ensures the crowd moves as quickly as possible AWAY from the source of danger.	The crowd may need to be managed AFTER evacuation (say on a holding area) to be kept safe until the threat/danger has passed. You may need to keep managing the crowd for several hours during a holding operation. You will need to keep the crowd informed until it is safe to let the crowd disperse.
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Still (2014) notes that the majority of crowd-related incidents are linked to design-related failures, in particular, entry system design, citing Cincinnati, USA (1979 – 11 dead, 23 injured), Hillsborough, UK (1989, 96 dead, more than 700 injured) and Love Parade, Duisberg, Germany (2010, 21 dead, more than 500 injured) as examples of disasters where there was a fundamental failure to understand the risk associated with crowds entering an event. Crowds arriving at an event require consideration for the throughput, the rate of passage through the system and the holding (queuing) areas. This needs to be sufficient for the anticipated crowd numbers that are expected. If the rate of arriving crowds exceeds the rate at which they can enter, a queue will develop. If that queue develops too quickly, the space will become overcrowded and, if left unchecked, could be fatal.

This approach recognises that, due to the nature of this type of activity and potential patron behaviour, risk is always shifting and changing throughout the course of an event. How risks can change over time is difficult to both articulate and visualise in the conventional risk assessment process, and the assignment of a single value can be both inappropriate and misleading (Still 2014, p. 50). For example, the moment the entry gates open, there is likely to be a surge of movement – high risk for a period of time, but then lower risk if the system is working efficiently. Similarly, during circulation there will be a surge of movement at performer change-over times resulting in high risk as patrons move between stages at the festival site, but then reducing once patrons ‘settle in’ to their selected viewing areas. In this context, however, a different set of risks will arise related to moshing activities. Egress can be as equally problematic as ingress. Still (2014, p. 53) recommends diagrammatic risk mapping as a valuable contribution to risk assessment for (dynamic) crowd-related risks.

As noted by Still (2014) crowd-related risks by their very nature can change and the challenge is to devise a method that is both simple to implement and provides useful information for the person who evaluates and manages crowd risks. In order to anticipate potential design-related problems, he proposes the adoption of a Routes-Areas-Movement-Profile (RAMP) analysis, the various components of which can be explained as follows:

Routes – outlines the directions the crowds take to get into the site, move around the site and leave the site (flow path analysis).

Areas – identifies the capacity of each sector of the event and the location of crowd densities (low, medium and high) and site risks relating to these locations.

Movement – measures the rate of passage through the various parts of the system (e.g. the rate at which patrons are processed through the ticket/search area), and general crowd flow (flow rate analysis) over the site.

Profile – estimates the expected behaviour of the crowd in moving between areas of the site.

In developing a risk profile for an event, Still (2014) advocates a simple and diagrammatic approach to risk mapping which is visually appealing, meaningful and readily useful. He suggests ‘mark ups’ of site maps and plans to highlight flow paths and areas of relative density using the following colour coding scheme:

- *Green* indicates areas where the crowd density is 2 people per square metre or less, and indicates low crowd safety risk
- *Orange* indicates areas where the crowd is 3-4 people per square metre, and indicates medium crowd safety risk
- *Red* indicates areas where the crowd density may be 5 people per square metre or more, and indicates high crowd safety risk.

While this approach provides an eminently sensible and practical approach to analysing routes, areas and movement, Still (2014) does not offer any suggestions as to risk mapping for the crowd profile component of the RAMP analysis. This is where, it is suggested, the method developed by the author and outlined later in this chapter, finds a logical home and ‘fit’. And, in addition to its use as a pre-event assessment tool, it can be used as a ‘real time’ instrument for monitoring and dynamically assessing crowd behaviour. The author has adopted the approach suggested by Still, incorporating the behaviour monitoring instrument, for a festival crowd analysis in 2014. The document is set out in Appendix J.

3.5 Arbon (2004)

Arbon (2004) notes that the ‘mass-gathering’ literature demonstrates that there are a number of key characteristics of an event (see Milsten et al. 2002) that impact on patrons’ health and safety. For example, circumstances surrounding mass gatherings, such as weather conditions, duration of event, crowd size or the emotional/psychological states of the participants, have been shown to make events more hazardous and increase the vulnerability of patrons (Delir Haghighi, Burstein, Zaslavsky, Arbon & Krishnaswami 2010).

Arbon suggests that these factors influence the decisions that are made when planning for the provision of health services at events (Arbon 2004, p. 209) and has organised these characteristics into three primary domains - the psychosocial, environmental and biomedical domains (see Figure 5.7).

Figure 5.7: Arbon’s conceptual model (2004)

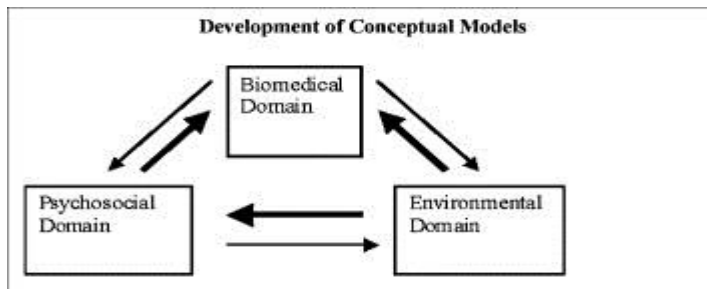
<i>Psychosocial domain</i>	<i>Biomedical domain</i>	<i>Environmental domain</i>
Crowd: a. behavior b. mood	Crowd and individual health status	Crowd: a. attendance b. density
Individual: a. motivation b. behavior	Latent potential for illness and injury	Venue: a. bounded/unbounded b. extended/focused c. locale/terrain
⇐ ⇒		⇐ ⇒
Crowd interests/ morals/ culture	Crowd average age/ gender	Type/ nature of event
⇐ ⇒		⇐ ⇒
Rationale/ reason for attendance	Activity level (participant/ spectator)	Predominantly seated or mobile
⇐ ⇒		⇐ ⇒
Length of stay	Heat- or cold-related physiology	Outdoor or indoor weather (temperature/humidity)
⇐ ⇒		⇐ ⇒
Use of alcohol or drugs	Alcohol- or drug-related physiology	Availability of alcohol or drugs
	↓	↓
	Effect	Response
	Risk of injury or illness: a. Patient presentation rate (PPR) b. Transport to hospital rate (TTHR)	Level and extent of healthcare services

Prehospital and Disaster Medicine © 2004 Arbon

Each domain has set characteristics which help to explain the impact on the mass-gathering event. For example, crowd behaviour is considered in the psychosocial domain, health status in the biomedical, and crowd density in the environmental domain giving a full descriptor of separate characteristics of the crowd, which all interrelate and impact on each other.

In addition, Arbon's (2004) conceptual framework aims to describe the interrelationship between the psychosocial, environmental and biomedical domains of a mass gathering (see Figure 5.8). Strengths of influence are further described within the model to clarify the interrelationships of the domains on each other.

Figure 5.8: A relationship model of domains for mass-gathering health. (Relative strength of influence is indicated by weights of arrows.)



Given that Arbon's model was developed in the emergency medicine content, it is logical that the biomedical domain is the linchpin of the model, to which the other two domains contribute. The biomedical domain includes the health of both the crowd and the individual and also the potential for illness and injury. The data collected covers items such as the average age, dominant gender, and the level of activity of the crowd. Drug and alcohol physiology is also assessed in order to understand the impact on crowd behaviour. These indicators are linked to the overall risk of illness or injury at a mass-gathering event (Arbon 2004).

The environmental domain incorporates the geographic features of the environment (Arbon 2004) and whether the event is hosted inside or outside, seated, mobile or bounded (fenced or not fenced). Characteristics include crowd attendance, crowd density and the availability of drugs and/or alcohol. Temperature and humidity are also important. Since all of these characteristics, and in particular the crowd density and weather conditions (Milsten et al. 2002), impact on the potential for injury and illness (Arbon 2005), the environmental domain is strongly aligned with the biomedical domain. Moreover, the environmental domain can also influence the psychosocial domain in regards to how environmental influences impact on crowd mood and behaviour (Arbon 2004; Zeitz et al. 2005). For example, evidence has shown that extended length of travel increases the likelihood of presentation to health care services at the event (Arbon 2005).

The characteristics of the psychosocial domain also have a strong influence on the biomedical domain (Arbon 2004). Characteristics of the psychosocial domain include the social influences within a mass gathering, such as the examination of individual and crowd mood and behaviour, crowd interests, rationale for attending the event and the use of drugs and alcohol (Arbon, 2004). The use of alcohol and other drugs (AOD) in particular impacts strongly on the biomedical domain as it is well documented that the use of AOD increases the latent potential for injury and illness to the mass-gathering population (Milsten, Maguire, Bissell & Seaman 2002). In fact, Arbon et al. (2001) found a doubling of presentations where alcohol is on sale.

The reason for attending an event also has a strong impact on the biomedical domain, as the individual's impetus for attending and their behaviour at a mass gathering can also be a factor in injury presentation. Event organisers and promoters need to be aware of the implications of attracting particular types of clientele. The HSE (1999, p. 7) argues that event organisers and promoters must be aware of the history of the performers selected and the types of audiences they attract. Both the HSE (1993) and Upton (2004a, p. 5) have indicated that knowledge of the crowd demographics and behaviours are important for both design and operational features for outdoor music festivals.

Analysis of mass gatherings has improved understanding of the elements of an event and the impact the event may have on participant health and safety outcomes. For example, Hutton, Munt, Zeitz, Cusack, Kako & Arbon (2010) used the framework to examine the Adelaide Schoolies Festival and concluded that:

...while Arbon's (2004) mass gathering conceptual framework does not consider how individuals prepare to attend a mass gathering event, the three domains and their characteristics, variables and inter-relationships are very important components that used together can assist with understanding and predicting the behaviour of crowds at mass gathering events. The outcome of such an assessment can be an improvement in outcomes especially in regard to a reduction in reported injuries and illnesses (p. 185).

Arbon's (2004) conceptual model of mass gatherings is a useful starting point in developing a better understanding of the safety dynamics at outdoor music festivals.

3.5.1 The biomedical domain

Factors impacting on the biomedical domain include the level of activity, heat/cold (including humidity effects) and, in particular, alcohol and drug consumption.

3.5.1.1 Alcohol and drug consumption

Many authors have perceived alcohol consumption to be the biggest influence on crowd behaviour. Research suggests that genre and audience profile can influence the level of spend on alcohol (White 2001). Parker and Auerhahn (1998, p. 292) explained that experimental studies have shown a consistent relationship between alcohol use and aggressive behaviour, especially in the presence of social cues, such as aggressive music or an antagonistic performer.

Wertheimer (2000b, p. 16), who reported on a large survey of event professionals in the United States, said that 70% of the respondents considered alcohol consumption to be the major risk factor they had to manage. Furthermore, a University of Illinois study into 300 medical incidents at outdoor concerts in Chicago, found that 48% of those being treated had taken alcohol or drugs. Alcohol was the most common substance used by concert spectators and was documented in 36% of all patients (Reuters 2007).

Allsop, Pascal and Chikritzhs (2005) warned that it is difficult to predict the effects of alcohol consumption on any group. Drunken males were identified as potentially problematic, especially in relation to aggressive types of behaviour such as fight dancing (Allsop, Pascal & Chikritzhs 2005). It should be noted that the relationship between alcohol consumption and aggressive behaviour is complex and influenced by a range of social cues (Allsop, Pascal & Chikritzhs 2005), including:

- (i) aggressive music or an antagonistic performer
- (ii) the expectations, characteristics, values and attitudes that individuals have
- (iii) any changes to an individual's perceptions, motor skills, emotions or cognitions.

Finally, there is increasing evidence that the use of illicit drugs, such as cocaine and methamphetamine, are also having an impact on crowd behaviours at outdoor music festivals and other events (see, for example, Earl et al. 2004b; Vider 2004).

3.5.2 The environmental domain

The environmental domain considers the type and nature of the event, characteristics of the venue including the natural environment and elements if the event is an outdoors one, whether patrons will be seated or mobile, the density of the crowd and its movement. Crowd densities and crowd dynamics are of particular concern for crowd managers.

3.5.2.1 Infrastructure and services

EMA (1999, xiii) has warned that the inappropriate provision of infrastructure and essential services to meet the needs of each outdoor music festival has resulted in increased health and safety risks for festival patrons. Particularly relevant from a safety perspective is the immense size of these events, as they are not limited by the same physical constraints as indoor events. For the majority of outdoor music festivals there are limited or no permanent facilities existing on the sites used, and these crowds require substantial food and water supplies, liquid and solid waste disposal services, first aid, medical and emergency evacuation facilities, traffic management, and a high level of crowd management and control (DoH 2005; EMA 1999; HSE 1999). It is important that infrastructure and services reflect the intended or anticipated attendance for each event (EMA 1999, xiii; HSE 1999, p. 1). Examples of services required include the following:

- (i) fire safety escape routes, appropriate and adequate firefighting equipment and staff (numbers and capacity) (HSE 1999, p. 21-30)
- (ii) first aid and medical services involving medical facilities, ambulances and appropriate staff, including mobile patrols (Hodgetts & Cooke 1999, p. 957)
- (iii) emergency management planning for structural faults, equipment or amusement ride failure or malfunction, bomb threats and crowd control (DHS 2003, p. 28)
- (iv) security and stewarding for crowd control, guarding of 'back of house', back stage and 'front of house' areas, cash and equipment protection and control of entry and exits (MCDEM 2003, p. 36)
- (v) environmental health services (e.g. food, waste management, animal, pest or vermin management) (EMA 1999, p. 31-42)
- (vi) public transport co-ordination, traffic management and parking control (EMA 1995, p. 198)
- (vii) cleaning and maintenance services for ablution facilities, toilets and the general site (HSE 1999, p. 80).

3.5.2.2 Natural environment and elements

Being outdoors, these events can be affected by the natural elements. Environmental hazards include exposure to topography, solar and ultraviolet radiation, extreme temperatures, high winds, bushfires, storms, flooding, pests and pollens (EMA 1999, p. 31). There have been incidents where natural events have contributed to fatal disasters at outdoor music festivals. For example, 53 festival patrons died from a crowd crush at Belarus when attendees sought shelter from a hailstorm in an underground railway station (CMS 2001a, p. 5).

3.5.2.3 Patron numbers – crowd density

A relevant factor in the environmental domain which has a significant impact on crowd behaviour is the number of patrons at an event, or crowd density. Density is the number of people and/or objects in a given space (Drintewater and Gudjonsson (1989) and plays a central role in the appraisal of crowding (Baum, Davis, and Aiello 1978). Density is a physical condition of the environment, considered to be an antecedent of crowding, while crowding is a response or appraisal of the environment (Eroglu and Machleit 1990; Stokols 1978; Sundstrom 1978).

The Glastonbury festival, a premier outdoor music festival in Europe was not given a licence in 2001 because the event manager had not attempted to control the numbers attending the 2000 event (MDC, 2000). The police officers that witnessed the impacts of overcrowding at the 2000 event reported that this was of significant concern as the site capacity and infrastructure had been significantly compromised and public safety was put at risk (Avon & Somerset Constabulary, 2000).

In addition, successfully securing the festival site from unwanted entry is critical to ensuring that the infrastructure and services will remain adequate. Controlling numbers at outdoor music festivals can be difficult as many of the venues or sites used are not constrained by secure physical boundaries (EMA, 1999:17). Many of the venues are open farmlands or showgrounds and are easily accessible for unauthorised entry.

Crowding

Crowding is often equated to having too many people in one place at the same time, and the result of it is the feeling of being uncomfortable and edgy. According to the UK Design Guide for Interiors (1997), 'crowding occurs when personal space and territoriality mechanisms function ineffectively, resulting in an excess of undesired social contact'. Other definitions (Aiello et al. 1974) include the following:

1. A demographic condition of high population density where crowding is a function of the number of people and the area available per person. Hence, the less space per person, the more crowded the situation
2. A phenomenological reaction to spatial restriction where crowding is related to the perception of too many people or too little space
3. A social condition of high interpersonal stimulation where crowding is a function of unwanted, unnecessary and interfering potential or actual interactions.

The first two definitions share a common assumption that crowding is related to spatial restriction, interference, and territorial infringement (Knowles 1978). Crowding occurs when the demand for space exceeds supply during the individual's appraisal of the density condition (Stokols 1972; Eroglu & Harrell 1986). It is an outcome of an appraisal of physical conditions, situational variables, personality characteristics and coping assets (Stokols & Altman 1987). Crowding is personal and subjective to the individual. It is a motivational state that often results in goal-orientated behaviour which alleviates discomfort and centres on the feeling of having or controlling too little space. The third definition, on the other hand, regards crowding as a social phenomenon where an individual is affected by the presence of a crowd (or in other words the crowd influences the person). Among scholars who support this definition is Desor (1972), as well as Valins and Baum (1973) who proposed that crowding phenomena resulted from the overall level of stimulation from social sources and that feelings of being crowded are related to excessive stimulations or excessive/unwanted interactions.

Crowding has also been conceptualised as a psychological phenomenon. Under this view, it is described as the subjective feeling of unpleasantness due to the presence of other people. If the expectations on the use of space are violated by the presence of others, the feeling of being crowded is induced. Consequently, emotional distress may arise and some behavioural adjustments aimed at preserving one's personal space may occur. In other words, crowding can be defined as a negative assessment of a certain density level in a given area.

Research has shown that there is a stress arousal factor associated with crowding (Worchel & Teddlie 1976; Altman 1975; Valins & Baum 1973). Crowding causes stress due to the consequences of having to interact with other people (Sinha & Sinha 1989). It is important to note that different density levels affect individuals differently in terms of crowding feelings. ‘In some conditions and for some people, a given level of density will lead to crowding while in other conditions or for other people it may not’ (Baum & Paulus 1987 p. 534).

The vast environmental psychology literature on crowding effects has typically found that crowding has detrimental effects on human psychology, behaviour and physical health (Evans & Lepore 1992; Baum & Paulus 1987; Stockdale 1978). Crowding can produce a strong negative evaluation of the environment and the situation among all individuals (Schmidt & Keating 1979), and cause a spectrum of undesirable outcomes including psychological distress (Evans, Schroeder, & Lepore 1996; Gomez-Jacionto & Hombrados-Mendieta 2002), social withdrawal (Evans, Rhee, Forbes, Allen, & Lepore 2000), aggression (Regoeczi 2003), role stress (Szilagy & Holland 1980), hostility, anxiety, and desire for interaction (Zeedyk-Ryan & Smith 1983), and fatigue, irritation, annoyance, and involvement (Aiello, Thompson, & Brodzinsky 1983). It has also been shown to affect task performance (Heller, Groff & Solomon 1977; Paulus & Matthew 1980), affect (Bruins & Barber 2000; Langer & Saegert 1977), and job satisfaction (O’Brien & Pembroke 1982).

Paulus (1980) has explained that the level of emotion in a crowd is related to the density of people within that crowd. As crowd density increases, the intensity of an individual’s moods and behaviours increases (Freedman 1975). This level of intensity has been used to describe different types of crowds that might be encountered, such as:

- casual crowds – people who happen to be in the same place at the same time with only brief, if any, interaction, such as shoppers in a mall
- conventional crowds – people who have come together for a scheduled event and share a common focus, such as graduation ceremonies
- expressive crowds – people who are releasing their pent up emotions with others who share similar emotions, such as a football grand final
- acting crowds – people intensely focused on a specific purpose or object, and on the verge of violent or destructive behaviour, such as those associated with mobs, riots or panic-driven crowds (Blumer, cited in Kendall, Murray & Linden 2000).

Theories of crowding

There are several theoretical bases for understanding the crowding phenomenon. The *stimulus overload theory* of crowding was developed from studies on city life that involved high levels of physical and social stimulation (Wirth 1938; Simmel 1950). Overload is defined as a situation in which the rate and amount of environmental stimuli exceed the capacity to cope with the stimuli (Miligram 1970). This theory assumes that there is an optimal level of stimulation, and deviations from this ideal state are undesirable (Altman 1978). High density causes high levels of stimulation that overload the individual's processing capabilities, thus resulting in the perception or appraisal of crowding and stress. Research on overload models and crowding has been empirically tested in many studies (Saegert 1973; Langer and Saegert 1977; Altman 1975). The major premise of the overload model is that when one's processing ability of environmental stimuli has been exceeded, the perception or appraisal of crowding will result.

The *arousal theory* is very closely related to the overload model (Evans and Lepore 1992). Arousal has a curvilinear effect on performance with low and high levels of arousal leading to negative results, and medium arousal leading to positive results (Hebb 1972). This inverted U relationship is also called the Yerkes-Dodson Law. Hebb (1972) argued that there is an optimal level of arousal and people will behave in such a manner as to maintain it. Support for this curvilinear effect has been found in many empirical studies (Broadbent 1971; Hebb 1972). High density creates above-optimal levels of arousal, thus causing stress and negative reactions from individuals such as unpleasant feelings and decreased performance on complex tasks (Evans 1978; Paulus, Annis, Seta, Schkade, & Matthews 1976). In addition to arousal directly affecting individuals, it may also be a consequence of overload (Cohen 1978), thus linking the overload and arousal theories (Evans and Lepore 1992). Therefore, individuals in a high density situation may experience both arousal and overload, leading them to appraise the environment as crowded.

