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Understanding Crowd Behaviours: Supporting Evidence



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DISCLAIMER

Please note, the recommendations made in this report regarding good practice for event preparation and crowd management are an interpretation of best practice made on the basis of knowledge and expertise gained from literature and interviews. They are not definitive rules of event preparation and crowd management.

Contents

List of Figures	viii
List of Tables	x
Foreword	xi
Acknowledgements	xiii
A Guide for Readers	xv
Executive Summary	1
Part 1 – Very Large Scale Crowd Events	10
Crowd Behaviours at Very Large Scale Events	12
Differences at Very Large Scale Events	14
New and Additional Potential Risks at Very Large Scale Events	16
Part 2 – A Cautionary Tale: Heathrow Terminal 5 (T5)	22
The Opening of T5	24
Evolution of the T5 Debacle	26
Inter-Related Factors and Knock-On Effects at T5	29
Contributory Factors to the T5 Debacle	34
Technology and Software Failures	36
Inefficient Staff Training and Familiarisation	37
Lack of New System Testing	39
Staff Delays	41
Incomplete Building	42
Lack of End-User Involvement	43
Inflexible Management Style	45
Poor Industrial Relations	47
Failure to Learn Lessons	49
Lack of a Systems Approach	51
Recommendations for Crowd Events from the T5 Debacle	52
Part 3 – Review of the Literature	54

Literature on Crowd Behaviours	56
Neglect in the Literature	58
Defining a Crowd	59
A 'Crowd' – Defining Criteria	62
Key Learning Points	69
Types and Characteristics of Crowds	70
Types of Crowds	70
Characteristics of Crowds	73
Decision Making in Crowds	75
Crowd Management versus Crowd Control	76
Key Learning Points	78
Key Theories of Crowd Behaviours	79
Acknowledgement of Theoretical Evolution	80
Classic Theories	81
Game Theory	84
Deindividuation Theory	86
Social Facilitation Theory	90
Social Loafing Theory	93
Emergent Norm Theory	95
Minimal Group Paradigm	98
Social Identity Theory	100
Self-Categorisation Theory	103
Social Identity Model of Crowd Behaviour	106
Elaborated Social Identity Model of Crowd Behaviour	110
Social Identity Model of Deindividuation Effects	117
Place Scripts	121
Key Learning Points	125
Moderators of Crowd Influence on Individual Behaviours	128
Moderators of Crowd Influence on Members' Behaviours	129
Stable Moderators of Crowd Influence	130
Situational Moderators of Crowd Influence	132
Key Learning Points	135
Literature on Crowd Behaviours in Emergencies	137
Theories of Crowd Behaviours in Emergencies	139
Mass Panic	140
Affiliation and Normative Models	144
Social Identity/Self-Categorisation Approach	146
Key Learning Points	148
Emergency Evacuations	149
Interpretation	150
Preparation	153
Action	154
Key Learning Points	160
Literature on Relevant Crowd Disasters	161
The Importance of Examining Crowd Disasters	163
Reasons for Crowd Disasters	165
Failure to Learn from Crowd Disasters	168
Hillsborough Football Stadium Disaster (1989)	170
Evolution of the Disaster	170
Reasons for the Disaster	173

King's Cross Underground Fire (1987)	179
Evolution of the Disaster	179
Reasons for the Disaster	181
Bradford Football Fire Disaster (1985)	184
Evolution of the Disaster	184
Reasons for the Disaster	185
Hajj Pilgrimage Disaster (2006)	186
Evolution of the Disaster	188
Reasons for the Disaster	189
Key Learning Points	190
Literature on Simulating Crowd Behaviours	191
Crowd Models and Simulations	193
Main Ideas	193
Types of Crowd Simulation Model	194
Macroscopic Models	195
Fluid Dynamics Models	196
Microscopic Models	198
Rule-Based Models	199
Social Forces Models	201
Self-Organisation Phenomenon	205
Cellular Automata Models	215
Agent-Based Models	218
Evacuation Models	228
EXODUS	230
SIMULEX	231
Future Simulation Models	232
Key Learning Points	235
Gaps in Current Research Literature	238
Types of Crowds	240
Stewarding of Crowds	241
Non-Ticketed Event Crowds	242
Part 4 – Expert Interview Findings	243
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The Expert Interviewees	245
Experienced Police Officers	247
Key Practitioners	247
Leading Academics	248
Key Interview Findings	249
Types of Crowd	251
Key Lessons and Good Practice Advice for Crowd Events	255
Planning and Preparations	256
Multi-Agency Teamwork	260
Communication and Information	263
Understanding the Crowd	265
Experienced Personnel	268
Command and Control	269
Observing and Monitoring	271