The third theory that helps explain the effects of crowding is Zajonc's (1965) *theory of social facilitation*. The basic premise of social facilitation theory is that the presence of others increases arousal. This, then, enhances the tendency to perform stronger dominant responses, the latter being responses with the greatest habit strength. Increasing the number of individuals results in increased feelings of being crowded (Baum and Greenberg 1975), less satisfaction with the environment (Aiello, Epstein, & Karlin 1974; Griffitt & Veitch 1971),

less liking of, and more competitive orientation towards, others (Baum & Greenberg 1975; Griffitt & Veitch 1971), and greater physiological or psychological symptoms of stress and arousal (D'Atri 1975; Aiello, Epstein, & Karlin 1974). These studies indicate that as the number of people in a given environment increases, the appraisal for crowding increases. Thus, these studies illustrate the negative effects of large numbers of people within an environment.

The fourth theory of crowding is *adaptation theory* (Helson 1964; Wohlwil 1974). Adaptation theory posits that all individuals seek an optimum level of stimulation from the environment, and that individuals with over- and under-stimulation will engage in ways to reduce or increase the amount of environmental stimulation. This optimum level of stimulation is known as the adaptation level and is based on the individual's previous experiences (Baron 1995). When individuals are not in their adaptation level or preferred range of stimulation, they seek to devise coping mechanisms to minimise the amount of negative effects of the situation. Empirical evidence has been found to support this theory with crowding and coping behaviours (Sundstrom 1975). A second aspect of adaptation theory contends that there are shifts in the adaptation level itself. Without any conscious effort, the individuals over time may shift their tolerance levels so that they get accustomed to dealing with higher density than before (Baron 1995). Research supporting crowding and shifts in adaptation is limited because of the necessity to study responses at different times (Sundstrom 1978). Adaptation theory helps explain the perception of crowding, the adaptations that are made in response to crowding, and the shifts in responses to crowding.

The fifth theoretical explanation of crowding is *behavioural constraint* that draws from Brehm's (1966) reactance theory that human beings have a basic desire to maintain their behavioural freedom. When an individual's desired actions are restricted due to excessive amounts of people in an environment, the individual will perceive the environment as crowded. Studies have shown that high density interferes with goal attainment and restricts movement (Evans & Lepore 1992; Stokols 1972; Sundstrom 1975). Another study by Proshansky, Ittelson & Rivlin (1970) observed that crowding was experienced when environmental density led to the frustration of an individual's pursuit of important activities and goals. Any perceived limitation of freedom to perform a behaviour will result in an individual's reaction to the setting in a way to restore that freedom. According to Saegert (1978), a person loses behavioural freedom in high density environments in the following

ways: (1) through lack of space to move freely, (2) through the increased need to coordinate behaviour, (3) through the increased number of people with whom coordination is required, and (4) through less complete and accurate knowledge of conditions, which in turn reduces awareness of behavioural options.

At least three conclusions can be reached from the above review of crowding theories that are relevant to this study. First, crowding leads to a stressful experience which results from a high density condition when demand for space exceeds the supply. Second, crowding has physical, psychological and behavioural outcomes, depending on its intensity and duration. Third, to the extent that crowding is experienced, it can interfere with goal achievement and, therefore, indirectly impact all of the physical, psychological and behavioural ramifications related to the success or failure of this endeavour.

Studies of crowding phenomena

The research literature appears to reflect four main conceptual phases in crowding research, each of which build logically on the preceding one. These phases relate to:

- animal research
- experimental research on people
- conceptual research
- human behaviour research.

Animal research

Stockols (1978) reports that the earliest systematic studies of crowding were conducted by animal researchers from 1960 to 1969, who reported that population concentration among members of laboratory or naturalistic communities led to severe behavioural and psychological impairments (Ardrey 1965; Calhoun 1962; Lorenz 1966). These findings supported the notion that high density is necessarily associated with a syndrome of crowding stress; i.e. density = crowding = stress. Findings from the animal studies subsequently generated widespread interest to extend the investigation into human communities.

Correlational surveys utilising census tract indexes of density, crime, suicide and disease were carried out (Mitchell 1971; Schmitt 1966) and yielded a significant positive relationship between measures of population density and rates of pathology. The results suggest that density or crowding acts as a stressor that promotes social and psychological anomalies among nonhumans and humans alike (Stokols 1978).

Experimental research on humans

The second phase of crowding research reveals the adoption of more experimental and empirical approaches. Some interesting findings were revealed during this phase. For example, task performance remained unchanged by high density; females were found to have a higher tolerance for special limitation; and that males and people in large groups were more likely to act aggressively than those in smaller ones (Griffitt & Veitch 1971; Proshansky et al. 1970).

This phase was also dominated by two views of crowding. The first view was put forward by Freedman (1975) and Mitchell (1971), who concluded that the remarkable capacity of people to adapt to their environment enabled them to tolerate their exposure to high density conditions while experiencing no negative effects of that exposure. An alternative view of crowding was suggested by Proshansky and colleagues (1970), who considered that density or crowding is not always problematic for people, but becomes stressful to the extent that it precludes privacy or places other limitations on behaviour. During this phase, then, density was equated with crowding but with the absence of stress at the human level.

Conceptual research

The third phase of crowding research was marked by a conceptual distinction between the terms *density*, a physical condition of limited space, and *crowding*, an experience in which one's demand for space exceeds the available supply. During this phase, attempts were made to analyse the relationship between high density with perceived crowding, and stress based on existing social psychological theory. At least three theoretical perspectives were proposed as a basis for specifying the circumstances under which density exerts negative effects on behaviour - stimulus overload, behavioural constraints and ecological orientations.

Stimulus overload analyses portrayed high density as a stressor, variable to the degree that it exposes individuals to excessive levels of stimulation. Behavioural constraint formulations viewed high density as stressful to the extent that it imposes restrictions on behavioural freedom. And from an ecological perspective, high density was characterised as disruptive to the degree that it is accompanied by a shortage of social roles or physical resources in a particular setting.

Building from this third stage, the period from 1974 to the late 1980s witnessed the formulation of a crowding construct, subsequent refinements and elaborations of this construct, and the consequent development of a comprehensive theory of crowding and spatial behaviour.

Human behaviour research

The present phase of crowding research continues to highlight issues such as the use of human space (Kaya & Erkip 1999), privacy dimensions (Demirbas & Demirkan 2000), and the effects of crowding on human behaviour (Bruins & Barber 2000). However, the research interest has taken a different twist with vigorous attempts to explore crowd safety and crowd management (Au 2001; Chow & Cho 2002; Marana et al. 1998), to develop methods of modelling crowd motion (Al-Haboubi & Selim 1997; Fang et al. 2003; Smith 1995; Tajima & Nagatani 2001), as well as conducting cross-cultural investigations on crowding (Evans, Lepore & Allen 2000). The current scenario is also characterised by methodological innovativeness in the study of crowding. Efforts to quantify mood, stress or arousal, social behaviour, task performance and perception of the environment, both objectively and subjectively, have been actively pursued by researchers, leading to the development of indexes such as the Residential Crowding Experience Scale (Nagar & Paulus 1997) and the Perceived Crowding Scale (Heberlein & Vaske 1977; Tarrant 1999).

Crowding and stress

The contention that crowding can have a negative impact on health and safety rests in part on straightforward evidence as well as on the postulation that crowding induces physiological stress. Stress can be viewed from three perspectives. Firstly, it is regarded as a stimulus where the focus is on the source of tension. Stressors are physically or psychologically challenging events or circumstances. Examples are catastrophic events or chronic circumstances. In the second perspective, stress is viewed as a process. Not only does this perspective focus on the stressors and strains but also adds transactions between people and the environment. A person is regarded as an active agent who can influence the impact of a stressor through behavioural, cognitive and emotional strategies. The third perspective views stress as a reaction or response to stressors. This reaction could be psychological (behaviours, thoughts and emotions) or physiological (heightened bodily arousal). Proponents of this perspective view stress as a feeling which results from excessive pressures and environmental stimuli.

By implication, this feeling is unpleasant and unwanted and there are likely to be associated medical symptoms if the pressure persists. Consequently, this study will adopt the third perspective and regard stress as the 'conditions in which person-environment transactions lead to a perceived discrepancy between the physical or psychological demands of a situation and the resources of the individual's biological, psychological or social systems' (Mahudin 2003). In view of this, crowd stress can, therefore, be defined as 'the feeling of having insufficient space due to the proximity of other people' (Parsons 2003).

The assumption that crowding induces stress is manifested in the frequent use of crowding in animal studies as a stressor in examining the relationship between health and psychological stress (Ardrey 1966; Calhoun 1962; Lorenz 1966). Generally, animals that were crowded demonstrated changes in physiological indexes such as increased adrenal gland activity, hormonal changes, and aggression. In a study on chimpanzees by Waal et al (2000), where they calculated the rate of self-scratching (which indicates anxiety among primates) and cortisol level, it was found that groups of chimpanzees that had little space and heard neighbours' vocalisations experienced more stress. Also, in the absence of noisy neighbours, chimpanzees in small spaces showed the same stress level as those with more space.

As a form of stress to humans, crowding involves subjective discomfort and physiological arousal (Lazarus 1966). Common sense tells us that the greater the amount of crowding, the higher the degree of stress. This impression has been supported by substantial literature that depicts a stress-pathology linkage between crowding and a multiplicity of outcomes. For instance, greater traffic congestion and exposure to crowding in mass transit environments are associated with absenteeism at work (Knox 1961; Novaco et al. 1990), feelings of irritation, frustration, anxiety and general annoyance (Novaco et al. 1979; Evans & Carrere 1991) and reduced job satisfaction (Kozlowsky & Krausz 1993), particularly for women (Novaco et al. 1991).

From the physiological perspective, there is evidence that the higher the level of density the greater the level of both perceived stress and neuroendocrine indicators, even for a relatively short period. (Lundberg 1976). These findings are supported by Singer et al (1978), who found elevated catecholamine levels for commuters travelling by train under crowded conditions. Another study by Bencsics et al (2001) also found that a high crowd density in trains can induce significant physical discomfort. Likewise, literature on prison crowding

reveals that long-term crowding causes high blood pressure, higher death rates, more disciplinary problems and higher psychiatric needs (McCain et al. 1980).

In terms of behavioural changes, many studies have also shown that individuals in a crowded, dense environment for a short period of time demonstrated behaviours such as aggression, lower task performance, poor memory and anxious feelings, as well as poor development of a sense of individuality. Although it has been reported that higher density environments result in increased aggression, during activities involving competitive elements individuals were withdrawn rather than aggressive. Hutt and Vaisey (1966) showed that individuals with lower levels of electrocortical activity (brain-damaged children) became more aggressive under crowded conditions, whereas autistic children with abnormally high levels of electrocortical activity exhibited extreme withdrawal from social activity under the pressures of crowding, while normal children exhibited a drop in social interaction.

Heat, crowding and stress

Heat, when combined with crowded conditions, is thought to contribute to aggressive behaviour. Griffitt (1970) showed that interpersonal relations are more negative and critical at elevated temperatures (more than 32 degrees Celsius) than in normal conditions (such as between 20 and 24 degrees Celsius). These results were confirmed by those of Griffitt and Veitch (1971) on the combined effects of crowding and density. In the latter study, it was found that people were less friendly towards each other on hot days, and regarded each other more negatively when many people were crowded into one room. Another finding was that the subjects imagined themselves to be warmer in a crowded room than in an uncrowded room, even though temperatures in both were identical. This, according to Griffitt and Veitch, implies that 'hot weather', or negative interpersonal responses, may occur in crowded conditions where only moderate temperature prevails. Twenty years later a study by Braun and Parsons (1991) supported this notion, as they discovered that there is a tendency to associate heat, odour and discomfort with the feeling of being crowded. Their experiment found that for conditions normally within the comfort range, low density crowds can cause significant thermal strain and this can be attributed to restricted evaporative loss in the thermal microclimate as well as to other heat exchange mechanisms.

3.5.2.4 Patron movement - crowd dynamics

Crowds display a wide variety of behaviours that arise spontaneously from the collective motion of unconnected individuals. There are a number of useful theoretical constructs used to interpret crowd dynamics. One view is that people move roughly like particles in a liquid – hence the use of terms like ‘crowd flow’. Other theorists suggest that crowds behave like gas molecules (Davis, Yin & Velastin 1995). Helbing and Johansson (2010) note that when crowd density is low, pedestrians can move freely and the observed crowd dynamics can be partially compared to the behaviour of gases. At medium and high densities, however, the motion of pedestrian crowds shows some striking analogies with the motion of fluids.

At extremely high densities, though, motion is more analogous to driven granular flows. Fruin (1993, p. 40) has commented that if this type of crowd movement were observed, crowd densities would be at about seven persons per square metre, which is very dangerous. At this density, people can be lifted off their feet and propelled as much as three metres or more. It is often hard to breath, and the heart and thermo insulation from the surrounding human mass causes weakening and fainting. When densities are less, and independent movement is still permissible, Still (1999, p. 2), who undertook an extensive crowd study at Wembley Stadium in London, has suggested that there are clear patterns to movements within crowds when he observed:

...the same patterns recurring time and again: long chains of moving people would form spontaneously, persisting with almost military precision before fading away into randomness. The particular patterns of movement would vary in different parts of the Wembley complex, but [the movement patterns] would stay consistent in each part...the type of crowd made little difference, the same thing happened whether they were there to see Tina Turner or a football match.

This occurs because a moving crowd, even a large one, has the capacity to self-organise safely if the density is low enough. Under normal conditions, crowds have a spontaneous intelligence of their own, developing ‘laminar flows’, or streams, that keep everyone moving. One of the best-known examples is the spontaneous formation of unidirectional lanes in bidirectional pedestrian flows. As density increases, these smooth patterns start to disintegrate. In a study by Helbing et al (2007), as crowd density rose, they identified the onset of stop-and-go waves similar to those found in road traffic jams. This was followed by transition to a much more chaotic state, with outbreaks of panic as individuals lost control. This phenomenon, known as crowd turbulence, can trigger disasters.

Cooper et al (2006) suggest that there are three governing psychological factors which influence crowd movement. The first is that each person is trying to reach a specific geographical goal. The second is that people will walk at a maximum speed dependent on certain environmental conditions. The third is that a discomfort zone exists – this means that if all things were equal then someone would rather be at one point than another. This can also be thought of as personal space. These three factors all interact with each other to determine what path a person in a crowd will take when considering how to reach their desired position. Once these and other factors governing crowd behaviour, including leadership, emotional intensity and collective unity of purpose (Berlonghi 1995), have been established, the crowd's behaviour can be anticipated. Both individual and collective human behaviour can be predicted, as it is largely rational and goal-oriented, and as time evolves a hierarchy of goals is formed and these influence the decisions that a person will make⁷¹.

This typical approach towards studying crowds conceives them as a collection of individuals who are undergoing some common experience (Milgram & Toch 1969), but does not always consider smaller subgroups of people within the crowd. The issue of groups within a crowd has not been totally overlooked by social scientists, who recognise that a 'physical crowd' may be made up of more than one 'psychological' crowd or group (McPhail 1991; Turner & Killian 1987; Reicher 2001). However, this observation has played a relatively small part in the modelling of crowd dynamics. If people interact with a crowd as part of a group rather than as individuals, then it may be appropriate to extend crowd analysis beyond the inter-individual level. Aveni (1977) conducted a study into the relevance of considering subgroups within a larger crowd by periodically interviewing members of the public attending an American football game. The findings of this study indicated that only a quarter of the people in this crowd were actually by themselves, thus showing that the majority were not isolated, anonymous individuals. More recent research across a range of types of crowd events has supported this finding. It has been shown, for example, that (a) many people in crowd events are known to each other rather than being anonymous (Reicher 1984); (b) large crowds are sometimes made up of opposing factions, who act and move collectively yet against other groups in the crowd as a whole (Stott et al. 2007); and (c) the extent to which people in a crowd operate and behave as individuals as against their behaviour in subgroups or collectively varies over time and place (Drury & Reicher 2000).

⁷¹ It is largely for this reason that crowds can be modelled using rational computer programming: Hughes & Lee (2006).

3.5.3 The psychosocial domain

Hutton, Zeitz, Brown and Arbon (2012) suggest that crowd behaviour is the most visible feature of the psychosocial domain of mass gatherings. Zeitz, Bolton, Dippy, Dowling, Francis, Thorne, Butler and Zeitz (2007) describe it as an important factor that requires assessment and monitoring to underpin management actions. Sime (1993, 1995) has argued that insufficient attention to the way that people behave in a crowd, and the relationship between behaviour and systems design are major factors in crowd disasters. Berlonghi argues that it is important to understand crowds to ensure ‘competent and effective action’ when managing them (1995, p. 239), and that without understanding the nuances of the crowd’s behaviour, disastrous mistakes can happen in planning and in crowd management and control.

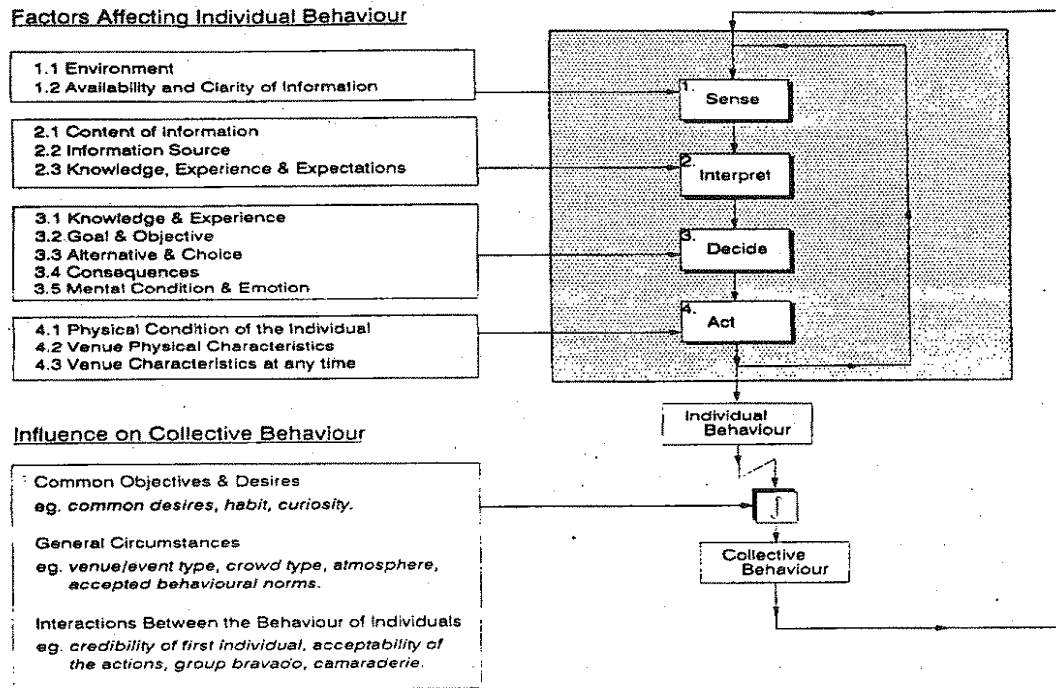
Al-Gadhi (1995, p. 78) suggests that ‘variation in crowd behaviour (B) may be attributed to variation in three factors: crowd characteristics (C), facility design and layout (F) and management practices (M). That is, $B = f(C, F, M)$ ’, and that crowd characteristics ‘include, but are not limited to, the physical characteristics of the crowds and their movement, normal crowd dynamics and triggering mechanisms that transform normal crowds into potentially hazardous mobs’.

To date, however, the science of mass gatherings has focused on the environmental and biomedical domains of mass gatherings, and the relationship between the environmental and the biomedical domains has been well described (Milsten et al. 2002; Arbon 2004, 2007). Zeitz, Tan, Grief, Couns and Zeitz (2009) suggest that crowd behaviour is the demonstrable factor that requires assessment and monitoring to underpin management actions, and note that no literature has progressed the notion of monitoring, assessing or describing crowds to underpin interventions or controls. Hutton, Zeitz, Brown and Arbon (2012) suggest that there is limited knowledge to support our understanding of the psychosocial domain, including identifiable key features and how these elements interact with each other. They note that there is ‘a dearth of literature describing the psychosocial domain and how the participants’ behaviour, mood and motivation impact their health and safety at mass gatherings’ (p. 415), as well as ‘limited evidence of practical tools for monitoring and measuring crowd characteristics at mass gatherings’ (p. 415).

3.5.3.1 Models of crowd behaviour

In an attempt to look at how behaviour might be affected at mass gatherings, Au et al (1993) developed a crowd behaviour model (see Figure 5.9) which outlines the factors influencing individual and collective behaviour.

Figure 5.9: Factors affecting behaviour in public venues (Au et al. 1993)



In this model, behaviour is considered to be a continuous process that is made up of the following four key elements:

- Sensing – obtaining information from the surrounding environment
- Interpreting – considering the meaning of the information received
- Planning – deciding on the actions required in response to the interpreted situation
- Acting – executing the plan or decision.

Using this approach, factors affecting crowd behaviour can be categorised in terms of:

1. Factors affecting the physical ability of people obtaining and receiving information (e.g. seeing, hearing, etc.) from the surroundings. This would normally depend on what and how much information is available, its clarity, and environmental factors such as lighting level, glare, noise, echoes, etc.