Key Risks Involved with Crowd Events	272
Debriefing	273
Key Learning Points	274
Appendix: References	276

List of Figures

Figure 1. The potential risks associated with very large scale events from a systems perspective	21
Figure 2. The problematic Terminal 5 opening from a systems perspective	33
Figure 3. A density distribution of 40 people per 10 square metres	63
Figure 4. A density distribution of 20 people per 10 square metres	64
Figure 5. A density distribution of 84 people per 10 square metres	65
Figure 6. Visual representation of Fruin's levels of service	67
Figure 7. Arching effect observed as crowd members try to pass through a narrow exit	141
Figure 8. The Leppings Lane end of Hillsborough	171
Figure 9. Perspective of the police at Hillsborough	176
Figure 10. Perspective of event administrators at Hillsborough	177
Figure 11. Perspective of supporters at Hillsborough	178
Figure 12. Diagram of King's Cross Underground	180
Figure 13. Layout of the Jamarat Bridge	188
Figure 14. Severe overcrowding during the Hajj	189
Figure 15. Reynolds' (1987) 'boids' model	199
Figure 16. Snapshot of social forces model simulation, showing crowd members moving towards a narrow exit	201
Figure 17. Arching effect observed at a narrow exit	206
Figure 18. Lane formation	207
Figure 19. Oscillations in crowd movement at a bottleneck in counter-flow	208
Figure 20. Roundabout flow pattern observed at an intersection	208
Figure 21. Corner hugging	209

Figure 22. Competitive crowd behaviour	209
Figure 23. Queuing behaviour	210
Figure 24. Herding behaviour	211
Figure 25. Crowd members do not evenly fill available space	212
Figure 26. Flow patterns in a densely packed crowd	213
Figure 27. Appropriately placed columns to encourage lane formation	214
Figure 28. Cellular automata grid showing two alternative paths to the exit (A and B)	215
Figure 29. Hierarchy of agent behaviour	222
Figure 30. Simulation rules for exiting a venue	225
Figure 31. Simulation rules demonstrating herding behaviour	225
Figure 32. Simulation rules demonstrating queuing behaviour	226
Figure 33. Simulation rules demonstrating flocking behaviour	226
Figure 34. Simulation rules for a fire on a train	227
Figure 35. An EXODUS grid used to represent a wide-bodied aircraft	230
Figure 36. SIMULEX screen display showing a populated area	231

List of Tables

Table 1. Fruin's levels of service	66
Table 2. Types of crowd	72
Table 3. Characteristics of crowds	74
Table 4. Factors important in the assessment of emergency egress	159
Table 5. Examples of crowd related disasters	164
Table 6. History of the Hajj disaster	187

Foreword

Foreword



I am pleased to be able to commend this guidance to you. It was sponsored and funded by the Civil Contingencies Secretariat, project-managed by the Emergency Planning College and written by a team of specialists in organisational psychology from Leeds University Business School. It is the product of a year's research involving a detailed literature review and primary research with practitioners and specialists in the field. It summarises our knowledge, articulates our current understanding of good practice in crowd management and gives planners clear direction, and supporting information, regarding the safe assumptions that may be made about crowd behaviour. As such, this guidance fills what had been a significant gap in our canon of guidance, and contains information that will be of value to a broad cross-section of the public safety and resilience community.

A handwritten signature in black ink, appearing to read 'Bruce Mann'.

Bruce Mann

Director

Civil Contingencies Secretariat

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A Guide for Readers

A Guide for Readers

You should read this report if you are: -

- **Involved practically in the field of crowd events, particularly with preparations for very large scale, multi-day, multi-site crowd events.**
- **Interested in the literature behind the good practice guidelines for crowd management, emergency situations and evacuations, and crowd simulation techniques.**
- **Interested in understanding crowd events and management from the perspective of experts in the field.**

We would recommend reading this report as a supplement to “Understanding Crowd Behaviours: Guidance and Lessons Identified”, in order to better appreciate the derivation of the guidelines.