2. Factors affecting how the information is interpreted. Interpretation of information is a cognitive process that could be affected by the content of the information (e.g. is it sufficient, general or specific, open to misinterpretation, etc.), where the information comes from (e.g. how seriously people are likely to take it and are they going to trust it, comply with it, ignore it or take it to mean something else), and the people themselves (e.g. experience at similar events or in similar situations and expectation of what is to happen).
3. Factors affecting decision-making. This is also a cognitive process whereby people decide what to do next or what response is required to the information. This could be affected by a wide range of factors such as what people's knowledge and experience tell them, their goals and objectives (i.e. what they are there for, what they want to do, what immediate needs and desires they may have and whether, and to what extent, what people are required to do complements or contradicts their goals and objectives), what the alternatives and choices are, what people think are the consequences of doing or not doing certain things, and people's mental and emotional state (e.g. aggressiveness, fright, emotional fever, etc.).
4. Factors affecting their physical ability to execute whatever they have decided to do. This would often depend on the physical ability of the people themselves (e.g. influence of drugs and/or alcohol, injury, etc.), the venue design (e.g. layout, space and capacity, etc.), and any temporary features and characteristics (e.g. maintenance and construction, temporary barriers and fencing, weather conditions, emergency situations, etc.).

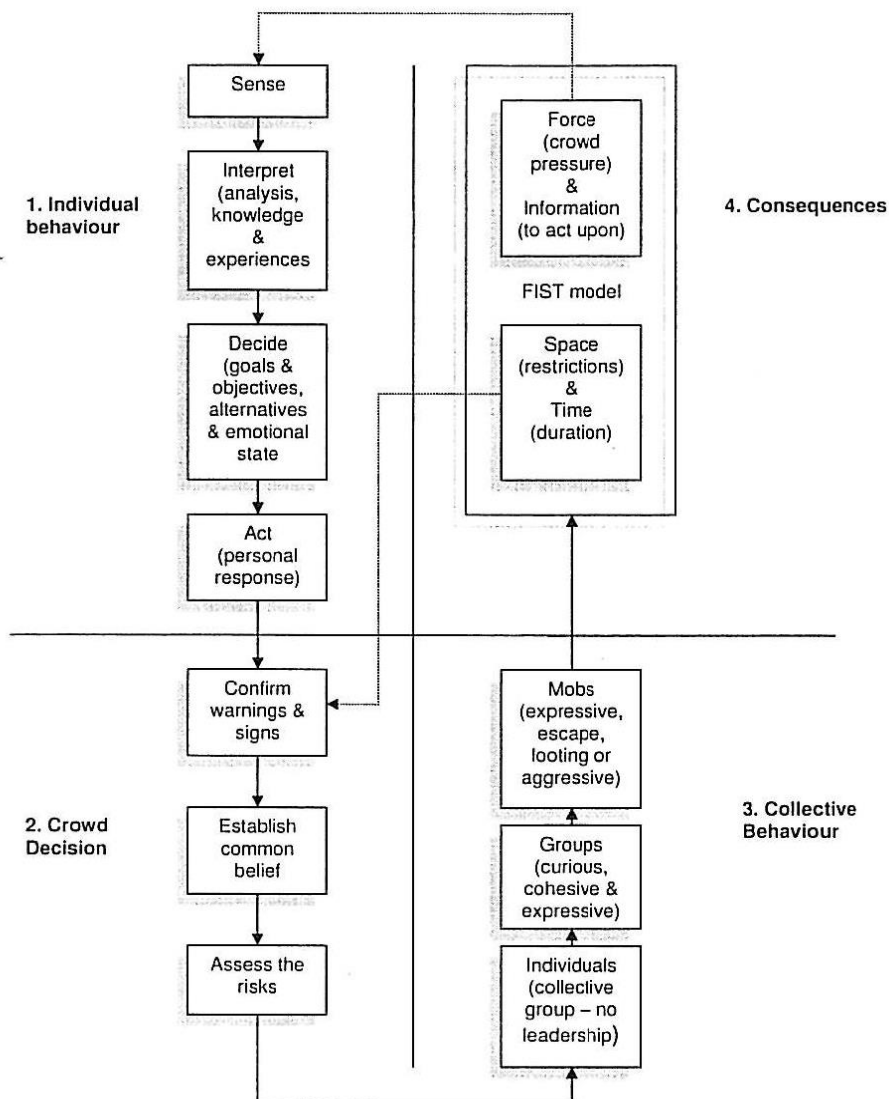
In addition, the model recognises that the actions of individuals can combine in specific ways to give a collective or group response to a situation. Factors influencing collective behaviour can be categorised as follows:

- The influence of individual actions
- Common objectives and desires, including the influence of habit and curiosity
- General circumstances, such as the type of event or venue, crowd type(s), atmosphere and accepted behavioural norms (e.g. the kind of behaviour acceptable in, say, a pop concert may not be considered acceptable in another public venue)

- Interactions between the behaviour of individuals within a crowd – the extent to which this happens is influenced by factors such as the credibility of the individual who initiated certain action(s), the acceptability of the action(s), group bravado, camaraderie, etc.

Based on the work of EMA (1999) and several other commentators (Fruin 2002; Tatrai 2001), Earl (2008a) expanded the Au et al (1993) model to develop a contextualised model to assist event organisers and promoters enhance their understanding of crowd behaviour at outdoor music festivals (see Figure 5.10).

Figure 5.10: Crowd behaviour model (Earl 2008, based on the work of EMA 1999; Fruin 2002; Tatrai 2001)



This model shows the basic individual and group cognitive and crowd degeneration processes that can lead to adverse safety outcomes at music events. The steps are described as follows:

Step 1 (individual behaviour)

Individuals in the crowd are exposed to stimuli, make decisions and formulate personal responses based on factors such as experience, knowledge and expectations.

Step 2 (crowd decision)

Emergency Management Australia (EMA 1999, p. 87) has suggested that crowd responses are a series of individual and collective behaviours where individuals communicate with one another to be collegial, reduce confusion and evaluate emotional responses. These responses are then communicated out through the crowd in order to affiliate with others. Based on decisions made at this stage, changes in crowd behaviour can occur.

Event organisers and promoters need to be aware of the types of crowds that performers attract (HSE 1999, p. 7). The greater the homogeneity in a crowd the greater is the cohesion in the audience (Tatrai 2001, p. 6). This homogeneity may be caused by gender, age bias or strong collective interest. According to Arbon (2002) and Milsten et al (2002, p. 158), the impact of this homogeneity can be exacerbated by the consumption of alcohol and crowd mobility (e.g. large standing areas or mosh pits). Alternatively, encouraging a broad crowd demographic with a balance of gender and diversity of ages generally has a positive calming effect on crowds. For example, events such as folk festivals attract a broad demographic and have considerably fewer issues for crowd safety (Tatrai 2001, p. 6).

Step 3 (collective behaviour)

Crowd incidents show different types of group motivation. In some cases there is an interruption of a simple traffic process, such as exiting a stadium or a passenger conveyor, resulting in a critical crowd pressure point. Others fall into the two general behavioural categories of either a flight response or a craze (Fruin 1981). Examples of each of these have been presented in Chapter 4.

Step 4 (consequences)

Fruin (2002) has developed a model that can assist with the analysis of risks at outdoor music festivals by providing insight into the causes of crowd disasters and intervention strategies. The elements of the model form the acronym FIST, which is a useful reminder that any crowd situation can quickly become threatening and potentially lethal. The acronym stands for the following:

Force (F) – of the crowd, or crowd pressure;

Information (I) – real or perceived information on which the crowd acts or reacts;

Space (S) – standing area, physical facilities, etc. involved in the crowd incident; and

Time (T) – duration of events, event scheduling, facility processing rates, etc.

Force

In crowded environments such as mosh pits or constricted passageways, at occupancies of about seven persons per square metre, a crowd becomes an almost fluid mass. The crowd forces generated can be impossible to resist or control. When crowd density equals the plan area of the human body, individual control is lost as one becomes an involuntary part of the mass. Forces are the result of pushing from within the crowd and the domino effect of people leaning against each other (Fruin 2002).

Raineri (2004, p. 5) notes that the majority of crowd-related deaths have been due to compressive asphyxia and not the ‘trampling’ usually reported by the media. Davis Associates (2003, p. 1) report evidence of bent steel railings after several fatal crowd-related incidents, indicating forces exceeding 4500N (or 1000lbs). Shock waves can be propagated through the mass sufficient to lift people off their feet and propel them distances of up to three metres or more. Intense crowd pressures, exacerbated by anxiety, make it difficult to breathe. The heat and thermal insulation of surrounding bodies cause some to be weakened and faint. Access to those who fall is virtually impossible. Removal of those in distress can only be accomplished by lifting them up and passing them overhead to the exterior of the crowd. Davis Associates (2003, p. 32) also confirm that the specific factors that contribute to the generation of forces within crowds are pushing, crowd surges, flow paths and the domino effect of these factors occurring within a crowd.

Information

Fruin (2002) maintains that crowd behaviour is affected by the provision of information and maintains that information which affects group perceptions has many forms, including ‘...the sights and sounds from within the crowd, public address announcements, training and experience, the actions of staff, signs and event ticketing’ (p. 5). He suggests that clear signposts and simple, audible public address messages are vital, as poor communication can lead to confusion and crowd flow blockages. In addition, individual patrons can be influenced by the behaviour of others around them. Leaders within crowds need to be identified and their effects neutralised or limited (HSE 1993).

Most crowd incidents exhibit a lack of ‘front to back’ communication - people in the rear of the crowd press forward while those in front experience severe distress. This is due, in part, to the flow process itself. The lighter densities in the rear allow freer movement while those in front are immobile and under great pressure. The collapsing of front ranks gives a false perception of forward movement. Security personnel often attempt local control of a crowd from the front, urging people not to push. However, this type of control is largely ineffective during a serious crowd incident in progress.

Space

Fruin (2002) maintains that the main features of space include occupancy rates, audience viewing areas and the capacities of corridors, ramps, stairs, doors, escalators and elevators to manage crowd movement. Considering the movement of people during an event is critical. Designing for crowd management requires that projected maximum occupancy levels be correlated with the movement capabilities of all pathways at the event (Fruin 2002). Interruptions of simple traffic flows can result in a critical crowd pressure point.

Time

Fruin (2002) explained timing as the more gradual and lighter density arrival process before an event, compared to the rapid egress and heavy crowd densities after an event. The objective of temporal strategies is to keep pedestrian densities below critical levels (Raineri 2004). Examples of these strategies include staggering start times for activities within the event or mixing up the line-up for the day to allow popular acts to perform throughout the day. The objective of these temporal strategies is to keep pedestrian densities below critical levels.

3.5.3.2 Individual to collective behaviour processes

While both of the models outlined in the previous section provide a good schematic of the factors affecting individual behaviour at events and their relative influence on translating this into collective behaviour, they do not identify or consider the underlying psychosocial dimension of the processes which translate individual behaviour into a collective response. Understanding these processes is a critical precursor to developing an appropriate method and tool which can be used to assess crowd-related safety risk at outdoor music festivals and mass gatherings generally.

A review of the literature in this area suggests that the following processes are at play in converting individual behaviour into collective action:

1. Individuation
2. Group polarisation
3. Group think.

Deindividuation

Deindividuation is the feeling of losing one's 'individualness' or personal identity as the result of being 'submerged in a group' (Festinger et al. 1952). The idea here is that we become deindividuated through factors such as anonymity, shared or diffused responsibility, large groups, sensory overload, and altered states of consciousness such as through alcohol, drugs or sleep deprivation. This leads to a minimisation of self-observation-evaluation and concern for social evaluation, which in turn leads to weakening of controls based upon guilt, shame, fear and commitment and a lowered threshold for expressing inhibited behaviours. The outcome is an emotional, impulsive, irrational, regressive, high-intensity, self-reinforcing behaviour which is difficult to terminate.

Deindividuation stems from Le Bon's (1895/1960) notion of contagion (see the following section on theories of collective behaviour). Zimbardo (1970) calls this hyper-responsiveness or 'contagious plasticity' to behaviour of proximal, active others. At extreme levels, deindividuation leads to a group dissolving, as its members become autistic in their impulse gratification. In other words, we lose our ability to reason and instead act on our instincts. In this regard, Zimbardo (1970, p. 259) suggests that the context is not important:

In addition, the behaviour must not be under discriminative stimulus control. It must be unresponsive to features of the situation, the target, the victim, or the states of self which normally evoke a given level of response or a competing response.

Deindividuation occurs primarily when people (i) are aroused by being in a large group, and (ii) feel diminished responsibility for their acts. Factors that increase arousal or diminish responsibility further can add to feelings of deindividuation. For example, novel environments, drugs or physical activities (such as dancing or chanting) can increase the arousal felt in a group. Group activities, like chanting and dancing, can also diffuse responsibility by strengthening group identity at the expense of personal identity.

Anonymity further diminishes people's sense of responsibility. When Watson (1973) studied the warfare patterns of more than 200 cultures, he found that warriors wearing depersonalising masks or face paints were more likely to torture their captives than were warriors in cultures that did not use these devices. Zimbardo (1970) found that women wearing white laboratory coats and hoods that masked their identity delivered longer electric shocks to victims than did women wearing normal clothes and name tags.

In a more elaborate project, Zimbardo (1975) studied deindividuation in a mock prison setting. He took over a basement corridor in the psychology building at Stanford University and converted it into a simulated prison. Zimbardo then used the toss of a coin to assign normal college student volunteers to roles of either 'prisoners' or 'guards'. He gave the guards special uniforms designed to look official and required the prisoners to wear smocks made out of muslin, a cap made from a nylon stocking and a light chain and lock around one ankle, and assigned the prisoners numbers instead of names. He did not allow any personal belongings in the cells. The first clue as to how the study would turn out came during the 'count' of the prisoners that the guards took three times daily. On the first day, the count took 10 minutes or less. On the second day, the guards started using count time to harass the prisoners, so the count time increased. By the fifth day, some of the counts lasted for several hours as the guards berated prisoners for minor infractions of the 'rules'. Gradually, the guards began treating the prisoners as 'nonpersons' – beings who weren't really human at all. The prisoners became 'servile, dehumanized robots who thought only of escape, of their own individual survival, and of their mounting hatred of the guards' (Zimbardo 1971, p. 3). The study was to have lasted for two weeks; Zimbardo stopped it after six days. Both prisoners and guards apparently lost contact with their normal guides for behaviour. Zimbardo

observed that '[i]n less than a week, the experience of imprisonment ended (temporarily) a lifetime of learning; human values were suspended, self-concepts were challenged, and the ugliest, most base, pathological side of human nature surfaced' (1971, p. 3).

Researchers suggest three possible reasons for the occurrence of deindividuation. First, deindividuation conditions may lead to a loss of personal identity that leaves one unrestrained by personal standards and inhibitions. Crowd behaviour can diminish self-awareness (Beaman et al. 1979) and interfere with the control that people's attitudes have over their actions (Diener 1980). Behaviour then becomes vulnerable to the standards set by the crowd – standards that are often emotional, impulsive and even 'primitive'.

The second possibility is that loss of personal identity in a group leads to people taking on a new identity – one which the group and the situation define. This was probably an important factor in Zimbardo's prison study where students took on identities defined by their roles as guards and prisoners. Johnson and Downing (1979) found that the type of group can determine how one is affected by depersonalisation and identification within a group. Subjects wearing nurses' uniforms were less aggressive when they were made anonymous than when their personal identities were stressed. In this case, deindividuated behaviour was positive because the new identity defined by the group was positive.

The third possibility is that in feeling a decreased sense of personal identity in a group, people attempt to reassert their personal uniqueness. Feeling lost in a crowd may motivate people to do something that will make them stand out and be recognised, all in an attempt to overcome the uncomfortable feeling of being 'lost in the crowd'.

Zimbardo's experiment illustrates the power of situations to unleash a darker side of our humanity. However, deindividuation can have a positive effect. It can free us from personal inhibitions, which is sometimes liberating. For example, the 'anonymous nurses' in Johnson and Downing's study were less aggressive than non-anonymous nurses. Other liberating effects of deindividuation occur when, for example, authors use pseudonyms, revellers celebrate Mardi Gras or new students explore their autonomy when commencing at a large university.

Group polarisation

Group polarisation is the tendency for group involvement to strengthen the average member's before-involvement inclination. In groups, the 'risky get riskier and the prudent get more prudent'. Research suggests two main possibilities why group polarisation occurs – normative influence and informational influence. Normative influence occurs when people learn other people's opinions. Informational influence occurs when people hear persuasive arguments and learn new information.

The 'normative influence' explanation focuses on social comparison. According to Festinger (1954), people like to evaluate themselves, including their opinions, by comparing themselves to others. People want to be perceived favourably, so if they discover that other people are inclined to feel the same way as they do, they are motivated to shift their opinion further in that direction. This indicates their support of the perceived group norm (McGarry et al. 1992). In fact, they may shift beyond the group norm because they know that people tend to admire those who are on their side of an issue but who are more extreme (Eisenger & Mills 1968; Myers 1982).

The normative influence explanation depends completely on knowing what other people think (the group norm), not why. The 'informational influence' explanation depends on knowing why other people think as they do. This explanation suggests that the arguments we hear from other people persuade us to adopt a more extreme position (Laughlin & Earley 1982).

Research indicates that both normative and informational influence contribute to polarisation effects (Isenberg 1986). For example, in support of the normative influence explanation, people do show polarisation when they learn others' positions without hearing their supporting arguments (Goethals & Zanna 1979; Sanders & Baron 1977). On the other hand, people hearing new arguments without knowing the specific position of group members also show polarisation (Burnstein & Vinokur 1973, 1977; Hinsz & Davis 1984).

Groupthink

Feelings of cohesion knit a group together and make membership rewarding. On the other hand, feelings of cohesion can stifle dissent and lead to poorly-based group decisions. Janis (1972) believes that high group cohesion is a major factor leading to faulty group decisions through a process he calls 'groupthink'. According to Janis (1972), '[g]roupthink refers to a deterioration of mental efficiency, reality testing and moral judgement that results from in-group pressures'.

Janis suggests three main contributing factors – a highly cohesive group, structural and procedural faults in the group, and a provocative situational context. These combine to produce a 'concurrence-seeking tendency' and groupthink (Janis & Mann 1977). Concern for cohesion leads group members to strive for unanimity at the expense of rational decision-making processes (Janis 1972). Under conditions of groupthink, people in highly cohesive groups act as if upsetting the group would be worse than making a wrong decision. It should be remembered, though, that groups do not always make faulty decisions and that not all faulty decisions by groups are the result of groupthink.

The second factor refers to the makeup of the group and conditions established by the leader. For example, groupthink is more likely in homogenous groups (such as subcultures) and groups isolated from outside interaction. It is also more likely if there is a lack of procedure for examining different alternatives and if the leader is strong and directive in presenting the 'best' solution. Under these conditions even low cohesive groups may fall prey to groupthink (Hart & Kroon 1989; Tetlock et al. 1992). In the subcultural context, groups such as Mods, Hippies, Beats, Punks, Metal Heads (also called Headbangers), Skinheads, Disco and Ravers all bring their own distinct social mores and behaviour to music events (Bennet 2002).

The third factor refers to stress the group feels to come up with a satisfactory solution. Groupthink is most likely when the group is under stress and has little hope of finding a better solution than the one favoured by the leader. In this situation, other options appear to be cut off and the group feels driven to accept the 'favoured' solution. In the subcultural context, group members will behave according to subcultural values (e.g. skinheads like to be aggressive), norms (e.g. heavy metal crowds are big alcohol and drug consumers, ravers like ecstasy), and expectations (e.g. punks expect to be able to slam dance or mosh).

3.5.3.3 Theories of collective behaviour

Vider (2004) maintains that understanding the relationship between the individual and the crowd is important and, over the years, sociologists and other scholars have proposed a number of explanations of collective behaviour. Most of these explanations have focused on crowds, riots, and social movements, rather than on rumours, fads, and other collective behaviours that involve less social interaction. Table 5.3 summarises these explanations.

Table 5.3: Collective Behaviour Theory snapshot

Theory	Major assumptions
Contagion theory	Collective behaviour is emotional and irrational and results from the hypnotic influence of the crowd.
Convergence theory	Crowd behaviour reflects the beliefs and intentions that individuals already share before they join a crowd.
Emergent norm theory	People are not sure how to behave when they begin to interact in collective behaviour. As they discuss their potential behaviour, norms governing their behaviour emerge, and social order and rationality then guide their behaviour.
Value-added theory	Collective behaviour results when several conditions exist, including structural strain, generalised beliefs, precipitating factors, and lack of social control.
Social identity theory	People in a crowd act as one because they share a common social identity. This identity specifies the normative behaviour of the group.

Contagion Theory

Contagion theory was developed by French scholar Gustave Le Bon in his influential 1895 book, *The Crowd: A Study of the Popular Mind* (Le Bon 1895/1960). Like many other intellectuals of his time, Le Bon was concerned about the breakdown of social order that was said to have begun with the French Revolution a century earlier and to have continued throughout the 19th century. Mob violence by the poor was common in the century in cities in Europe and the United States. Intellectuals, who tended to live in relatively wealthy circumstances, were very disturbed by this violence. They viewed it as irrational behaviour, and they thought that the people taking part in it were being unduly swayed by strong emotions and the influence of other people in the mobs. Le Bon's book and its contagion theory reflected these intellectuals' beliefs.

The contagion theory posed by LeBon (1960), has been frequently referenced in event safety literature (e.g. Davis & Associates, 2004). LeBon (1960) believed that being in a crowd has a hypnotic effect and that with the anonymity of belonging to a large group, individual personalities vanish. A collective or group mind then emerges along with irrational, emotionally-charged behaviour (LeBon 1960; Vider 2004). Individuals can no longer control their unconscious instincts and become violent and even savage. This theory only focuses on the collective aspect of the crowd and discounts the actions of individuals within the crowd (Vider 2004).

The views of contagion theory were popular well into the 20th century; however, recent authors have comprehensively rejected LeBon's group mind idea along with the notion of individuals being anonymous, irrational and emotional (Levy 1989; McPhail 1989; Reicher 1987). McPhail (1989) maintains that individuals in crowds typically assemble with friends, acquaintances or family members, which discounts the anonymity perspective. Schweingruber and Wohlstein (2005) add that there is no evidence to support individuals within crowds suffering any cognitive deficits. Finally, Couch (1968) argues that emotions are part of all social interactions including those associated with being in a crowd. Emotions and rational behaviours are not mutually exclusive and being emotional does not necessarily lead to irrational behaviours (Massy 2002; Schweingruber & Wohlstein 2005).

Convergence Theory

Convergence theory is one of the theories that presented this new understanding of collective behaviour. According to this theory, crowds do not unduly influence individuals to act in emotional and even violent ways. Rather, crowd behaviour develops due to individuals with a shared predisposition or like-minded individuals converging at the same place (Fogiel & Goldstein-Fuchs 2000; Levy 1989) and reflects the behaviour and attitudes of those individuals who decide to join a crowd. Once they converge in a crowd, the behaviour of the crowd is a consequence of their behaviour and attitude. Instead of the crowd affecting the individuals in it, the individuals in it affect the crowd. Reflecting the adage that 'birds of a feather flock together', people who feel a certain way about a particular issue and who wish to act in a certain way tend to find and converge with similar people. The crowd they form then reflects their beliefs and desired activities.

This theory stems from early work by Sigmund Freud and Floyd Allport and the later works of Neal Miller and John Dillard (Levy 1989). In applying this theory, crowd behaviour is considered to be rational or premeditated with individuals just expressing existing beliefs and values (Macionis 2004). As Goode (1992, p. 58) writes, convergence theory:

...says that the way people act in crowds or publics is an expression or outgrowth of *who they are ordinarily*. It argues that like-minded people come together in, or *converge* on, a certain location where collective behaviour can and will take place, where individuals can act out tendencies or traits they had in the first place. (emphasis in original)

Convergence theory does not deny that people may do something in a crowd that they would not do by themselves, but it does say that what a crowd does largely reflects the individuals who compose it. If we think of a mob or at least a small group of people who commit a hate crime - for example, gay bashing - we can see an application of convergence theory. The individuals who form this group are people who hate homosexuality and who hate gays and lesbians. The group violence they commit reflects these beliefs. However, the theory has been heavily criticised for 'not having a structured framework for explaining critical aspects of crowd dynamics such as behavioural shifts, multiple predispositions or role acquisitions' (Levy 1989, p. 70).

Emergent Norm Theory

Just after the mid-20th century, Ralph H. Turner and Lewis M. Killian (1957, 1972, 1987) presented their *emergent norm theory* of collective behaviour, arguing that it is the combination of like-minded individuals, anonymity and shared emotions that lead to collective behaviours. According to Turner and Killian, when people start interacting in collective behaviour, initially they are not sure how they are supposed to behave. As they interact, norms governing their behaviour emerge, and social order and rationality then guide behaviour. People come together with specific expectations, beliefs and values that are changed due to interactions within the crowd with new behaviours emerging as a result (Macionis 2004). In at least two ways, emergent norm theory takes a middle ground between contagion theory and convergence theory. As should be clear, emergent norm theory views collective behaviour as more rational than contagion theory does. But it also views collective behaviour as less predictable than convergence theory does, as it assumes that people do not necessarily already share beliefs and intentions before they join a crowd.

The problem with this theory is that there is no evidence to support the emergence of new forms of behaviour just from being in a crowd (Crouch 1968; Schweingruber & Wohlstein 2005). Waddington and King (2005) explain that as the different groups within a crowd bring their own sets of values, beliefs and expectations with them, it is unlikely that new behaviours would be adopted. On a technical note, McPhail (1991) notes that the theory lacks the specificity needed to allow it to be tested properly, thereby making it somewhat impractical.

Value-Added Theory

One of the most popular and influential explanations of social movements and other forms of collective behaviour is Neil Smelser's (1962) *value-added theory* (also called *structural-strain theory*). Smelser wrote that social movements and other collective behaviour occur if and only if several conditions are present.

One of these conditions is *structural strain*, which refers to problems in society that cause people to be angry and frustrated. Without such structural strain, people would not have any reason to protest, and social movements would not arise. Another condition is *generalized beliefs*, which are people's reasons for why conditions are so bad, and their solutions to improve them. If people decide that the conditions they dislike are their own fault, they will decide not to protest. Similarly, if they decide that protest will not improve these conditions, they again will not protest. A third condition is the existence of *precipitating factors*, or sudden events that ignite collective behaviour. In the 1960s, for example, several urban riots started when police were rumoured to have unjustly arrested or beaten someone. Although conditions in inner cities were widely perceived as unfair and even oppressive, it took this type of police behaviour to ignite people to riot. A fourth condition is *lack of social control*; collective behaviour is more likely if potential participants do not expect to be arrested or otherwise hurt or punished.

Smelser's theory became very popular because it pointed to several factors that must hold true before social movements and other forms of collective behaviour occur. However, collective behaviour does not always occur when Smelser's factors do hold true. The theory has also been criticised for being a bit vague; for example, it does not say how much strain a society must have for collective behaviour to take place (Rule 1988).

Social identity theory

Social identity theory (Reicher, cited in Drury and Winter 2004; Drury 2007) maintains that people act as one in a crowd because they share a common social identity. Social identity is described as that part of the self-concept that results from membership in social groups (Strangor 2004). This common identity specifies the appropriate normative behaviours. The theory recognises ‘that different identities have different [normative behaviours] – some peaceful, some conflictual’ (Drury 2007, p. 3). Drury and Reicher (1999, p. 383) explain that:

Control over behaviours is not lost but rather governed by the [expectations, beliefs] and values that define [a particular] social identity. Crowd members still act in terms of self-interest, but they are different interests being based on a different and collective self.

In applying this theory, individuals categorise themselves into particular social groups, such as *Goths*, *Punks* or *Metalheads*. These individuals then gain an understanding of, and adopt, that group’s expectations, beliefs and values which become the basis of future behaviour. Individuals usually have a variety of these social identities and each has the potential to impact on group processes (Drury & Winter 2004; Vider 2004).

The social identity model has been credited with recognising the transformation of identity, not a loss of one, and the retention of an individual’s decision-making abilities (Vider 2004). However, Vider (2004) has commented that this model neither explains the emergence, then spread, of the collective behaviour, nor individuals becoming bystanders rather than participants.

In summary, it is evident that these theories only ‘address particular elements of crowd behaviour’ (Levy 1989, p. 72). The contagion theory considers collective behaviour that is the result of individuals being anonymous, irrational and emotional within a crowd. The convergence theory explains this behaviour as like-minded individuals at the same location responding to stimuli in a similar way. The emergent norm theory says that social interactions alone are responsible for collective behaviours, while the social identity model attributes a shared social identity within a crowd as the cause. While an explanation of the relationships between individuals and the crowd remains incomplete (Hogg & Abrams 1988; Levy 1989), the social identity model has been hailed as one of the most developed, comprehensive modern theories available, making it particularly salient to this discussion (Earl 2008a).

4. Measuring crowd behaviour

Practical strategies to monitor and measure the behaviour of a crowd have received limited attention (Zeitz et al. 2009). Hutton et al. (2012), however, note that an important element of the Arbon (2004) model is the potential impact of the psychosocial domain on injury and illness rates due to elements traditionally described as *crowd type* and *crowd mood*. Crowd type is a descriptor of the societal sub-culture of a crowd, while crowd mood is a descriptor of crowd emotion. A number of recent studies (Zeitz et al. 2009; Hutton et al. 2010; Hutton et al. 2012) have used these two descriptors as measures of crowd behaviour.

4.1 Crowd type

Various categorisations have been developed to describe the collective actions and behaviour of crowds. The earliest of these was proposed by Le Bon (1895, 1960) who distinguished between heterogeneous crowds (e.g. anonymous street crowds, planned assemblies) and homogeneous crowds (e.g. political, religious, military, sacerdotal, bourgeois and working people crowds).

Blumer (1951) attempted a further classification, based on the emotional intensity of a crowd. He distinguishes four types of crowds: casual (a contingent collection of people that simply encounter in the same place at the same time, like people in a shopping centre, without displaying any real social interaction), conventional (a prearranged meeting of people, such as a political meeting), expressive (a crowd that is animated by a strong emotional motivation, like a political demonstration or protest march), and acting (a crowd that has the purpose to perform a specific action, such as a protest crowd engaging in possible violent behavioural dynamics directed towards a specific target). His system is dynamic in nature. That is, a crowd changes its level of emotional intensity over time and therefore could be classed in any one of the four types.

Momboisse (1967) developed a similar typology composed of four types – casual, conventional, expressive and aggressive. Casual, conventional and expressive crowds can be observed regularly at music festivals and, on rare occasions, aggressive crowds can also be seen, such as at the 1999 Woodstock festival, where 500 festival-goers rioted, lighting fires, looting vendor tents, smashing ATM machines and toppling toilets and speaker towers (Vider 2004).

Canetti (1962) proposed an alternative classification based on the following characteristics of crowds – the propensity to grow and become denser, the physical proximity among members, differences in the nature of goals, and the transformation of single members into a collective entity where individual differences are discarded. On the basis of these criteria, Canetti suggested three dichotomous categories of crowds – open-closed, stagnating-rhythmic and quick-slow crowds.

In the context of crowd management during large urban events, Berlonghi (1995) identified eleven different types of crowds, categorised according to the primary purpose of their existence. The characteristics of these crowds are outlined in Table 5.4.

Table 5.4: Crowd types (Berlonghi 1995; EMA 1999)

Crowd type	Comment
Ambulatory	Walking, usually calm.
Disability/limited movement	Crowd has limited or restricted movement; requires additional planning.
Cohesive/spectator	Watching specific activity.
Expressive/revelous	Emotional release; for example community fun runs.
Participatory	Involved in actual event; for example, pickets, marches.
Aggressive/hostile	Initially verbal, open to lawlessness.
Demonstrator	Organised to some degree; for example, pickets, marches.
Escape/trampling	Danger may be real or imaginary.
Dense/suffocating	Reduction of individual physical movement.
Rushing/looting	Attempt to acquire/obtain/steal something; for example, tickets.
Violent	Attacking/terrorising.

The Berlonghi typology is the classification system widely adopted in the literature and is promoted by Emergency Management Australia (EMA 1999).

Crowds can also be categorised according to the cohesion and organisation within. For example, Earl, Parker and Capra (2005) suggest that there are three main classifications for crowds. These are:

Type 1 - groups without leadership or focus

Type 2 - groups with common interests, consisting of the following sub-categories:

- curious crowds, such as stopping to watch a busker or spectators at the scene of an accident
- cohesive crowds, such as attending a sporting event or theatre
- expressive crowds, such as patrons at a classic rock music event or a football crowd.

Type 3 - mobs that are responsible for the extreme reactions in crowds. These do not occur often, and usually result from the degeneration of Type 2 crowds. Sub-categories to this crowd type are:

- expressive mobs, such as post New Year's Eve crowds
- escape mobs, such as crowds escaping a fire or explosion
- acquisitive mobs, such as looting crowds after disasters
- aggressive mobs, such as the crowd at the 1999 Woodstock festival.

Generally, patrons attending music events are a collection of individuals sharing a common location and are generally without leadership or focus (Tatrai 2001, p. 4; Vider 2004). Tatrai (2001, p. 4) described this type of crowd as a 'collective group'. However, there are numerous variables that can unite these individuals into a 'cohesive group'. These variables include sharing close proximity (e.g. being in the mosh pit), similarity (e.g. appearance), and shared interests or cooperative interaction (e.g. love of punk music) (Turner 1995 in Vider 2004, p. 146). Crowds can move readily between each classification and the subcategories within them. Each classification has implications for event planning and management.

4.2 Crowd mood

The mood of the crowd has been described as an important element in determining crowd behaviour (Milsten et al. 2002; Zeitz et al. 2007). Milsten et al. (2002) and Earl et al. (2004b) consider that crowd mood is associated with a number of factors. Milsten et al. (2002) maintain that mood is linked to the closeness of crowds, the occurrence of incidents (such as a crowd crush) and/or the effect of the music.

A study undertaken by Earl et al. (2004b) found that the type of music being performed, especially heavy metal, punk, rock and rap, was a significant influence on crowd behaviour. In particular, it was the tempo, rhythm and recognition of songs that triggered behaviour change within the crowd. Earl et al. (2004b) report that heavy metal, hardcore punk and rap performances are highly influential on crowd behaviour. Earl et al. (2004b) consider that these crowds have lots of energy with a group mentality (i.e. '...more likely to become unruly' and 'because they are much louder and they tend to follow each other'), and attitude (i.e. '...there is less respect for authority at music events') that also influences mood (Earl et al. 2005).

In addition, the HSE (1999, p. 7) considers it important for event organisers and promoters to have knowledge of the performers and their effect on an audience. Tatrai (2001, p. 6) maintains that knowledge of a performer's effects on audiences is vital to planning and operational processes for outdoor music festivals. Often this is ignored until it is too late. For example, Upton (1995a, p. 7-9), while head of security at an outdoor music festival in England, learned quickly the effect that the American band, *Guns and Roses*, had on a heavy metal audience after two people died and many more were injured during their set. Similarly, the promoters responsible for bringing American band *Limp Bizkit* to Australia later claimed to have been unaware of the reputation of this band after a crowd crush incident resulted in a death at the *Big Day Out* festival in Sydney in 2001. However, both Ambrose (2001) and Vider (2004) identified the trail of destruction and mayhem caused by this band in America was well known and documented.

Hill (2002) has reported that there is considerable 'inconsistency in the way [that performers] tend to behave towards their audiences' (p. 2). Fruin (2002) indicates that artists cancelling shows at late notice, late starts, walking off stage early, diving into the audience, throwing souvenirs and encouraging hazardous or inappropriate group reactions, all have negative effects on crowd behaviour.

Zeitz et al. (2005) examined a significant number of mass-gathering events and found that crowd mood was an important factor in predicting medical workload at a mass-gathering event, but was not found to be significant for other emergency services such as police, fire and rescue (see also Zeitz et al. 2009).

Hutton et al. (2010) used a data collection tool, adopted from the work of Zeitz et al. (2005) and Emergency Management Australia (1999), to measure crowd behaviour in a systematic way at the 2009 annual Schoolies event in South Australia. Crowd behaviour was measured using a simple matrix incorporating Berlonghi's crowd type typology and a framework developed by Pines and Maslach (1993) to measure crowd mood, as well as additional factors relating to motivation to attend – age, gender, interests, crowd interests, morals and culture, rationale/reason for attendance (if different from motivation to attend) and length of stay. The Pines and Maslach (1993) framework uses the audience profile for assessment of crowd mood. They use descriptors to clearly identify separate groups such as families, young adults, children, elderly and rival factions and then attach a rating scale (1 -5) to these groups. This

scale is used to grade the amount of verbal noise, physical movement and overall audience participation (see Table 5.5).

Table 5.5: Crowd mood classification (Pines and Maslach 1993; Zeitz et al. 2005, 2009)

Mood descriptor	Score
Passive	1. Little or no talking
	2. Little or no physical movements
	3. Little or no physical contact
	4. Little or no audience participation
	5. Co-operative
Active	1. Moderate degree of talking
	2. Moderate degree of physical movements
	3. Moderate degree of physical contact
	4. Moderate degree of audience participation
	5. Co-operative
Energetic	1. Considerable degree of talking
	2. Considerable degree of physical movements
	3. Considerable degree of physical contact
	4. Considerable degree of audience participation
	5. May be episodes of violence

Hutton et al. (2012) adopted this same methodology to examine crowd behaviour at the Adelaide *Big Day Out* festival in the summer of 2010. In analysing the data, the researchers applied a simple scoring schema to each tool, attributing numerical values to each element to quantify the findings and identify any trends. For the crowd mood descriptors (see Table 2), a score was applied to each element from 1-15. Passive (little or no talking) was assigned a score of 1, passive (little or no physical movement) a score of 2, etc., through to energetic (may be episodes of violence) being assigned a score of 15. Berlonghi's crowd types (see table 1) were also assigned scores, with ambulatory = 1, disability/limited movement = 2, cohesive = 3, and so on. Finally, a score was attributed to the behaviours observed during the classifications (passive, active, energetic) provided by Pines and Maslach.

Hutton et al. (2012) suggest that descriptive tools such as those promoted by Pines and Maslach and Berlonghi are limited. In particular, the language used to describe aspects of a crowd is poorly defined. For example, Pines and Maslach describe *crowd mood*, but, in fact, physical descriptors of crowd activity such as talking or participation are used. Berlonghi's descriptors of *crowd type* focus on the actions of the crowd and are not a descriptor of the type of crowd. They maintain that the collection of brief qualitative descriptors gives a more dynamic picture of crowd behaviour. In addition, adding a scoring matrix to any model allows a more practical surveillance method to emerge. The results of the pilot support the

notion that *crowd mood* and *crowd type* are outward displays of the interplay between mood, motivation and type and that, therefore, the data collected for the psychosocial domain should focus primarily on crowd behaviour as the observable and measurable element.

Hutton et al. (2012) also suggest that the addition of other measurements such as basic descriptors of crowd activities, the presence of alcohol and/or drugs, measures of crowd density and the scoring of behaviours, may improve the data set to better illuminate the psychosocial domain. They submit that crowd mood, type and descriptors can be assessed and then used to describe or even predict behaviour.

In the past few years, Brown and Hutton (Brown & Hutton 2013; Hutton, Brown & Verdonk 2013; Wallis, Hutton, Brown, Challans & Gardner-Stephens 2013) have been examining practical strategies to develop accurate models to understand crowd behaviour in order to enable more accurate predictions on the health care needs of people attending these events. Their efforts have concentrated on the development of a data collection system designed to capture and compare real time data on a wide range of variables (such as density, humidity and temperature) which might influence audience behaviour.

The results of the Hutton et al. (2012) pilot study show that it is possible to monitor elements of the psychosocial nature of crowds at mass gathering events and verify what event organisers may already know – that crowd behaviour changes through the duration of a festival or event (Getz 2007). Having a measurement scale that enables real time identification of changes in crowd behaviours allows a promoter or event manager to modify existing settings or programs in order to influence change interventions to assist crowd control and risk management.

The author respectfully agrees with the suggestions made by Hutton et al. (2013); however, is of the view that any additional descriptors are influencers of the mood of the crowd and, as such, suggests that they be measured as part of this descriptor. Since the topic of this study is the development of an overall diagnostic instrument, this aspect will not be examined, but should be the subject of further research and development. This study will, therefore, confine itself to the use of *crowd mood* and *crowd type* indicators to develop a composite measuring instrument, which is outlined in the next section of this Chapter.