Part 1

- This part of the report is specifically concerned with additional issues and risks which are likely to arise in the preparation for, and management of, the crowds which will be attracted to very large scale events, which take place over multiple days and across multiple sites.
- It should be of particular interest to all those involved with preparing for, and managing, very large scale, multi-day, multi-site crowd events.

Part 2

- This part of the report describes the problematic opening of Terminal 5 at Heathrow Airport on 27th March 2008, as an example of how crowd events can turn into PR disasters if not prepared for, and managed, appropriately.
- It should be of particular interest to all those involved with preparing for and managing crowd events.
- It specifically highlights the way in which seemingly minor issues can – when occurring in combination – have a significant impact on event success.

Part 3

- This part of the report reviews the literature concerned with crowds, their behaviour (in both normal and emergency situations), psychological theories used to explain their behaviour (in both normal and emergency situations), and differing methods which can be used to simulate their behaviour.
- It also discusses the lessons to be identified from relevant crowd disasters.
- This section is particularly applicable to those who wish to understand the theoretical underpinnings of the good practice guidelines.
- An assessment of apparent gaps in the current research literature is also provided, which may be of specific interest to those involved in undertaking and funding crowd research, and to those interested in developing new knowledge in this area.

Part 4

- This part of the report details the key findings of the 27 semi-structured interviews conducted with experts (both practitioners and academics), specifically in relation to crowds, their behaviour and the most appropriate ways of preparing for, and managing, crowd events.
- It will be of interest to those wishing to learn more about crowd events – particularly concerning best practice advice and lessons identified – from the perspective of experienced individuals directly involved with crowds.
- It should also be of interest to those who want to understand the origins of the good practice guidelines.

EXECUTIVE SUMMARY

Executive Summary

- This research was sponsored and funded by the Cabinet Office, as part of the canon of civil protection literature and guidance, and is published on their UK Resilience website (<http://www.cabinetoffice.gov.uk/ukresilience.aspx>).
- For ease of reading, the research has been divided into a series of four, inter-related reports, namely: -
 - **Understanding Crowd Behaviours: Guidance and Lessons Identified**
 - **Understanding Crowd Behaviours: Supporting Evidence**
 - **Understanding Crowd Behaviours: Simulation Tools**
 - **Understanding Crowd Behaviours: Supporting Documentation**
- This Executive Summary provides an overview of the whole research project (i.e., of all four reports), summarising the Research Aims, Methodology, Key Messages, Good Practice Guidelines, Lessons Identified and Recommendations for Further Research.
- For completeness, this Executive Summary is included at the beginning of each report.
- In addition, a separate guide has been prepared for readers of the reports, which aims to help identify which reports may be of most relevance and use.
 - **Understanding Crowd Behaviours: A Guide for Readers**
- **We recommend that anyone with a professional interest in crowd behaviours should read this Executive Summary.**

Research Aims

- To review – and identify gaps in – existing research, theoretical literatures, and available knowledge on crowds and their behaviour, in both normal and emergency situations.
- To review how the leading simulation software tools accommodate crowd behaviours, and consider how approaches to modelling and simulating crowd behaviours might be enhanced for the future, incorporating both psychological and technical concerns.
- To identify ways forward for the field of crowd management, particularly in relation to planning for very large scale crowd events, which will take place over consecutive days and across multiple locations.
- To produce a set of professional guidelines for emergency planners and responders, specifying reasonable assumptions which can be made with regard to crowd behaviours in normal and emergency situations, against which current assumptions can be tested, and with which future planning can be informed.

Methodology

- A rigorous methodology was undertaken during this research, to gain a wealth of information regarding crowds, their behaviours and methods of simulation, from a wide range of sources (see [Understanding Crowd Behaviours: Supporting Documentation](#), ‘Research Methodology’, pages 43 to 56).
- In-depth literature reviews examining over 550 academic papers, books and official reports were carried out (see [Understanding Crowd Behaviours: Supporting Evidence](#), ‘Part 3 – Review of the Literature’, pages 54 to 242). These specifically concerned: -
 - The key theories of crowd behaviours, with particular focus on the underlying assumptions and rules governing human behaviour, in both normal and emergency situations.
 - Relevant disasters and mishaps involving crowds, with particular emphasis on crowd behaviours, and the often interconnected nature of contributory factors.
 - The key methods used to model and simulate crowd behaviours.