5. A model of crowd behaviour

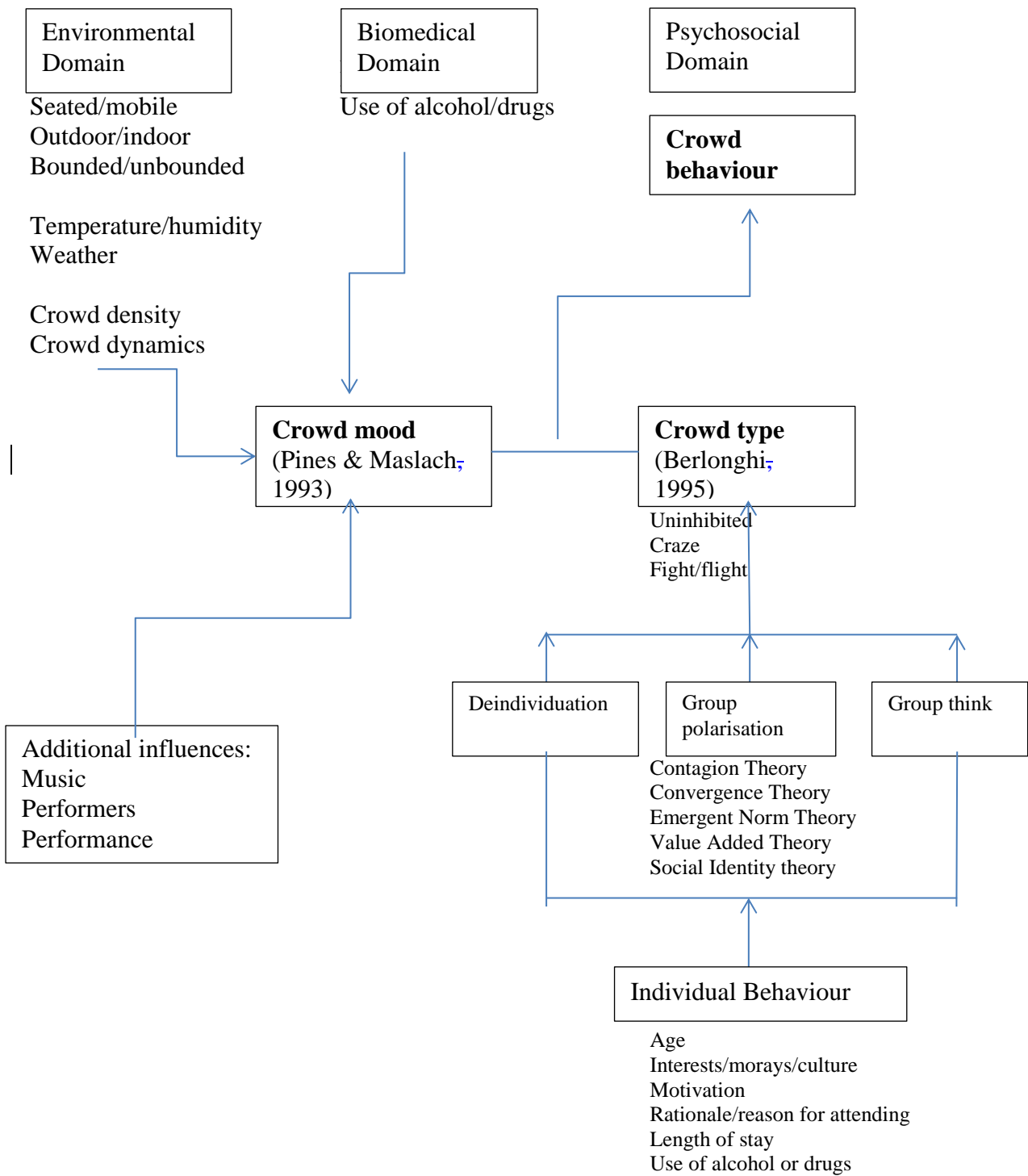
Figure 5.11 outlines a model developed by the author that attempts to integrate the various influences on crowd mood at outdoor music festivals. This model derives from the research undertaken by Arbon (2004, 2007) and others (Hutton et al, 2010; Hutton et al. 2012; Milsten et al. 2002; Zeitz, Schneider, Jarrett, D & Zeitz 2002; Zeitz, Bolton, Dippy, Dowling, Francis, Thorne, Butler & Zeitz 2007; Zeitz, Tan, Grief, Couns & Zeitz 2009) in articulating a framework within which the key characteristics of mass gathering events, and outdoor music festivals in particular, can be systematically collected and analysed. A particular advantage of this approach is that the ‘...characteristics, variables and interrelationships’ (Hutton et al 2010, p. 185) of the various elements of the model ‘...can assist with understanding and predicting the behaviour of crowds at mass gathering events’ (Hutton et al. 2010, p. 185).

Central to the Arbon (2004) model is the biomedical domain, which includes the health of both the individual and the crowd. The biomedical domain is impacted by both the environmental domain and the psychosocial domain, in which the natural environment and elements, infrastructure and services, crowd density and crowd dynamics are major influences.

The key focus of this study, however, is the psychosocial domain and here *crowd mood*, a descriptor of crowd emotion, has been found to be a significant indicator of crowd behaviour. Prior to the development of any new monitoring and assessment method, a number of collective behaviour models were examined and found to be wanting in their explanation of the processes (and, therefore, the influencing factors) by which individual behaviour is transformed into collective behaviour. Relevant psychological theories which explain the transition from individual to collective behaviour are examined and then integrated into a (new) composite model outlining this process.

Because models are a conceptual representation whose purpose is to explain and predict observed phenomena (Schwartz et al. 2000), it is felt that the articulation of a model at this stage provides intellectual scaffolding for the creation of the proposed new risk assessment methodology and instrument. Earlier versions of the model (Raineri 2013a, 2013b, 2013c) have been presented by the author at several Australian national safety conferences and conventions in July and October 2013 and at the 5th *International Conference on Safety and Security* in Rome, Italy in September 2013. These papers can be found in Appendix G.

Figure 5.11: Elements and processes of the psychosocial domain



The model is read from the bottom up. Individuals are motivated to attend outdoor music festivals by factors such as their personal interests, morals and cultural affiliations, their rationale for attending the particular event, festival expectations, anticipation, and how long they intend to stay. Individual behaviour is also heavily influenced and affected by the use of alcohol or drugs, both prior to attending the event and at the event itself.

Once at the event, individuals are subsumed by social forces which transform their behaviour into collective action through the agency of a number of social science theories. Patrons can lose their individual personal identity through normative influences that lead them to abandon their sense of self and identity and identify instead with group subcultural norms, rituals and displays. In non-emergency situations, this sense of abandonment manifests in displays of uninhibited, and potentially dangerous, collective behaviour. This collective behaviour can be described using Berlonghi's crowd type taxonomy (Hutton et al. 2010, 2012).

At the same time, collective behaviour is affected by the mood of the crowd, which in turn is heavily influenced by environmental factors and those factors which are unique to the event such as the music, the performers and the tenor of the performance itself (such as lighting and special effects, pyrotechnics, etc.). Crowd mood can be described and measured using the Pines and Maslach (1993) model, as demonstrated by the several studies conducted by Hutton et al. (2010, 2012).

6. An instrument to monitor and assess behavioural risk

The crowd behaviour model articulated in Figure 5.10, and the literature supporting its development, suggest that a matrix of *crowd type* and *crowd mood* could be used as a ‘real time’ monitor and measure of crowd-related safety risks which, as suggested by Still (2014) are dynamic in nature. While useful for monitoring and assessing behavioural risk, this Crowd Behaviour Matrix (CBM) can be augmented and will become even more useful once the ALARP tolerability and decision-making trigger points are included. A meta-matrix is outlined in Figure 5.12.

Figure 5.12: Crowd Behaviour Matrix showing tolerability and decision-making trigger points

Ingress / Circulation / Egress (Still 2009)

Crowd Type (Berlonghi 1995; EMA 1999)	Crowd Mood (Pines and Maslach 1993; Zeitz et al. 2009; Hutton et al. 2011)		
	Passive	Active	Energetic
Ambulatory (walking, usually calm)	Acceptable	Acceptable	Acceptable
Cohesive/Spectator (watching specific activity)	Acceptable	Acceptable	Acceptable
Participatory (involved in actual event; e.g. waving hands)	Acceptable	Acceptable	Acceptable
Expressive/Revelous (emotional release; e.g. dancing, including slam dancing, swirling and pogoing)	ALARP	ALARP	ALARP
Demonstrator (organised to some degree; e.g. crowd surfing)	ALARP	ALARP	ALARP
Disability/Limited Movement (e.g. moshing)	ALARP	ALARP	ALARP
Dense/Suffocating (reduction of individual physical movement; e.g. crowd crushing)	Unacceptable	Unacceptable	Unacceptable
Aggressive/Hostile (initially verbal; open to lawlessness)	Unacceptable	Unacceptable	Unacceptable
Escape/Trampling (danger may be real or imaginary)	Unacceptable	Unacceptable	Unacceptable
Rushing/Looting (attempt to acquire/obtain/steal something; e.g. tickets)	Unacceptable	Unacceptable	Unacceptable
Violent (attacking/terrorising)	Unacceptable	Unacceptable	Unacceptable

The crowd mood columns can be further subdivided to accommodate the relevant crowd mood descriptors, resulting in the Crowd Behaviour Matrix (CBM) outlined in Figure 5.13. Including the descriptors provides not only clearer signposting for assessors regarding the criteria to be adopted, but goes a considerable way to removing the subjectivity which is often adopted, and has been heavily criticised, in conducting risk assessments. Real time assessment can be undertaken at any time during the event and at any place throughout the venue.

The Crowd Behaviour Matrix (CBM) can be augmented by overlaying the risk tolerability and intervention ‘trigger point’ regions as outlined in Figure 5.14. Such an approach increases the ease with which the instrument can be used by providing visual and graphic ‘cues’ for decision-making. Activity falling within the green areas is acceptable and requires no response. Activity within the orange areas requires responses according to the ALARP regime and interventions will need to be determined, agreed and communicated to relevant staff before the event. Similarly, responses in the red area will attract the highest level of intervention, including probably even stopping the show and activating a pre-prepared contingency plan.

In addition to determining the state of safety at any single point in time and providing a decision-making tool for intervention and action, the Crowd Behaviour Matrix (CBM) can be used at regular intervals to build a picture of the dynamics of an event over time. The recording of these patterns of behaviour at different times throughout an event, for different components of an event, and at different locations within a venue, will provide a valuable evidence-based ‘blueprint’ that can confidently inform the planning of similar future events.

Deciding on how to ensure crowd safety in public venues has long been a matter of judgement, often based on the personal views and experience of individual planners and decision-makers alone (e.g. venue owners and their operations managers). This approach is often ill-structured, piecemeal and ad hoc (Au et al. 1993) and past disasters and a number of studies (e.g. Au et al. 1993; Harvey 1993) have shown that this traditional approach to crowd safety planning is inadequate. The adoption of an evidence-based approach is a novel initiative and provides a marked improvement in the area of crowd safety risk management.

Figure 5.13: Crowd Behaviour Matrix including relevant mood descriptors

Location/Activity:

Ingress / Circulation / Egress

Time:

Crowd type	Crowd mood														
	Passive					Active					Energetic				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ambulatory (walking, usually calm)															
Cohesive/Spectator (watching specific activity)															
Participatory (involved in actual event; e.g. waving hands)															
Expressive/Revelous (emotional release; e.g. dancing, crowd surfing, pogoing, fight dancing)															
Demonstrator (organised to some degree; e.g. slam dancing, swirling, Wall of Death)															
Disability/Limited Movement (reduction of individual physical movement; e.g. moshing)															
Dense/Suffocating (reduction of individual physical movement; e.g. crowd crushing)															
Aggressive/Hostile (initially verbal; open to lawlessness)															
Escape/Trampling (danger may be real or imaginary)															
Rushing/Looting (attempt to acquire/obtain/steal something; e.g. tickets)															
Violent (attacking/terrorising)															

Mood descriptor

Passive		Active		Energetic	
1	Little or no talking	6	Moderate degree of talking	11	Considerable degree of talking
2	Little or no physical movement	7	Moderate degree of physical movement	12	Considerable degree of physical movement
3	Little or no physical contact	8	Moderate degree of physical contact	13	Considerable degree of physical contact
4	Little or no audience participation	9	Moderate degree of audience participation	14	Considerable degree of audience participation
5	Cooperative	10	Cooperative	15	May be episodes of violence

Figure 5.14: Crowd Behaviour Matrix with highlighted risk tolerability and intervention trigger points

Location/Activity:
Ingress / Circulation / Egress
Time:

Crowd type	Crowd mood														
	Passive					Active					Energetic				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ambulatory (walking, usually calm)	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Cohesive/Spectator (watching specific activity)	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Participatory (involved in actual event; e.g. waving hands)	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Expressive/Revelous (emotional release; e.g. dancing, crowd surfing, pogoing, fight dancing)	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Demonstrator (organised to some degree; e.g. slam dancing, swirling, Wall of Death)	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Disability/Limited Movement (reduction of individual physical movement; e.g. moshing)	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Dense/Suffocating (reduction of individual physical movement; e.g. crowd crushing)	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Aggressive/Hostile (initially verbal; open to lawlessness)	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Escape/Trampling (danger may be real or imaginary)	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Rushing/Looting (attempt to acquire/obtain/steal something; e.g. tickets)	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Violent (attacking/terrorising)	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red

Mood descriptor

Passive		Active		Energetic	
1	Little or no talking	6	Moderate degree of talking	11	Considerable degree of talking
2	Little or no physical movement	7	Moderate degree of physical movement	12	Considerable degree of physical movement
3	Little or no physical contact	8	Moderate degree of physical contact	13	Considerable degree of physical contact
4	Little or no audience participation	9	Moderate degree of audience participation	14	Considerable degree of audience participation
5	Cooperative	10	Cooperative	15	May be episodes of violence

7. Summary

Outdoor music festivals are complex events to plan, organise and run. Minimising adverse health and safety impacts is important to the delivery of safe events and this can be achieved through detailed and comprehensive planning and preparation. Undertaking an assessment of all risks, supported by comprehensive and strategic operational structures, is considered essential.

Crowds at events like outdoor music festivals are the principal hazard that needs to be dealt with and, while there are a number of resources available that provide good consistent advice for event promoters and organisers and local government authorities that licence these events, there is very little information on how to conduct an appropriate and effective risk assessment of crowd safety. What guidance exists is not exhaustive enough and too crude for complex crowd safety problems that often exist at the larger venues.

A number of attempts have been made to develop an appropriate methodology to assess crowd-related safety risks at mass gatherings. Initial attempts by Au et al. (1993) and Au (1998, 2001) identify relevant factors impacting on crowd safety at mass-gathering events, and provide a very useful basis and starting point for assessing crowd safety risks. The methodology features keywords (similar to a HAZOP process) for behavioural-related and physical factors that can arise in public venues and at mass gatherings, and adopts a risk rating regime consisting of separate ratings for likelihood and severity, and a likelihood-severity matrix for determining the extent of risk. In addition, Mahudin's (2003) Crowd Stress Index also provides a very useful typography of variables to consider when contemplating crowd stress.

However, Still (2009, 2014) suggests that the traditional risk assessment approach fails to recognise and take into account the shifting and changing nature and severity of risks during the course of an event due to the nature of activities and patron behaviour, and that new methods need to be devised which are both simple to implement and provide useful information for the person who evaluates and manages crowd risks. The work of Arbon (2004) and associates has provided a basis for the development of an appropriate and effective monitoring and assessment method.

CHAPTER 6

VALIDATING THE METHOD

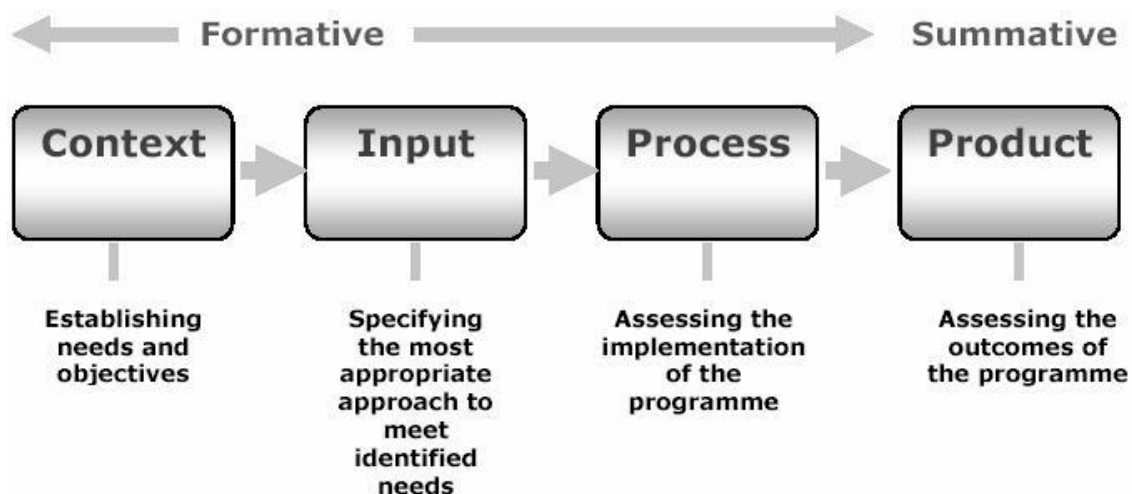
“I can’t change the wind, but I can adjust my sails
to always reach my destination”
James Dean (1931 – 1955)

Chapter Outline

8. Introduction
9. Background
10. Evaluation models and frameworks
11. Evaluation inquiry methods
12. Evaluating the new method
13. Outline and analysis of survey results
14. Summary

1. Introduction

As outlined in Chapter 3, the CIPP Model (Guba & Stufflebeam 1970; Stufflebeam 2004) was adopted as the theoretical framework to underpin the research design, and each element of the model has been utilised to guide discrete stages of the study. Chapter 4 outlines the context phase of the study, where the nature, extent and confirmation of continued existence of the problem were identified and confirmed. Chapter 5 examines the inputs available to develop an appropriate intervention, and outlines the collective behaviour model and crowd behaviour index instrument developed as outputs of the study. This chapter addresses the final, process and product, phase of the study as outlined in the following diagram and reports on efforts to evaluate the impact, effectiveness and useability of the outputs.



Section 2 highlights the need to adopt a summative evaluation methodology for this final stage of the study in order to test the outcome against the research aims/objectives; viz. the impact, effectiveness and ease of use of the method developed in Chapter 5. In order to validate the method, a training seminar was developed and delivered to risk assessors, and an evaluation undertaken through the administration of a post- and retrospective pre-test survey (RPT) which included not only questions typically associated with measuring participants' reactions, but also included a set of questions to gauge whether and how much learning occurred.

Section 3 outlines various possible approaches to evaluation and suggests that a decision-oriented evaluation model is most appropriate in the circumstances. The section notes that the CIPP model adopted as the research design framework is itself a decision-oriented evaluation model which, apart from its advantages as a research design model, lends itself to the robust evaluation of the impact, effectiveness, transportability and sustainability of a developed product. The section also outlines the Kirkpatrick model, itself also essentially a decision-oriented model, traditionally used to evaluate training programs, and finishes by outlining a blended model which is both comprehensive and relevant to the study.

Section 4 outlines relevant evaluation inquiry methods and highlights the use of a survey as a useful way of measuring participant satisfaction, change in competency, and/or to identify a problem due to no measurable effect.

Section 5 discusses the use of a post and retrospective pre-test survey (RPT) to evaluate the training workshop held for industry participants at which the new method was explained and situated within the context and framework of contemporary risk management approaches to crowd safety. The section sets out and analyses the survey results and notes that the satisfaction rating for the workshop was high.

Section 6 provides a summary of this final phase of the study, which sought to determine whether the new method provides a rigorous, effective, viable and user-friendly approach to monitoring and assessing behavioural risk at outdoor music festivals.

2. Background

Evaluation comprises the systematic investigation and use of evidence that informs judgements about the reliability, effectiveness and/or efficiency of a product or service (Stufflebeam & Shinkfield 2007). Stufflebeam and Shinkfield (2007, p. 326) refer to it as:

the process of delineating, obtaining, reporting and applying descriptive and judgemental information about some object's merit, worth, significance, and probity in order to guide decision making, support accountability, disseminate effective practices, and increase understanding of the involved phenomena.

James and Roffe (2002, p. 12) provide a more simplified explanation of evaluation as 'comparing the actual and real with the predicted or promised.' Whatever the definition, the function of evaluation is to provide a meaningful evidence base that contributes to informed decision-making about the quality of a product or service (Stufflebeam & Shinkfield 2007).

Evaluations that are implemented from a prospective position to provide information for improvement are regarded as formative evaluations. They proactively guide decision-making regarding alternative courses of action and implementation of plans through interim results. In this study, the *context* phase (see Chapter 4) explored, highlighted and confirmed the continuing existence of the problem and the need for the development of a new crowd safety behavioural risk monitoring and assessment method. The *input* phase (see Chapter 5) appraised relevant literature, presented previous attempts at addressing the issue, and guided the development of a new conceptual model showing the factors which influence and shape collective behaviour at music festivals and the development of a new behavioural risk monitoring and assessment method.

Summative evaluations, on the other hand, are used to determine outcomes, are retrospective and are typically implemented toward the end or following completion of a program. In this final phase of the study (the *process - product* phase), in order to 'test' the impact, effectiveness and ease of use of the risk monitoring and assessment method developed in Chapter 5, a training seminar/workshop was developed and delivered to risk assessors and an evaluation undertaken to determine the effectiveness of the training and the impact of the method on potential behaviour change.

3. Evaluation models and frameworks

There are numerous models available to guide evaluation of products, services and activities, each with a different theoretical basis or philosophy that influences their application, implementation and the interpretation of results (Kellaghan et al. 2003). Bourke and Ihkre (2005) recommend that the selection of an appropriate model should be based on three key considerations:

- (i) The evaluation question
- (ii) The context
- (iii) The needs of stakeholders.

Quality assurance processes offer one approach to evaluation. Quality assurance processes gauge the effectiveness of products, services and activities through comparison with external standards. Quality assurance methods have been used in assessing the effectiveness of nursing and clinical education programs (Pope, Garrett & Graham 2000) and dimensions of institutional performance. This method shares a philosophical base with benchmarking and best practice models, where evaluation activities are framed around the comparison of performance with external standards and indicators (Bourke & Ihkre 2005). Because quality assurance models are suited to determining the effectiveness of organisational processes against benchmarks, given the paucity of failure data and lack of standards in the event management domain, this type of approach is not suited to initiatives such as the intervention undertaken in this study.

Participatory evaluation models offer another approach to evaluation and are suited to change-oriented projects that involve a socio-political process of reflection, diagnosis and long-term improvement involving all stakeholders (Bourke & Ihkre 2005). For example, Guba and Lincoln's (2000) Responsive Evaluation model has a participatory focus, emphasising the values of stakeholders within evaluation processes from a participative and constructivist point of view and advocates working towards consensus regarding change. This type of evaluation model requires significant stakeholder 'buy in' as all involved work toward meaning, understanding and consensus (Guba & Lincoln 2000). Scriven (2003) suggests that participatory models like that of Guba and Lincoln (2000) are useful for evaluation projects where social advocacy is needed, as target groups are often marginalised or have not been previously consulted within evaluation processes. However, the constructivist and collaborative nature of this type of model lends itself more to team

evaluation contexts rather than individual led applications. In addition, the primary focus on participation (Scriven 2003) means that, if applied to the current study, determination of impact would become a secondary focus, whereas this is a critical feature that the evaluation process in the current study seeks to investigate.

Client centred or consumer oriented evaluation models offer guidance for program evaluation that focuses on observed effects, achievement of goals and the development of understanding of products, services and activities in a given context (Bourke & Ihkre 2005). The primary measure of success focuses on the extent to which the consumer or client's needs are met (Scriven 2003). Stake's (2000) Countenance model is an example of a client centred evaluation model that uses an action research approach to evaluation, gathering data from case studies on antecedents, transactions and outcomes. However, the primary focus of Stake's (2000) model is on developing an understanding of the client's perspective rather than determining any objective outcome. While this type of model may assist in determining a client's perspective, it places lesser emphasis on determining outcomes such as competence and behaviour change and is, therefore, of limited application in the current study.

Decision oriented evaluation models focus on proactive and retroactive improvement approaches in determining the formative and summative outcome of products, services and methods, and are employed to determine answers in response to specific questions (Stufflebeam & Shrinkfield 2007). This type of approach has links to outcome-based evaluation, although how outcomes support decision-making is additional to simply determining outcomes (Scriven 2003). Decision oriented evaluation models offer systematic and comprehensive direction that focuses on looking at all relevant outcomes in order to fully assess value and inform decision-making. Such approaches appear to offer significant direction in ascertaining the impact of interventions on awareness and competence by informing evaluators if the original needs have been addressed and, if not, identifying what influences are responsible. This type of approach is well suited to this study.

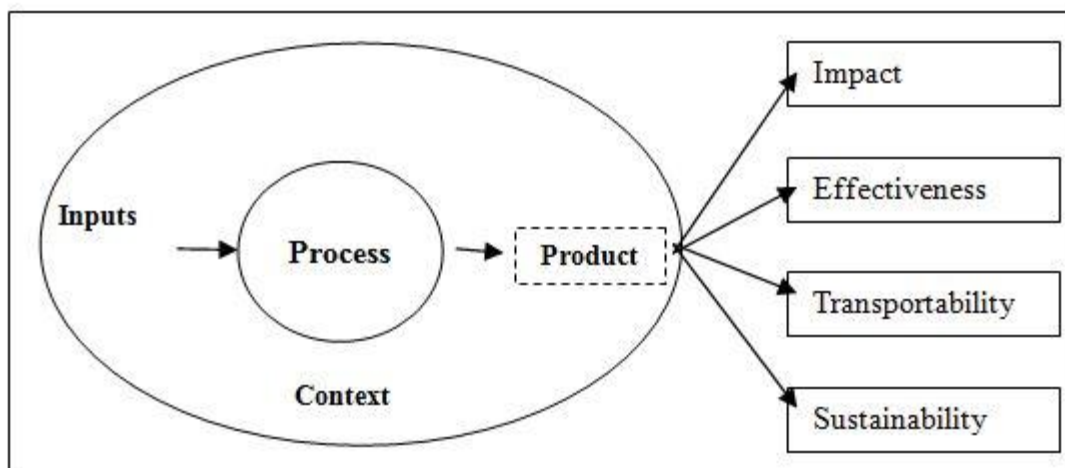
Stufflebeam's (2004) CIPP model is an example of a decision oriented evaluation model. House (2003) explains that the model has a 40 year development history and is one of the oldest and most thoroughly tested evaluation models, especially in educational contexts. It was originally developed in collaboration with Guba (Guba & Stufflebeam 1970), another evaluation theorist, in the 1960s and has since been refined by constant use. Payne (1994)

identifies that the main advantage of the CIPP model is that it is a comprehensive framework that supports organisation of evaluative activities. Gibton (2002) suggests that the CIPP model offers a good combination of theory and practice and comments that specific information on how relevant practical examples apply to theory is useful to prospective users. The model provides direction for individual self-evaluation application, where an evaluator conducts an evaluation in order to improve a product, service or activity in which they have been involved. This is in contrast to many other decision oriented evaluation models that only offer external review perspectives in determining the impact of the intervention, such as, for example, that by Cronbach (1982, in Stufflebeam & Shinkfield 2007).

One of the main strengths of the CIPP model in relation to this study is that it offers formative as well as summative methods to users. The CIPP model places priority on formative dimensions of evaluation and directs changes in practice by guiding the evaluator in setting goals, planning, implementation and development efforts within the *context* and *input* evaluation stages. This provided significant direction in shaping the response to risk assessors' needs. Additionally, the CIPP model has a summative emphasis where the process and product evaluation elements focus on 'testing' of the new methodology, gauging impact by implementing measurement, and interpreting outcomes to determine if the original need has been resolved (Stufflebeam & Shinkfield 2007).

Based on checklists developed by Stufflebeam (2002, 2007) to support various instalments of the CIPP model, Adedokun-Shittu and Shittu (2013) describe the factors relevant to a product evaluation, as outlined in Figure 6.1.

Figure 6.1: CIPP Evaluation Model – adapted and developed based on Stufflebeam (2007)



Impact assesses whether the product, service or activity has a direct effect on participants. *Effectiveness* checks whether the product, service or activity achieves its intended benefits. *Transportability* measures whether changes in behaviour can be directly attributed to, or associated with, the product, service or activity. Lastly, *sustainability* looks at how lasting the effect of the product, service or activity will be in practice (Stufflebeam 2007).

Product evaluation is usually summative in nature, conducted for the purpose of accountability in determining the overall effectiveness and worth of an implementation (Stufflebeam 2004). Outcome assessment techniques are usually adopted, measuring anticipated outcomes, attempting to identify unanticipated outcomes, and assessing the merit of the program. In the present study, application of the contemporary risk assessment methodologies (Au et al 1993; RM Consultants 1998; Au 2001; Still 2009, 2014) and the behavioural risk monitoring and assessment method developed as part of the study were not able to be ‘field tested’, principally for the reasons already outlined in Chapter 1. Any such testing will need to occur at a live event and will be the subject of further research. However, the outcome sought to be achieved at this stage is a validation of the method through the raising of risk assessors’ awareness, a determination of the usefulness of the method, its ease of application and a change in assessor behaviour in committing to adopt the method.

Product (or ‘outcome’) evaluation looks at results. It measures the direct effects of program activities on targeted recipients, such as the degree to which a program increased knowledge. But results don’t tell the whole story. Evaluation that only focuses on outcomes is sometimes called a ‘black box’ evaluation because it does not take process evaluation into consideration. Disappointing outcome evaluation results can frequently be illuminated by examining how the program was implemented, the number of clients served, dropout rates, and how clients experienced the program. These are process evaluation questions. Process evaluation looks at how program activities are delivered. It helps practitioners determine the degree to which an intervention was implemented as planned and the extent to which it reached the targeted participants. Implementation quality is critical to maximising the intended benefits and demonstrating strategy effectiveness, and process evaluation provides the tools to monitor quality. It also provides the information needed to make adjustments to strategy implementation in order to strengthen effectiveness.

Another popular decision oriented evaluation model which continues to be used in contemporary research (Schmidt 2009; Elliott et al 2009) despite its age, and one which implicitly includes scope for process evaluation, is that developed by Kirkpatrick in the 1960s. Although originally developed for assessing training programs, it is also a useful and meaningful way of measuring the reaction, learning, behaviour and results that occur from the implementation of a new product, service or activity. Kirkpatrick (1977, 1998) divided the evaluation process into four segments or stages as shown in Figure 6.2.

Figure 6.2: Kirkpatrick Evaluation Model

Stage One - Reaction	How do the participants feel about the program they attended? To what extent are they satisfied customers?
Stage Two - Learning	To what extent have the trainees learned the information and skills? To what extent have their attitudes changed?
Stage Three – Transfer/Behaviour	To what extent has their job behaviour changed as a result of attending the training program?
Stage Four - Results	To what extent have results been affected by the training program?

The stage one, *reaction*, level measures the relevance of the objectives of implementation of a product, program or activity and its perceived value and satisfaction from the point of view of the users. The second, *learning*, stage evaluates the knowledge, skills and attitudes acquired during and after implementation of the product, program or activity. It assesses the extent to which participants change attitudes, improve their knowledge or increase their skills as a result of implementation. It also assesses whether the learning that occurred is intended or non-intended. In the third, *transfer*, stage the behaviour of users is assessed in terms of whether the newly acquired skills are actually transferred to the working environment or whether they have led to a noticeable change in users' behaviour. Finally, the fourth, *results*, level measures the success of the program by determining whether the desired outcomes are being achieved (Kirkpatrick & Kirkpatrick 2007).

One of the key ingredients of this model is its simplicity. Evaluating at the reaction stage allows a trainer to gain a quick understanding of how the learners felt about the session in terms of content, structure and how it was delivered. Usually this will be gauged in the form of a self-completion questionnaire completed at the end of the training event. By analysing the results, the trainer can quickly make amendments to the program as necessary.

Kirkpatrick (1977) suggests that the usefulness of stage one evaluations is dependent on the honesty of attendees who complete the questionnaire and whether they feel comfortable in being able to tell the truth. One way to encourage honesty in this process would be to have attendees complete the questionnaire anonymously, although this might limit the opportunity for the trainer/facilitator to provide additional support or follow-up to attendees where they felt that their objectives were not met. There is also the potential issue of social desirability whereby the attendees feel that they have to respond in a particular way (Darby 2006), especially if they are asked to complete their evaluation in front of the trainer/facilitator or fellow attendees⁷². There is also a risk that the evaluation might focus too heavily on enjoyment rather than on how useful it has been (Hamblin 1974), frequently in the form of ‘happiness sheets’ (Bramley & Kitson 1994).

Evaluating at stage two provides attendees with the opportunity to gauge their learning and to identify how they believe their behaviours might change. Assessing at this level moves the evaluation beyond learner satisfaction and attempts to gauge the extent to which students have advanced in skills, knowledge or attitude. In order to assess the amount of learning that has occurred due to a training program, level two evaluations often use tests conducted before training (pre-test) and after training (post-test).

Stage three of Kirkpatrick’s model evaluates ‘the extent to which change in behaviour has occurred because the participant attended the training program’ (1998, p. 20), while stage four highlights ‘the final results that occurred because the participants attended the program’ (Kirkpatrick 1998, p. 60). James and Roffe (2000) argue that there are inherent challenges in evaluation at levels three and four which can be attributed to other factors that may have an impact on changes in performance, including personal factors (e.g. motivation, ability and attention), instructional factors (e.g. course design and trainer’s ability), and organisational factors such as climate, timing, management, learner support, etc. This view is confirmed by Tyson and Ward (2004). Cheng and Hampson (2008) note that levels three and four are not often used because organisations find it much simpler to focus on the first two levels. Certainly, measurement of these is immediate and relatively easy to undertake. In addition, Allinger and Janak (1989) argue that some organisations may not deem evaluation at all four levels as necessary for some interventions.

⁷² Lee and Pershing (2002) believe that Kirkpatrick provides insufficient guidance on how stage one can be achieved through a questionnaire and suggest that guidelines in this area would be useful.

4. Evaluation inquiry methods

Evaluation is not equated with any one method of scientific or social science inquiry. Rather, appropriate methods are applied systematically to reach evidence-based judgements that inform the evaluation purpose (Kellaghan, Stufflebeam & Wingate 2003; Stufflebeam & Shinkfield 2007). While research methodologies inform the conduct of evaluations, there is a fundamental difference between evaluation and research design. Stufflebeam (2004, p. 262) makes a clear distinction between the two concepts when he makes the statement that ‘an evaluation’s most important purpose is not to prove but to improve’. This is subsequently reinforced when he asserts that ‘evaluation is thus conceived primarily as a functional activity oriented in the long run to stimulating, aiding and abetting efforts to strengthen and improve enterprises’ (Stufflebeam & Shinkfield 2007, p. 331). These statements do not disregard the application of research methods, rather they advocate that evaluation investigates issues from a broad perspective using appropriate methodologies, while also fulfilling practical imperatives by informing decision-making and stimulating efforts to strengthen and improve products and services.

Qualitative methods are a means for collecting information on the feelings, beliefs and impressions of participants about a product or service. These methods are open-ended and especially useful in a formative evaluation of a product or service when pilot testing of procedures, activities and materials are being conducted. Qualitative methods such as interviews, focus groups and participant observation can collect this type of information which can then be used to refine the product or service.

Quantitative methods are used to collect objective data expressed in numbers, such as the number of participants attending a program (process evaluation), change in knowledge or practice after the program (impact evaluation) or a change in injury rates after the program (outcome evaluation). Surveys are the usual methods for systematically collecting quantitative data. Surveys can be undertaken during the development of a product or program to identify areas of difficulty before implementation and, therefore, allow modification to increase efficiency (pilot survey), and/or to gather baseline data on knowledge, attitudes and behaviour. Once a product or service is delivered, surveys can measure participant satisfaction, change in competency compared with baseline levels, and/or identify a problem with the product or service due to no measurable effect (Sherrard & Day 2001).

5. Evaluating the new method

Participants who took part in the original survey of the study (reported in Chapter 4) were invited to a workshop (the contents of which are outlined in Appendix I) outlining contemporary approaches to crowd risk assessment, including the new method developed by the author to monitor and assess behavioural risk. Nine persons in all participated in the workshop – seven of the original participants and two new. Participants' reactions to the survey were evaluated at the end of the workshop. In this regard, evaluation at Kirkpatrick's (1977, 2006) levels 1 and 2, and some tentative evaluation at level 3, was undertaken to determine whether the new method met the criteria outlined in the research questions. Such an approach accords with Stufflebeam's (2004) suggestion that an ongoing check of progress is an important step in evaluation projects, and is where activities are contrasted with previous plans and goals to identify unanticipated effects.

Training evaluation can be described as a systematic process of collecting and analysing information for and about a training program which can be used for planning and guiding decision making as well as assessing the relevance, effectiveness and the impact of various training components (Raab et al 1991). Hirumi (2002) notes that analysing the quality of learning can then be used to modify and refine previously-developed content, structure or media as necessary in order to achieve the program goal(s).

How can we be sure, though, that it was just the training intervention that made the difference? Controlling for other factors would normally involve undertaking experiments and using control groups (Kirkpatrick 1977). However, Kirkpatrick (1977) believes that proof can be gained by comparing pre- and post-intervention performance to identify whether there has been a shift, though the design of such a tool might be complex (Bramley & Kitson 1994).

In this regard, evaluation of the workshop was undertaken through the administration of a post- and retrospective pre-test survey (RPT), which is set out in Figure 6.3. The instrument included questions typically associated with measuring participants' reactions (Sugrue & Rivera 2006) (level 1), a set of questions to gauge whether and how much learning occurred (level 2) and a tentative attempt to determine the level of transfer that might be expected (level 3) and solicited responses across a five point Likert scale.

Figure 6.3 Training response survey

Crowd Analysis Workshop Friday 20th March 2015

Part A

1. How would you rate this workshop (circle one)

Poor	Ok	Fair	Good	Excellent
1	2	3	4	5

2. To what extent was attending this workshop worth your time (circle one)

Not at all	Slightly	Moderately	Very	Strongly
1	2	3	4	5

3. Please rate the workshop on the following items (circle one number for each item)

	Very poor	Poor	Fair	Good	Very good
(a) Content	1	2	3	4	5
(b) Organisation	1	2	3	4	5
(c) Use of instructional material	1	2	3	4	5
(d) Creating interest in the topic	1	2	3	4	5
(e) Involvement of participants	1	2	3	4	5
(f) Pace of delivery	1	2	3	4	5
(g) Worked example	1	2	3	4	5

4. Overall, to what extent was this workshop useful to you (circle one)

Not useful	A little useful	Somewhat useful	Quite useful	Very useful
1	2	3	4	5

5. Do you think that the risk mapping method outlined in this workshop is a **useful approach** to adopt when assessing crowd safety risks (circle one)

Not useful	A little useful	Somewhat useful	Quite useful	Very useful
1	2	3	4	5

6. Do you think that Crowd Behaviour Index outlined in this workshop is a **useful tool** to monitor and assess behavioural risk (circle one)

Not useful	A little useful	Somewhat useful	Quite useful	Very useful
1	2	3	4	5

7. Do you think that the Crowd Behaviour Index outlined in this workshop is an **easy tool** to use (circle one)

Complicated	Difficult	Easy	Quite easy	Very easy
1	2	3	4	5

8. To what extent do you think you can **apply** the information presented today in this workshop (circle one)

Not at all	A little bit	Some	Quite a bit	A lot
1	2	3	4	5

Part B

In this section of the survey you will find paired questions (before v after) seeking your understanding of behavioural risk. To better understand your personal learning please complete both part (a) and part (b) of each question

9. My awareness of the topic:	Very poor	Poor	Fair	Good	Very good
(a) before the workshop	1	2	3	4	5
(b) after the workshop	1	2	3	4	5

10. My understanding of the topic	Very poor	Poor	Fair	Good	Very good
(a) before the workshop	1	2	3	4	5
(b) after the workshop	1	2	3	4	5

11. My ability to demonstrate comprehension of the topic	Very poor	Poor	Fair	Good	Very good
(a) before the workshop	1	2	3	4	5
(b) after the workshop	1	2	3	4	5

12. My ability to apply these concepts to an actual situation	Very poor	Poor	Fair	Good	Very good
(a) before the workshop	1	2	3	4	5
(b) after the workshop	1	2	3	4	5

13. Any comments regarding your 'before' and 'after' selections?

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.....

14. How likely are you to **want to use** the risk mapping techniques outlined (circle one)

Not at all	Maybe	Likely	Quite likely	Definitely
1	2	3	4	5

15. How likely are you to **want to use** the Crowd Behaviour Index (circle one)

Not at all	Maybe	Likely	Quite likely	Definitely
1	2	3	4	5

16. Any final comments

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.....

Determining how much learning occurred is often considered a challenge that cannot be met because of issues relating to implementation, cost and usage (Lynch 2002). As already indicated, in the content of this study, this could only be effectively undertaken by using the new methodology and instrument repeatedly at live events over a given period, thereby gauging the degree of use and consequently the ‘behaviour transfer’ and ‘result’ of the training, and the corresponding ‘transportability’ and ‘sustainability’ of the methodology and instrument (see Figure 6.3).

However, this is largely overcome by using RPT, which has been shown to be a valid and reliable measure of the success of a training program and to correlate well with pre- and post-ratings of the performance of participants made by observing experts (Goedhart & Hoogstraten 1992; Terborg et al. 1980; Pratt et al. 2000). Unlike the traditional pre-post design where learners answer questions before an educational program, engage in the lesson, activity or course, then answer the same questions after the program, the RPT is administered at the same time as the post-test and both ‘before’ and ‘after’ information is collected at the same time. Respondents are asked to answer questions about their level of skill or understanding after an intervention such as a workshop or training session and are then asked to think back to their understanding prior to the intervention.

Recognising that traditional pre-tests are sometimes difficult or impossible to administer, and citing exemplar studies conducted by Deutsch and Collins (1951), Sears, Maccoby and Levin (1957) and Walk (1956), Campbell and Stanley (1963) advocated the RPT as an alternative technique to measure individuals’ pre-intervention behaviour. While Howard et al. (1979) prescribed adding the RPT to traditional pre-test, post-test designs as a means of managing the presence of response shift bias,⁷³ contemporary evaluators (e.g. Lamb & Tschillard 2005; Martineau 2004; Raidl, Johnson, Gardiner, Denham, Spain & Lanting 2002) have promoted the use of the RPT in lieu of the traditional pre-test (Allen & Nimon 2007).

⁷³ Response shift effect occurs when a respondent’s frame of reference or understanding or evaluation standard changes significantly during an intervention. It can create a problem when assessing self-reported change (Rockwell & Kohn 1989). Participants may not accurately assess their pre-program knowledge or behaviours. Then, at the end of the program, their new understanding of the program content may affect their response on the post self-assessment. In effect, they are actually responding based on two different frames of reference. The RPT method avoids the response shift effect by clearing up misconceptions before participants are asked to make assessments. Once a workshop or training session is over, and all concepts have been sufficiently explained, participants first assess their new level of understanding or skill and, secondly, reflectively assess the level of understanding or skill they had prior to the workshop or training: see also Howard 1980.

Citing data that suggest that pre-tests underestimate the impact of interventions, Lamb and Tschillard (2005) asserted that the RPT is just as useful as the traditional pre-test in determining program impact in the absence of response shift bias, and is even more useful when subjects' understanding of their level of functioning changes as a consequence of the intervention. Similarly, Martineau (2004) argued that the RPT correlates more highly with objective measures of change than self-report gains based on traditional pre-test ratings. Finally, Raidlt et al. (2002) promoted the RPT over the traditional pre-test because it addresses the challenges associated with obtaining complete datasets.

In addition, Howard et al (1979) noted that when individuals did not have sufficient information to judge their initial level of functioning (i.e. individuals did not know what they did not know), the RPT provided a more accurate measure of pre-intervention behaviour. Because the evaluation was administered post-intervention, participants could apply program knowledge in forming self-reports of their pre-intervention behaviour. Subsequent research (for a full review see Nimon & Allen 2007) across a wide variety of measures has indicated that RPT provides a more accurate measure of pre-intervention behaviour.

Given the time elapsed since a number of the participants completed the first survey (reported in Chapter 4), and that there were a number of new participants in this group, the use of the RPT is particularly appropriate for this study. This approach provides a relatively simple yet robust method by which to assess learners' self-reported changes in knowledge, awareness, skills, confidence, attitudes or behaviours (Klatt & Taylor-Powell 2005). It takes less time, is less intrusive and, for self-reported change, avoids pre-test sensitivity and response shift bias that result from pre-test overestimation or underestimation (Howard 1980; Rockwell & Kohn 1989; Pratt et al 2000; Lam & Bengo 2003).