- In addition, three of the leading simulation techniques currently available were reviewed – through utilising accessible literature and conducting interviews with both users and creators of the tools – focusing on their underlying behavioural assumptions and rules (see [Understanding Crowd Behaviours: Simulation Tools](#)).
- 27 semi-structured interviews were conducted with a wide range of individuals acknowledged to be experts in the field of crowds and crowd behaviours, including leading academics, experienced police officers, and key crowd event and management practitioners (see [Understanding Crowd Behaviours: Supporting Evidence](#), ‘Part 4 – Expert Interview Findings’, pages 243 to 275).
 - The interviewees were specifically chosen for their wealth of experience, ranging from a few to over 30 years. The majority had over ten years’ experience in the field.
 - They had a range of roles and responsibilities, including overseeing public order at major events, emergency planning, operational planning and safety management.
 - Experience of major crowd events amongst the interviewees included Notting Hill Carnival, The Matthew Street Festival, Glastonbury, Liverpool Capital of Culture 2008, Hogmanay, New Year’s Eve in London, large scale marches in London (such as Stop the City, Stop the War, May Day protests), and events at Wembley Stadium.
- In addition the lead author of this report: -
 - Attended two crowd-related courses held at the Emergency Planning College, on Crowd Dynamics, and on Public Safety at Sports Grounds and Events.
 - Spent a day with police officers at the Metropolitan Police Public Order Training Centre, Gravesend, and a day with Lothian and Borders Police during a visit from the Queen.
- Particular attention has been paid to examining very large scale crowd events, which will take place over multiple days and across multiple sites (see [Understanding Crowd Behaviours: Supporting Evidence](#), ‘Part 1 – Very Large Scale Crowd Events’, pages 10 to 21), focusing on: -
 - The differences between very large scale, multi-day, multi-site events and other, more frequent or one-off events, specifically with regards to preparation and crowd management.

- The new and additional risks that arise in light of these differences and the findings of this research, which will need careful and rigorous analysis and mitigation by appropriate professionals.
- Analysis has also been undertaken of the problems occurring at the opening of Heathrow Terminal 5 (see **Understanding Crowd Behaviours: Supporting Evidence**, 'Part 2 – A Cautionary Tale: Heathrow Terminal 5', pages 22 to 53), since this provides an excellent recent example of a major infrastructure and operational investment which was badly planned and managed. There are important lessons to identify from this case study.

Key Messages

The key messages to take away from this report are: -

- A great deal is known about crowds and how to plan for and manage crowd events. However, this has not been captured and articulated in a single guidance document until now.
- Key advice for successful crowd management includes: -
 - Thorough planning and preparation, using a wide range of “what if...?” scenarios, including unexpected scenarios.
 - Adoption of a system-wide approach.
 - Coordination between all agencies involved.
 - Utilisation of personnel who have plentiful first-hand knowledge, skills and experience in planning for and managing crowd events.
 - Communication with the whole crowd – both audio and visual – particularly in emergency situations.
 - Leadership and guidance to initiate crowd movement in emergencies.
 - Acknowledgement that seemingly small problems occurring in combination can have a significant impact on event success.
- Nevertheless, there are significant gaps in our understanding of crowd behaviours and in the current capability of crowd simulation tools.