6. Outline and analysis of survey results

Results of the survey are outlined in Table 6.1, which is a modification of the survey questionnaire with the rating number removed and replaced by the number of participants who made the various comments.

Table 6.1 Survey results

9. How would you rate this workshop (circle one)

Poor	Ok	Fair	Good	Excellent
-	-	-	2	7

10. To what extent was attending this workshop worth your time (circle one)

Not at all	Slightly	Moderately	Very	Strongly
-	-	-	2	7

11. Please rate the workshop on the following items (circle one number for each item)

	Very poor	Poor	Fair	Good	Very good
(h) Content	-	-	-	1	8
(i) Organisation	-	-	-	1	8
(j) Use of instructional material	-	-	-	1	8
(k) Creating interest in the topic	-	-	-	1	8
(l) Involvement of participants	-	-	-	1	8
(m) Pace of delivery	-	-	-	1	8
(n) Worked example	-	-	-	1	8

12. Overall, to what extent was this workshop useful to you (circle one)

Not useful	A little useful	Somewhat useful	Quite useful	Very useful
-	-	-	2	7

13. Do you think that the risk mapping method outlined in this workshop is a **useful approach** to adopt when assessing crowd safety risks (circle one)

Not useful	A little useful	Somewhat useful	Quite useful	Very useful
-	-	-	2	7

14. Do you think that the Crowd Behaviour Index outlined in this workshop is a **useful tool** to monitor and assess behavioural risk (circle one)

Not useful	A little useful	Somewhat useful	Quite useful	Very useful
-	-	1	-	8

15. Do you think that the Crowd Behaviour Index outlined in this workshop is an **easy tool** to use (circle one)

Complicated	Difficult	Easy	Quite easy	Very easy
-	-	1	2	6

16. To what extent do you think you can **apply** the information presented today in this workshop (circle one)

Not at all	A little bit	Some	Quite a bit	A lot
-	-	1	2	6

Part B

In this section of the survey you will find paired questions (before v after) seeking your understanding of behavioural risk. To better understand your personal learning please complete both part (a) and part (b) of each question

9. My awareness of the topic:	Very poor	Poor	Fair	Good	Very good
(c) before the workshop	1	2	4	2	-
(d) after the workshop	-	-	-	2	7
17. My understanding of the topic	Very poor	Poor	Fair	Good	Very good
(c) before the workshop	1	2	4	2	-
(d) after the workshop	-	-	-	2	7
18. My ability to demonstrate comprehension of the topic	Very poor	Poor	Fair	Good	Very good
(c) before the workshop	2	2	4	1	-
(d) after the workshop	-	-	-	4	5
19. My ability to apply these concepts to an actual situation	Very poor	Poor	Fair	Good	Very good
(c) before the workshop	2	3	4	-	-
(d) after the workshop	-	-	-	4	5

20. Any comments regarding your 'before' and 'after' selections?

Interesting techniques

I would like some more training in these techniques to be a bit more confident. But I think they are really good.

Great approach – visual; Behavioural tool = fantastic way of deciding when to get involved.

This workshop has really opened my eyes. These approaches are a huge leap forward in this area.

Method is easy to understand. Great way of dealing with this. Beats the usual risk assessment method.

Wow – what an eye opener.

Sensational – got a much better idea now of how to approach the crowding issue at my place.

Always thought there was something missing with risk assessment. Now I know what. This was a fantastic workshop.

I thought I knew a fair bit about how to assess venue risks, but never really considered crowd behaviour. Always wondered how we could address it.

21. How likely are you to **want to use** the risk mapping techniques outlined (circle one)

Not at all	Maybe	Likely	Quite likely	Definitely
-	-	1	2	6

22. How likely are you to **want to use** the Crowd Behaviour Index (circle one)

Not at all	Maybe	Likely	Quite likely	Definitely
-	-	1	2	6

23. Any final comments

Great workshop. I really learnt a lot today.

Fantastic – want to learn more about these.

Glad I came – good tools better than the usual way we do it.

These will be really useful at my venue.

Behaviour tool is good – nothing like it in use at the moment. Still need usual risk assessment with the diagrams. Splitting into (i) entry, (ii) being there, and (iii) out = good.

I want to know more.

Really glad I came. Aldo is fantastic.

Aldo is a genius – he made this stuff really easy to understand and that tool he developed is great. Really enjoyed this and really useful as well.

How refreshing to see some innovative work in this area. Easy to understand, easy to apply and really useful. Aldo should be congratulated for outlining the latest thinking and for the tool which he has developed. Well done.

Given the small sample size ($n = 9$), the absence of negative responses and the very small degree in variation in responses, it is not considered necessary to subject the results to any form of statistical analysis using traditional analytical methodologies to measure dispersal, variability or deviation. Burns (1994, p.63) notes that sample size is less important than representativeness of the sample in terms of those variables which are known to be related to characteristics that are to be studied. Given that all participants were operationally involved in crowd safety, a high degree of confidence can be expressed in the representativeness of the attendees in relation to the sample population.

Satisfaction rating of the workshop was high. In addition, all applicants found the workshop useful and indicated that participation improved their awareness, knowledge, comprehension and application of the concepts to actual situations. In this respect, all participants moved from a very poor/poor/fair level of awareness, understanding and application to good/very good (with a majority self-assessing at the very good level).

Reaction (Level 1)

Trainee reaction, the first level of the Four-level Evaluation Model, which was measured in questions 1 – 4 of the survey questionnaire, was extremely positive, with the majority of attendees rating the workshop as very good/excellent or good. All attendees indicated that attending the workshop was useful and worth their while. Training reaction is a measure of a trainee's feelings about a training program (Tan, Hall, & Boyce 2003). It is the most common criterion used to evaluate training programs (Bassi, Benson, & Scott 1996; Saari et al. 1988).

However, researchers have consistently cautioned against the overreliance of trainee reaction as a predictor for determining the effectiveness of a training program (Ruona et al. 2002; Tan, Hall, & Boyce 2003). Noe and Schmitt (1986) have suggested that trainee satisfaction has no significant relationship with learning. Similarly, Warr and Bunce (1995) found no significant correlation between reported enjoyment of training, usefulness of training, and learning scores. A number of studies have further emphasized the importance of understanding the multidimensional nature of trainee reactions (Morgan & Casper 2000; Tan, Hall, & Boyce 2003). One effort to overcome this problem is to distinguish trainee reactions into affective and utility reactions (Alliger et al. 1997). In their meta-analyses, Alliger et al. (1997) showed that stronger correlations were found between utility reactions and learning or job performance than between affective reaction measures and learning or job performance. A similar conclusion was made by Ruona et al. (2002), who searched for the relationship between utility reactions and the predictors of learning transfer. They suggested utility reactions for learning outcome evaluations, rather than traditional affective reactions.

Learning (Level 2)

Learning, the level 2 of the Four-level Evaluation Model, is defined as “principles, facts, and techniques understood and absorbed by the trainees” (Alliger & Janak 1989). This level of training was sought to be measured in questions 9 – 13 of the survey questionnaire. All attendees indicated a marked improvement in their awareness and understanding of the material presented in the workshop along with an increased ability to demonstrate comprehension and to apply the concepts to actual situations. However, declarative knowledge on its own is not a valid predictor of behaviour (Haccoun & Saks 1998; Kraiger, Ford, & Salas 1993).

Transfer (Level 3)

The transfer of training is defined as “the degree to which trainees effectively apply the knowledge, skills, and attitudes gained in training context to the job” (Baldwin & Ford 1988, p. 63). This is essentially the whole purpose of training and it is not surprising that transfer of training is one of the major concerns in training research. In order for training to be considered effective, learned behaviour must be generalized to the work context and maintained over a period of time on the job (Baldwin & Ford, 1988). This level of training was sought to be evaluated (albeit in a limited way through a self-report measure) in questions 5 – 8 and 14 – 15 of the questionnaire. All attendees indicated that the new method was useful and easy to use, that they could apply the techniques presented in the workshop (including the new method to monitor and assess behavioural risk) and that they would, in fact, want to use these techniques.

During the workshop participants collaboratively and successfully worked through an example applying the contemporary techniques and approaches outlined (including the new behavioural risk monitoring and assessment method). A number of researchers have suggested that training performance has positive influences on transfer of training (Alliger et al. 1997; Kirkpatrick 1976; Kraiger 2002). Kozlowski et al. (2001) empirically tested the relationships among multidimensional training outcomes and performance adaptability and concluded that training performance was the most predictive of performance adaptability. Further, Tannenbaum et al. (1991) found that performance during training was associated with post-training motivation. Based on the expectancy theory, more successful trainees would be more motivated to transfer their knowledge and skills to the work settings than less successful trainees (Vroom, 1964). Therefore, training performance provides a potentially valid predictor of successful transfer of training.

Results (Level 4)

Level 4 evaluation measures the results of an intervention, including impacts on an organisation or industry and returns on investment (ROI) and generally includes ‘high level’ performance measures such as a reduction in accidents. Given the intervention in question, Level 4 evaluation was not undertaken.

7. Summary

The final phase of the study involved the development and delivery of a training workshop to a group of representatives of music promoters and venue owners and/or operators with safety responsibilities for events. The purpose of the workshop was to present contemporary approaches to the assessment and management of crowd-related safety risks and to situate the method developed by the author for the monitoring and assessment of behavioural risk within these contemporary approaches. In particular, this enabled the method to be ‘tested’ against the research objectives of the study, viz. the impact, effectiveness and ease of use of the method

While the CIPP model adopted as the research design framework for the study is itself essentially an approach to outcome evaluation, the Kirkpatrick *Four Level Training Evaluation Model*, which is traditionally used to evaluate the effectiveness of training interventions, was used to evaluate the training itself. This was undertaken through the use of a post and pre-test survey that sought to measure the effectiveness of the training at levels 1 (reaction) and 2 (learning) with a tentative attempt to determine the level of transfer that might be expected (viz. level 3). Given the time constraints of the study, more in depth evaluation at level 3 and evaluation at level 4 were not possible. However, further research should be undertaken to determine the effectiveness of the training and, indeed, the method itself, at levels 3 and 4.

Results of the survey were positive and encouraging, with all participants reporting high levels of satisfaction with both the workshop and the contemporary approaches presented (including the new method) for the assessment of crowd safety (level 1). In addition, all participants reported an increased awareness and new understanding of crowd related safety issues and how to proactively anticipate and then manage them (level 2). Finally, the responses suggest that a level of behaviour change can be anticipated (tentative level 3).

CHAPTER 7

CONCLUSION

‘The real voyage of discovery consists not in seeking new landscapes,
but in having new eyes.’
Marcel Proust (1871 – 1922)

Chapter Outline

1. Introduction
2. Summary of the study
3. Implications of the study
4. Contributions of the study
5. Limitations of the study
6. Recommendations for further research
7. Summary

1. Introduction

A number of commentators have suggested that current approaches to the assessment of risks at mass gathering events, including outdoor music festivals, are less than adequate (Weir 2002; Upton 1999, 2004, 2008; Wertheimer 1993; Arbon 2004; EMA 1999; Still 203, 2014). While generally tending to deal with the traditional hazards and risks found at most workplaces, they fail to take into account the dynamics of the crowd and those factors that influence its behaviour (Upton 1999), thereby leaving a significant source of risk unaccounted for. Insufficient attention to the way that people behave in a crowd and the relationship between behaviour and systems design have been found to be major factors in crowd disasters (Sime 1993; Berlonghi 1995).

This situation prompted a call (Challenger & Clegg 2009, Second Report) for the development of ‘a rigorous risk assessment tool that can be used by all those involved with planning for and managing events and circumstances involving crowds’ (p. 96) . In addition, the report (Challenger & Clegg 2009, Second Report) recommends that ‘...the risk assessment tool is developed with the help of its potential users, to ensure it is both user friendly and fully meets their various needs’ (p. 96).

This study has sought to address this call by developing a contextualised and user-friendly method to monitor and assess behavioural risk at outdoor music festivals that integrates behavioural and psychosocial factors with the “hard” laws of dynamics. In addition, the study has situated the method with contemporary approaches to the assessment of crowd safety risks generally. The aims and objectives of the study were:

- (i) to show how risk assessment can be best applied to crowd safety
- (ii) To investigate and explore, through the identification of relevant hazards and risk factors, how crowd safety assessment can be improved
- (iii) to determine whether such a method, which takes into account the specific nature of crowd safety risks, will affect the approach taken by crowd safety assessors, thereby leading to improved planning for outdoor music festivals.

The results indicate that the call for a rigorous and user-friendly risk assessment tool has been answered, and the aims and objectives of the study and associated research questions (outlined in Chapter 1) have been met.

Section 2 provides outlines the study in summary. This is considered to be useful in that it provides a snapshot of the process undertaken to achieve the aims and objectives of the study and to highlight the theoretical contexts and dimensions of the various phases of the study. The summary also provides a useful ‘ready reckoner’ of where the outcomes of the study sit in relation to the broader theoretical base from which it has drawn substance and nourishment. Section 3 then outlines the implications of the study for the broader theoretical domains on which it has relied and into which it has intruded.

Section 4 outlines the contributions that the study makes to new knowledge, practice and the author’s professional and personal development. These contributions situate the study within contemporary and nascent fields of study in the broader discipline of safety science. At the same time, the study makes a significant contribution to the practice of risk assessment, monitoring and management in the event safety sphere. In addition, undertaking the study has impacted profoundly on the author’s own personal and professional development.

Finally, section 5 outlines the limitations of the study, section 6 provides recommendations for further research and section 7 closes the study.

2. Summary of the study

The genesis for the study reported in this dissertation was the author's own experience with the lack of any methodology and instrument for monitoring and assessing crowd-related safety risks, particularly behavioural risks, while implementing and managing operational safety initiatives at outdoor music festivals in Australia. Not only was there a significant gap in practice, but also a significant gap in knowledge regarding the application of an appropriate risk management approach. While festival promoters and venue owners and/operators generally adopt a risk management approach to planning for these types of events, evidence suggests that current efforts are insufficient. Commentators argue that current risk assessment methods are inadequate in this context. Significant crowd-related safety disasters tend to confirm this proposition. Risk assessments for music festivals and mass gatherings generally tend to deal with the traditional hazards and risks found at most workplaces, without taking into account the dynamics of the crowd or those factors that influence its behaviour. This is due largely to a lack of understanding of the influences on crowd behaviour and a lack of appreciation of the risks involved. As a consequence, a significant source of risk is unaccounted for.

The USQ Professional Studies doctoral program presented itself as an ideal opportunity and provided a rigorous academic environment within which to explore the development of a contextualised method for monitoring and assessing behavioural risks at music events. While there has been some development in new approaches to assessing risk at mass gatherings and events, a vacuum still remained in relation to monitoring and assessing behavioural risks. As a work-based learning program, with its primary focus on the work as the starting-point, rather than a professional or academic discipline, the Professional Studies program's transdisciplinary approach enabled synergising and scaffolding of different disciplinary points of view to develop an acceptable and user-friendly methodology and instrument in response to the research problem. Not only did this approach result in a contribution to practice in this context, but also contributed to an increase in the knowledge base of this domain and to the author's personal and professional development. As a part of undertaking this study, the author has also sought to situate the professional studies program, along with its underpinning work-based approach, within the constructivist and contemporary academic educational theory of *expansive learning* and its underpinning basis of *activity theory*, thereby adding to the justification for this type of approach as academically rigorous and legitimate.

Adoption of activity theory as the dominant theoretical and conceptual paradigm for a work-based learning study required the application of an equally interpretivist research design. The design for this study was framed around an evaluation framework (the CIPP model) which accommodates descriptive, exploratory and developmental approaches during its various phases. The particular value of this framework over others lies in its fundamental tenet that the design of evaluation should be grounded in knowledge about the amount and importance of any proposed change, and the amount and quality of understanding which is available to support decision-making to effect change. In this regard, the study was identified as attempting to effect neomobilistic change (i.e. significant change in an environment involving low understanding of the change). According to the CIPP model, neomobilistic change should be investigated and implemented using qualitative research methods which are heuristic, exploratory and developmental. Due to the low level of understanding by music promoters and owners/operators of public venues of how to assess the risks arising from the dynamics of a crowd and their behaviour, and the lack of any dedicated resources to be able to do so, these approaches allow innovative activity involving inventing, testing and diffusing possible solutions to be explored and undertaken.

Crowds at events like outdoor music festivals are the principal hazard that needs to be dealt with and, without effective management, can become a significant problem with serious consequences. An examination of the context revealed that a considerable proportion of the safety risks associated with outdoor music festivals can be attributed to anti-social, irrational and unsafe behaviour by patrons, and that the encouragement of such behaviour has, to some extent, been a deliberate strategy on the part of music promoters and press agents, resulting in patrons attending music events becoming more aggressive and violent. In fact, it might even be considered to be part of the attraction of attending. While traditionally concert promoters and venue owners and/or operators have not considered crowd-related safety to be their responsibility but rather the personal responsibility of patrons (who are perceived to put themselves at risk by virtue of their attendance, zeal and behaviour), the legal reality is quite different with potential exposure to claims for compensation for injury and prosecution under work health and safety laws. When managing risks at outdoor music festivals it is important, therefore, to understand the nature of the crowd demographic attending the event and the factors that impact on and shape the behaviour of the crowd. A survey of promoters and venue owners and/or operators revealed inadequate knowledge in this regard and confirmed the need for an appropriate behavioural risk monitoring and assessment instrument.

A number of attempts have been made, over the last twenty years or so, to develop an appropriate methodology for assessing crowd safety at mass gatherings. While these approaches provide traditional (albeit contextualised) and contemporary approaches, none address the issue of behavioural risk. Research undertaken in the mass gathering emergency medicine context provided promising material for a possible approach to this aspect of crowd safety. A conceptual framework describing the interrelationship between the psychosocial, environmental and biomedical domains of a mass gathering was used by the author to knit together the various influences on individual behaviour which, mediated by various theories of social psychology, are translated into collective crowd behaviour at outdoor music festivals and to develop a conceptual model in this regard. An important focus of the model is the potential impact of the psychosocial domain on injury and illness rates due to elements traditionally described as *crowd type* and *crowd mood*. Crowd type is a descriptor of the societal sub-culture of a crowd, while crowd mood is a descriptor of crowd emotion. This model then formed the basis for the development of the Crowd Behaviour Index, which uses a matrix of crowd type/crowd mood to identify behavioural trigger points for action. The tool can be used in the planning phase of an event (as demonstrated by the integration of the CBI into the contemporary DIM-ICE framework) as well as in 'real time' monitoring.

In order to validate the methodology and instrument, a training seminar was developed and delivered to risk assessors and an evaluation undertaken to determine the effectiveness of the training and the impact of the methodology on potential behaviour change and, in particular, whether the methodology and instrument met the criteria outlined in the research questions. Evaluation of the workshop was undertaken through the administration of a post- and retrospective pre-test survey (RPT) which included not only questions typically associated with measuring participants' reactions, but also included a set of questions to gauge whether and how much learning occurred. Satisfaction rating of the workshop was high. All applicants found the workshop useful and indicated that participation had improved their awareness, knowledge, comprehension and application of the concepts to actual situations. The results indicate that the aims and objectives of the study and associated research questions, viz. the development of a user-friendly yet rigorous method for monitoring and assessing crowd-related behavioural risks at outdoor music festivals, have been met and answered. Field testing of the methodology and instrument could not be undertaken within the confines of this study; however, is the next logical step in validating the robustness of the methodology and instrument.

3. Implications of the study

This study makes a significant contribution to the nascent field of *crowd science* and the emerging discipline of *resilience engineering*. Crowd science can be defined as the study of the effect of density, dynamics and behaviour (individual and collective) on a crowd. Resilience can be conceptualised as the intrinsic ability of a system to adjust its functioning prior to, during, or following changes and disturbances, so that it can sustain required operations under both expected and unexpected conditions. Whereas conventional risk management approaches are based on hindsight and emphasise error tabulation and calculation of failure probabilities, resilience engineering looks for ways to enhance the ability at all levels of organisations to create processes that are robust yet flexible, to monitor and revise risk models, and to use resources proactively in the face of disruptions or ongoing production and economic pressures. In resilience engineering failures do not stand for a breakdown or malfunctioning of normal system functions, but rather represent the converse of the adaptations necessary to cope with the real world complexity. Individuals and organisations must always adjust their performance to the current conditions; and because resources and time are finite it is inevitable that such adjustments are approximate. Success has been ascribed to the ability of groups, individuals, and organisations to anticipate the changing shape of risk before damage occurs; failure is simply the temporary or permanent absence of that.

The study also makes a significant contribution to practice in this area. Not only has the model been peer reviewed and accepted for presentation at a number of conferences (local, national and international), but the CBI has been well received by music industry representatives as being useful, appropriate and easy to use. It remains for the instrument to be field tested. In addition, it is submitted that the instrument should be readily transferrable to other mass gathering contexts. Further work in both these regards is imperative.

Finally, and by no means least, undertaking the study has made a profound impact on the author's personal and professional development, resulting in a much more critically reflective world view and approach to practice. This approach has not only repositioned the author as a more empowered responsible agent of change, but has also demonstrated how reconstructing our thinking highlights different practice possibilities for change that had previously been fatalistically construed as structural in nature and, therefore, unchangeable.

4. Contributions of the study

The study reported in this dissertation makes contributions to:

- Knowledge
- Professional practice
- Personal and professional development.

4.1 Contribution to knowledge

Significant contributions to knowledge are evidenced in the following manner:

- The model of factors influencing collective behaviour at outdoor music festivals contributes to the social psychology literature relating to collective behaviour and provides the basis for a generic model of behaviour transformation
- The methodology and instrument propose a contextualised way of monitoring and assessing behavioural risks at mass gatherings, thereby adding to the literature on risk assessment and management
- The model, methodology and instrument contribute to the nascent discipline and field of crowd science, in an area not yet otherwise researched
- The methodology and instrument contribute to the knowledge base supporting the concept of resilience engineering, a contemporary approach to accident prevention, through the application of resilience concepts to the domain of crowd (and event) safety.

Crowd science can be defined as the study of the effect of density, dynamics and behaviour (individual and collective) on a crowd. It stems from the initial work of Still (2000) on *crowd dynamics*, which he defines as ‘the study of the how and where crowds form and move above the critical density of more than one person per square metre’ (Still 2000). This initial work was augmented by concepts of social psychology and behaviour and expanded by Still (2013) into the more comprehensive term of *crowd science*⁷⁴. The behavioural aspect, however, has remained largely unexplored – an aspect which the study reported in this dissertation has sought to address.

⁷⁴ The expression is not to be confused with the increasingly common practice in which people pool information (especially in the physical sciences) which they have gathered independently, and then have access to all of the information which they and others have supplied. As a group, they can develop new understanding and produce products that they never could have produced by working in isolation. In astronomy, for example, far too many galaxies and stars exist for any one individual to observe and analyse. So, the field has shifted dramatically from individual astronomers sitting at their telescopes writing up their discoveries, to networks of astronomers who share their information in a common database which all can use. The author considers this practice should be more appropriately referred to as *crowdsourcing* rather than crowd science.

Crowd science is closely aligned to the notion of *proxemics* developed by the sociologist E.T. Hall. Hall (1974, p.2) has defined proxemics in various ways over the years, but perhaps the following definition is closest to the concept of crowd science envisaged by Still (2000, 2013):

. . . the study of man's transactions as he perceives and uses intimate, personal, social and public space in various settings while following out of awareness dictates of cultural paradigms.

This definition has three key components. First, proxemics involves the study of interpersonal interactions. Second, these interactions are viewed in a spatial context, which Hall has defined by four ‘zones’ that he has termed intimate, personal, social, and public. Third, this behaviour is considered to be largely learned or culturally determined rather than entirely dictated by innate biological or physiological processes.

Resilience engineering is also an emerging discipline, with perspectives and research methods continuing to be developed (Furniss et al. 2011). It has been compared to a paradigm-shift in the Kuhnian sense in that it tries to take a major step forward from more traditional views of accident prevention by proposing a completely new way of thinking about safety (Woods, 2006b). Because event safety is a domain where things happen quickly and flexibility is the key to success, lessons learnt here provide evidence for other domains.

The classic definition of a safe system is when the number of adverse effects can be kept acceptably low. Because of this traditional definition of safety, models tend to describe what goes wrong and why (Hollnagel 2006). This description tends to attribute failure to a system component rather than the system as a whole (Leveson 2004) and is related to the fact that traditional event-based accident models tend to explain accidents in terms of multiple events sequenced as a chain over time. The last event in a chain is often described as a *root cause* but because this stopping point is selected arbitrarily (the event chain can almost always be propagated further) the assignment of the *root cause* is pragmatic. When the reason for conducting the accident investigation is to assign blame for the accident this pragmatism leads to the stopping point often being decided on when someone or something appropriate to blame has been found (Leveson 2004). Because human performance is seen as unreliable, the *root cause* often leads to defences or barriers being implemented to avoid the same failure in

the future, or that because the system is presumed to be faultless the humans are trained to better fit the designed system (Furniss, Back, Blandford, Hildebrandt, & Broberg 2011).

In an attempt to contrast resilience engineering to earlier approaches, Furniss et al. (2011, p.3) comment that:

Avoiding, detecting and recovering from failure is different from traditional approaches to safety which look at risk analysis and prevention, and traditional approaches to human factors that largely focus on improving task and system design. Instead, resilience focuses on action to compensate for poor behaviour, poor design, poor systems and poor circumstances.

There have been a number of attempts at defining resilience, such as Westrum's (2006) three major meanings of resilience, viz.:

- the ability to prevent something bad from happening
- the ability to prevent something bad from getting worse
- the ability to recover from something bad once it has happened.

Another definition comes from Woods (2006a), who maintains that resilience is:

...how well a system can handle disruptions and variations that fall outside of the base mechanisms/model for being adaptive as defined in that system.

A slightly different definition is offered by Lengnick-Hall & Beck (2009, p.41), who see resilience as:

...the organizational ability and confidence to act decisively and effectively in response to conditions that are uncertain, surprising, and sufficiently disruptive that they have the potential to jeopardize long-term survival.

Hollnagel (2011, p. 275), recognised as the leading researcher in the area of resilience engineering, suggests that:

Resilience is defined as the intrinsic ability of a system to adjust its functioning prior to, during, or following changes and disturbances, so that it can sustain required operations under both expected and unexpected conditions.

While the other definitions put an emphasis on some combination of a system's ability to prevent, respond to and recover from disruptions, this definition instead focuses on a system's ability to adjust its own functioning. Hollnagel (2011) further notes that resilience refers to a quality, something a system *does*, rather than a quantity, something a system *has*. It is a capability or process rather than a property. Resilience engineering is concerned not

only with what makes systems resilient and how to make them resilient, but also with how to maintain or manage the resilience of a system.

While traditional definitions and models of safety have tended to focus on what goes wrong and why, resilience engineering argues that it is necessary to focus on what can go right as well. Hollnagel (2011) proposes an alternate definition of safety as ‘the ability to succeed under varying conditions’, thereby moving the emphasis away from failure. This definition has a significant implication. It suggests that changes and disturbances are seen as a part of normal system variability⁷⁵. In resilience engineering the emphasis is not on maintaining the system unchanged in the face of disruptions. While protecting and sustaining its primary functions is important, this can be achieved by more traditional means, such as defence-in-depth and barriers. Instead, the definition puts emphasis on the ability to *adjust* rather than just to *continue* functioning under expected and unexpected conditions. This adjustment can take place *prior to*, *during* or *following* changes and disturbances. In order to adjust the system needs indicators of its state. These indicators can be *lagging*, *current* or *leading*, that is, they can indicate the past, the present or a future state of the system. Indicators come with a multitude of issues to consider, such as their reliability and validity, objective or subjective interpretation, whether they are sufficiently sensitive to change, whether they can be used for making concrete actions and whether they are easy and cheap to use or difficult and costly (Hollnagel 2011).

Because resilience is defined as being able to adjust *prior to*, *during* or *following* changes and disturbances, resilience engineering is concerned with *anticipating*, *monitoring*, *responding* to and *learning* from them. Hollnagel (2009) refers to these as ‘The Four Cornerstones of Resilience’, which he further elaborated in later work (Hollnagel 2011).

Anticipating – knowing what to expect

In looking for the potential, the goal is to identify possible future events, conditions, or state changes - internal or external to the system - that should be prevented or avoided. (Hollnagel 2009, p. 126)

Because regular threats are often already known to the system and mostly require monitoring, anticipating rather deals with identifying the most likely irregular threats; i.e. it deals with

⁷⁵ In this regard, the approach resonates strongly with Engeström’s formulation of Activity Theory and his notion of expansive learning based on disturbances and contradictions, outlined in Chapter 2.

what is potential. Traditional risk assessment does look for the potential threats, but is constrained because it relies on representations and methods that focus on linear combinations of discrete events, such as event and fault trees. While this might be acceptable for tractable systems which are well-defined, the more intractable a system is the more traditional risk assessment methods fall short. What is then needed is individual and collective imagination to explore possible future risks. This is costly because it takes time and also deals with something that may happen so far into the future that benefits are rather uncertain.

Monitoring – knowing what to look for

A resilient system must be able to flexibly monitor what is going on, including its own performance. The ability to monitor enables the system to cope with that which could become critical in the near term. (Hollnagel 2009, p. 124)

While anticipating deals with a more long-term time horizon, monitoring deals with a shorter one. The idea of flexible monitoring entails re-assessing the basis for monitoring every now and then so that it does not become constrained by routine and habits. Monitoring what is going on is often based on looking for certain conditions or indicators that things might become critical, and using this information to convert the system from normal operations into a state of alertness and readiness to respond. This is more cost-effective than keeping the system in a constant state of readiness. Both the ability to monitor and the ability to respond depend on being able to imagine the threat or event, whether it is possible to prepare a response and whether it is cost-effective to do so. Because of this, these two abilities mainly deal with regular threats, while irregular threats and unexampled events must be dealt with in a different manner. Not knowing whether an event or threat is imminent severely limits the system's ability to adjust its functioning prior to the event, making monitoring an important ability for resilient systems.

Responding – knowing what to do

In order to respond when something happens, the system must be able to *detect* that something has happened. Second, it must be able to *identify* the event and *recognize* or *rate* it as being so serious that a response is necessary. Third, the system must know how to *respond* and be capable of responding; in particular it must have or be able to command the required resources long enough for the response to have an effect (Hollnagel 2009, p. 121).

Responding deals with actual threats to the system. Some types of responding include mitigating the effects of an event or preventing deterioration or spreading of effects, in order

to restore the state that existed before the event or to resume the functioning that existed before. While these can all be good types of responses, they are not what defines a resilient system. What defines a resilient system is instead the ability to adjust its functioning to better match the new conditions in a timely and effective manner so that they can bring about the desired outcome before it is too late (Hollnagel 2011). Deciding whether an event is so serious that a response must be made can refer either to establishing a level of readiness or to taking action in the concrete situation. When it comes to establishing a level of readiness and which response capabilities are necessary, one must first consider what risks to protect against and what risks are acceptable. One principle that might be of use is the traditional risk management principle of *As Low as Reasonably Practicable* (ALARP).

When it comes to taking action in a concrete situation this can be done either by technology or by humans. In the case of technology this is done according to predetermined rules or algorithms, and in the case of humans it is greatly reliant on the competence of the specific individuals involved. Being able to respond also relies heavily on having the resources to do so available. Having prepared resources always available is only cost-effective for some regular threats, so a resilient system also needs to be flexible enough to make necessary resources available when needed, especially when it comes to irregular threats or unexampled events. In responding to events it is also essential to be able to distinguish between what is *urgent* and what is *important* (Hollnagel 2011).

Learning – knowing what has happened

The effectiveness of learning depends on what the basis for the learning is, i.e., which events or experiences are taken into account; on how the events are analyzed and understood; and on when and how often the learning takes place. (Hollnagel 2009, p. 127)

A resilient system is characterized by how it approaches learning. First of all, a resilient system tries to learn from how it functions and not only from its failures. Since resilience is the ability to sustain normal functioning and not only to prevent failures, it should not limit learning to only incidents and accidents. Secondly, a resilient system does not only describe events on the basis of their causes, as in the classic approach. Instead it looks for dependencies among functions and for the typical or representative variability of functions. Thirdly, learning should be continuous rather than discrete and should not be driven by events, but instead by a plan or strategy.

4.2 Contribution to professional practice

The genesis of this study was the perceived lack of a behavioural risk monitoring and assessment tool when managing large crowds at outdoor music festivals, and arose out of the author's personal involvement in the safety management of a number of such festivals. Subsequent research identified the extent of the safety problem in this domain and confirmed the lack of workable monitoring and predictive tools in this area. An initial survey of venue and music promoter representatives revealed little or no knowledge of how to effectively assess crowd-related safety risks. It also revealed that traditional risk assessment methods were not particularly suited to the assessment and analysis of behavioural risk associated with large crowds.

The author has developed the Crowd Behaviour Index (CBI), a tool which risk assessors can use to monitor and assess behavioural risk. It can be used proactively, in the planning phase of events, and dynamically, in 'real time', during the progress of an event. The tool resonates with, and can be 'nested' within, the contemporary crowd analysis method developed by Professor Keith Still (2009, 2014) outlined in Chapter 5 – see Appendix H for an example of this. It is, effectively, a crowd profiling tool for use within the RAMP analysis phases of Still's DIM-ICE framework.

An outline of the CBI and its use within the Still methodology (2009, 2014) presented at a workshop organised for industry representatives of venue owners and/or operators and music promoters was well received, as evidenced by the results of the post-workshop survey outlined earlier in this chapter. Comments indicated that the tool is useful (e.g. 'these will be really useful at my venue'; 'better than the usual way we do it'), innovative (e.g. 'nothing like it in use at the moment'; 'how refreshing to see some innovative work in this area'), and easy to use (e.g. 'easy to understand, easy to apply and really useful as well').

The CBI makes a significant contribution to the monitoring and assessment of crowd behaviour at outdoor music festivals and should, it is suggested, without any need for adaptation, be useful in 'measuring' the behaviour of crowds at any mass gathering or public assembly and, as such, addresses the research and practice gaps identified by the University of Leeds Report to the Civil Contingencies Secretariat of the UK Cabinet Office (Challenger & Clegg 2009) outlined in Chapter 1.

4.3 Contribution to personal and professional development

The final aim of the USQ Professional Studies Program, and of undertaking a professional doctorate rather than a traditional one, relates to the contribution that the exercise makes to personal and professional development. It is this aspect which, on reflection, has been the most significant for the author. Undertaking the study has led to a profound personal and professional transformation in approach, fired a renewed spirit of inquiry and provided the necessary tools and approaches to undertake continued research and inquiry. Not least, it has provided a significant boost to the author's confidence as a safety practitioner, academic and learner.

McGonigall (2008) suggests that the 'New Professional' is one who has expanded on their existing knowledge by developing a more implicit macro and micro analysis of what they know, why they do what they do, and how to do it better through a theoretical framework of action, research and learning. This involves moving beyond competency to mastery and occurs through critically reflective practice. Thompson (2002, p. 235) suggests that reflective practice is 'an active process of constructing solutions, rather than a passive process of following procedures or guidelines'. Reflective practitioners analyse a problem, seek to understand it within their context, think about the results of their actions, and puzzle over why things worked out like they did (White 2002, p. 2). They have the 'ability to evaluate critical incidents within daily work, using this evaluation as a means of improving practice and knowledge' (Macfarlane et al. 2005, p. 50). In this way, reflective practitioners provide space for 'new possibilities to be explored and realised' (Moss and Petrie 2002, in Macfarlane et al. 2005, p. 50).

By itself, however, reflection is not necessarily critical (Brookfield 1995; Ecclestone 1996). To engage in critical reflection requires moving beyond the acquisition of new knowledge and understanding into questioning existing assumptions, values and perspectives (Cranton 1996, p. 76). Boyd and Fales (1983, p. 100) claim that critical reflection 'is the core difference between whether a person repeats the same experience several times becoming highly proficient at one behaviour, or learns from experience in such a way that he or she is cognitively or affectively changed'. Duffy (2007) believes that reflective practice is an active deliberate process of critically examining practice where an individual is challenged and enabled to undertake the process of self-enquiry to empower the practitioner to realize desirable and effective practice within a reflexive spiral of personal transformation.

Critical reflection is thus viewed as transformational learning, which according to Baumgartner (2001) can happen either gradually or from a sudden or critical incident and alter the way people see themselves and their world. Mezirow (1990, p. 5) also sees critical reflection as an essential component of learning:

Perhaps even more central to ... learning than elaborating established meaning schemes is the process of reflecting back on prior learning to determine whether what we have learned is justified under present circumstances. This is a crucial learning process egregiously ignored by learning theorists.

Mezirow (1990, p. 14) maintains that such reflection on assumptions and presuppositions (particularly about oneself) leads to transformative learning:

Perspective transformation is the process of becoming critically aware of how and why our presuppositions have come to constrain the way we perceive, understand, and feel about our world; of reformulating these assumptions to permit a more inclusive, discriminating, permeable and integrative perspective; and of making decisions or otherwise acting on these new understandings. More inclusive, discriminating permeable and integrative perspectives are superior perspectives that adults choose if they can because they are motivated to better understand the meaning of their experience.

As Elias (1997, p. 3) puts it:

Transformative learning is the expansion of consciousness through the transformation of basic worldview and specific capacities of the self; transformative learning is facilitated through consciously directed processes such as appreciatively accessing and receiving the symbolic contents of the unconscious and critically analyzing underlying premises.

In other words, the real significance of learning appears when learners begin to re-evaluate their lives and to re-make them. This, for Mezirow, takes precedence over whatever it was they set out to 'learn' in the first place. Freire (1970) calls this the process of conscientization.

Not only has undertaking this study involved the author in 'an active process of constructing solutions' (Thompson 2002, p. 235) and 'reflecting back on prior learning to determine whether what we have learned is justified under present circumstances' (Mezirow 1990, p. 5), but has facilitated a 'transformation of basic worldview and specific capacities of the self' (Elias 1997, p. 3) which has given the author the foundations, confidence and a renewed vigour to pursue further engagement and research in the crowd safety domain.

5. Limitations of the study

The following limitations of the study are acknowledged:

5. generalisability
6. limited sample size
7. representativeness
8. use of self-report survey instruments

5.1 Generalisability

Generalisability is limited due to a number of reasons. Firstly, the method was developed in the content of outdoor music festivals. There are usually other variables involved when an event is located indoors, not least of which are seating arrangements, structural collapse of buildings and/or fittings and the greater potential for engulfment by fire, smoke and toxic vapours and fumes. These additional or alternate factors would, no doubt, affect the behavioural model developed by the author as a preliminary to the development of the new method. Similar considerations would apply to any attempt to generalise the model and method to any other type of mass gathering event.

5.2 Limited sample size

The sample numbers for each of the surveys were relatively small. Responses, therefore, may not comprehensively reflect the views of the industry.

5.3 Representativeness

Participants were selected as a consequence of the author's acquaintance with them, and as a consequence the sample is not truly randomised. In addition, participants were not representative of the whole spectrum of music promoters and venue owners and/or operators in Australia, and certainly not world-wide. There may well be other points of view that have not been considered by the author.

5.4 Self-report survey instruments

The use of self-report survey instruments, particularly in a survey and workshop environment, could give rise to report bias. Another potential limitation results from the survey instruments not being piloted.

6. Recommendations for further research

The method developed by the author was ‘validated’ by a number of potential users. However, the constraints and resources of the study did not allow for it to be field tested in a live environment. While the author has integrated the method as a component of the RAMP analysis of Still’s DIM-ICE model (outlined in Chapter 5), this was for the purpose of personal ‘validation’ and to use as a worked example at the workshop. Accordingly, the next logical research step is to test the method in a live festival environment, both at the initial planning stage and then in ‘real time’ as the festival progresses.

Live testing of the method will reveal the extent of its user-friendliness and will confirm or not confirm the survey results obtained from the workshop. Qualitative methods should be used to interrogate risk assessors using the approach.

In addition, it will be necessary to attempt some determination of the effectiveness of the method, both as a planning approach and a monitoring tool. Each aspect – planning and monitoring, should be researched separately. This should be done by using qualitative methods whereby assessors who have undertaken previous festival planning then undertake planning for a subsequent festival using contemporary approaches including the new method and are interrogated through a post- and retrospective pre-test survey in order to evaluate their experience. In attempting some level of triangulation, these results could be compared to a control group which continues to undertake planning without using the new method.

Further research is also recommended in relation to the behaviour transformation model developed by the author as a precursor to the new method, in order, particularly, to determine whether the factors which act on and influence individual behaviour and transform it into collective behaviour (crowd behaviour) are comprehensive or whether there is need to include additional influencing factors. In addition, further research should be done in the social psychology realm to determine whether there are any other relevant mediating theories.

Finally, in order to exploit the full potential of the method, further research should be undertaken to identify relevant factors and considerations in order to adapt the behavioural model and the method to other mass gathering contexts.

7. Conclusion

Outdoor music festivals are increasingly common events on the summer entertainment landscape for youth around the world, often drawing crowds in excess of 100 000 patrons at any one time. Attendance at these is associated with an increased risk of injury and, in extreme cases, death. A considerable proportion of these risks can be attributed to behaviour such as crowd surfing, moshing, stage diving, swirling (all of which are considered a form of free expression by patrons) or crowd surges in the general admission or standing room only areas in front of the stages, or “mosh pits”. As a consequence, there has been an increased called for more rigorous planning and management of events in order to minimise safety risks.

Assessing, monitoring and managing safety risks are an integral component of good planning for events. Traditional risk assessment techniques have been found to be inadequate in this content or domain and commentators have recommended the integration of behavioural considerations into the process. This study is the first to attempt to do so and, in that respect, makes a unique, innovative and significant contribution to the fields of safety science and event management.

Despite the limitations of the study and the need for further research, the author has developed what is essentially a crowd profiling method for monitoring and assessing behavioural risk at outdoor music festivals. This method can be used proactively in event planning and complements contemporary approaches to pre-event crowd safety risk assessment. In addition, the method can be used in ‘real time’ to monitor crowd activity and provide intervention triggers as part of a dynamic risk assessment process.

Subject to further research and refinement, it is anticipated and suggested that the method could form the basis for an approach that can be used to monitor crowds at any mass gathering event, including, for example, major sporting events and religious festivals. In that regard, the potential extension of this innovative approach would provide a further valuable contribution to the field of event studies.

Feci quod potui, faciant meliora potentes.

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