- These gaps are exemplified by the special circumstances of very large scale, multi-day, multi-site crowd events, which will be very different to more frequent, one-off events in a number of ways and, therefore, are likely to involve new or additional risks which will require careful analysis and mitigation.
- In particular, focusing on these very large scale, multi-day, multi-site events, there is a need to consider the potential risks surrounding: -
 - The different types of crowds and their likely behaviours.
 - The behaviours of non-ticket holders who will be attracted to the events, for a range of motives (both legal and illegal).
 - The boundaries – i.e., the scope and scale – of the system we are trying to plan for and manage.
 - The range of “what if...?” scenarios that need to be considered.
 - The knock-on effects of an incident over consecutive days.
 - The importance of coordination between all agencies, across widespread geographical locations.
 - The need to ensure all personnel – from all agencies and in all locations – are consistently and effectively educated, trained and briefed, for both normal and emergency circumstances.
 - The development of new capabilities and facilities for simulation tools, in order to accommodate the above issues.
- There are also some important lessons to identify from the experiences of the Heathrow Terminal 5 opening, in particular that: -
 - Combinations of failures in preparation and management can come together to create major inconvenience to the users of new facilities.
 - These factors include apparently mundane failures such as delays in the completion of the building programme, corner-cutting in training and familiarisation, initial software problems with new computing facilities, a failure to listen to the end users, and so on.
 - These can happen on such a scale as to represent a public relations debacle for the companies and authorities concerned and for the UK more generally.

- Careful preparations need to be made for such everyday contingencies.

Good Practice Guidelines

- A comprehensive set of good practice guidelines has been collated and established for all professionals and practitioners involved in the field of crowds, including crowd events, crowd management, crowd control and emergency services (see **Understanding Crowd Behaviours: Guidance and Lessons Identified**, 'Guidelines for Good Practice', pages 10 to 39). These guidelines focus on: -
 - Good practice for crowd management.
 - For example, concerned with: thorough planning and preparation; minor risks combining to create major problems; multi-agency teamworking; utilisation of experienced personnel; cross-agency coordination; strategies for communicating with the crowd; differentiation of different types of crowd; and awareness of different behaviours from different types of crowd.
 - Good practice for emergency situations and evacuations.
 - For example, concerned with: leadership and guidance during an emergency situation; initiating crowd evacuation as quickly as possible; strategies for communicating with the crowd and providing information; and awareness of how individuals are likely to behave during an emergency.
 - Good practice for crowd simulation techniques.
 - For example, concerned with: trying to model more accurately crowd movements and behaviours; incorporating different types of crowd and crowd member; including family or other small groups within simulation models, rather than just focusing on individuals; and modelling interactions between crowds and other groups, and between crowd members.

Lessons Identified

- A comprehensive set of lessons identified has been produced (see [Understanding Crowd Behaviours: Guidance and Lessons Identified](#), 'Lessons Identified', pages 40 to 85), concerning: -
 - Definitions and types of crowd.
 - Assumptions about crowds – including crowd movement and self-organisation, crowd behaviours in normal and emergency situations, crowd disorder, and ways of improving crowd management.
 - Ways in which crowds and their behaviours can be simulated.

Recommendations for Further Research

- Recommendations for future research and practice have been suggested (see [Understanding Crowd Behaviours: Guidance and Lessons Identified](#), 'Recommendations for Further Research, pages 94 to 134), with the main priorities concerning further work on: -
 - The development of a rigorous risk assessment tool, which will enable its users to identify the full range of risks associated with different kinds of events and circumstances involving crowds.
 - How new risks associated with the building and subsequent operation of a range of new facilities and sporting events, over an extended period, can be managed and mitigated – i.e., drawing on the lessons that can be identified from an analysis of what is different about very large scale, multi-day, multi-site crowd events, and of the multiple problems which contributed to the problematic opening of Heathrow Terminal 5.
 - Stewarding and its impact on crowd behaviours. At present, there appears to be no research investigating the interactions between crowds and stewards, despite stewards undertaking a crucial role during crowd events and often being the first point of contact for crowd members.
 - Individuals who wish to be part of an event but do not have tickets to attend the event itself – i.e., non-ticketed event crowds – and the impact which their behaviour has on the preparation for, and overall management of, an event.

- The scope of “what if...?” scenarios used during preparations to think about potential problems and to test out the suitability and sufficiency of the plans in place. A wide range of scenarios should be tested, considering not only major risks such as bomb threats, but also less dramatic, but probably more likely, risks such as tripping hazards or software problems, which have the potential to contribute towards more major incidents. Moreover, scenarios should be extended to consider the wider event environment, along with the knock-on effects of incidents occurring in succession or combination.
- The next generation of simulation tools, incorporating issues such as: behaviours of groups within a crowd; different types of crowd and crowd member; interactions between crowds and other groups and between fellow crowd members; emotions; tipping points; unexpected scenarios; different system scopes; multi-purpose behaviours; incomplete information; and theoretical underpinning.
- A definition and comprehensive typology of different kinds of crowds, considering dimensions such as: the purpose and duration of the crowd; level of movement possible within the crowd; the event atmosphere; levels of crowd membership identification and heterogeneity; levels of interaction, both within the crowd and with external groups; the size of groups within the larger crowd; and the amount of luggage or baggage crowd members have.

PART 1

Very Large Scale Crowd Events

Part 1 – Very Large Scale Crowd Events

This part of the report contains: -

- A set of additional issues which are likely to arise in the preparation for, and management of, the crowds which will most likely be attracted to very large scale crowd events, which take place over multiple days and across multiple sites.

Crowd Behaviours at Very Large Scale Events

Crowd Behaviours at Very Large Scale Events

- The primary aims of this research were to review existing literatures and available knowledge on crowds, their behaviour, and ways in which they can be simulated, in order to produce a set of good practice guidelines for those involved in the industry.
- However, as an extension to this more general investigation of crowds, a further aim was to consider crowd behaviours specifically in relation to very large scale, multi-day, multi-site crowd events, focusing on the implications of the review findings for planning and managing these major events.
- This section addresses two key issues, namely: -
 - What is different about very large scale, multi-day, multi-site crowd events, in comparison with normal crowd planning and management issues?
 - In light of the findings of this review, what new or additional potential risks do very large scale, multi-day, multi-site crowd events entail?

Differences at Very Large Scale Events

Differences at Very Large Scale Events

Most obviously, very large scale events will – in comparison to more frequent, one-off crowd events – involve: -

- Multiple events, distributed quite widely across multiple locations, and spread over several consecutive days. Amongst other things this will have significant impacts on the area's transport systems.
- Multiple agencies, including full-time specialist agencies – such as the police, ambulance service, fire service, transport staff, local authorities and event planners – and also many part-time, temporary stewards.
- The attendance of large numbers of families and groups who may well be treating such an event differently to its primary purpose. For example, they may treat a very large scale, multi-day, multi-site sporting event more like an entertainment event and/or a festival, rather than a normal one-off sporting event.
- The attendance of large numbers of people who are not familiar with the locations of the event, with the surrounding areas, or with the local travel arrangements, again unlike the crowds at many typical, more routine events.
- The probability of a day at a very large scale event being perceived as a family or group day out, instead of being considered simply as the attendance at an event. This may, therefore, involve a meal, a picnic, some shopping, the need for toilets and other facilities, opportunities to socialise with family and friends, and opportunities for sightseeing along the way.
- The attendance at very large scale, multi-day, multi-site events by large numbers of people for whom English is not their first language.
- The presence of unknown numbers of people who do not have tickets for the event, but just wish to be part of the fun, savouring the atmosphere in the local areas.
- The opportunity such large crowds present for street entertainers, souvenir sellers, street vendors and, of course, criminals such as pickpockets.

New and Additional Potential Risks at Very Large Scale Events

New and Additional Potential Risks at Very Large Scale Events

The major risks for very large scale, multi-day, multi-site events, which will need careful and rigorous attention by personnel specialising in the various issues, appear to be: -

- Given that the event will be spread across multiple locations, there is a need for coordination between the various agencies and for clarity over who is responsible for managing various boundary issues.
 - For example, if there is a problem with a local transport system, who is responsible for managing and communicating its effects?
 - How will such coordination be managed?
- Given the potential geographical spread of very large scale, multi-day, multi-site events, there is a need to clearly establish the boundaries of the system that is to be planned for and managed.
 - Is it a series of localised events?
 - Is it a set of areas in a town or city?
 - Is it the whole of a particular town or city?
 - Is it multiple areas throughout the country?
- How do we ensure that the transport system in the area will be able to cope with normal and additional loads?
 - How will the system cope in the event of local breakdowns and failures?
- Can we put in place adequate simulations which are able to cope with these different views concerning the scope and scale of the system we are trying to manage?
 - Can system-wide simulations be developed to examine and predict these wider impacts?

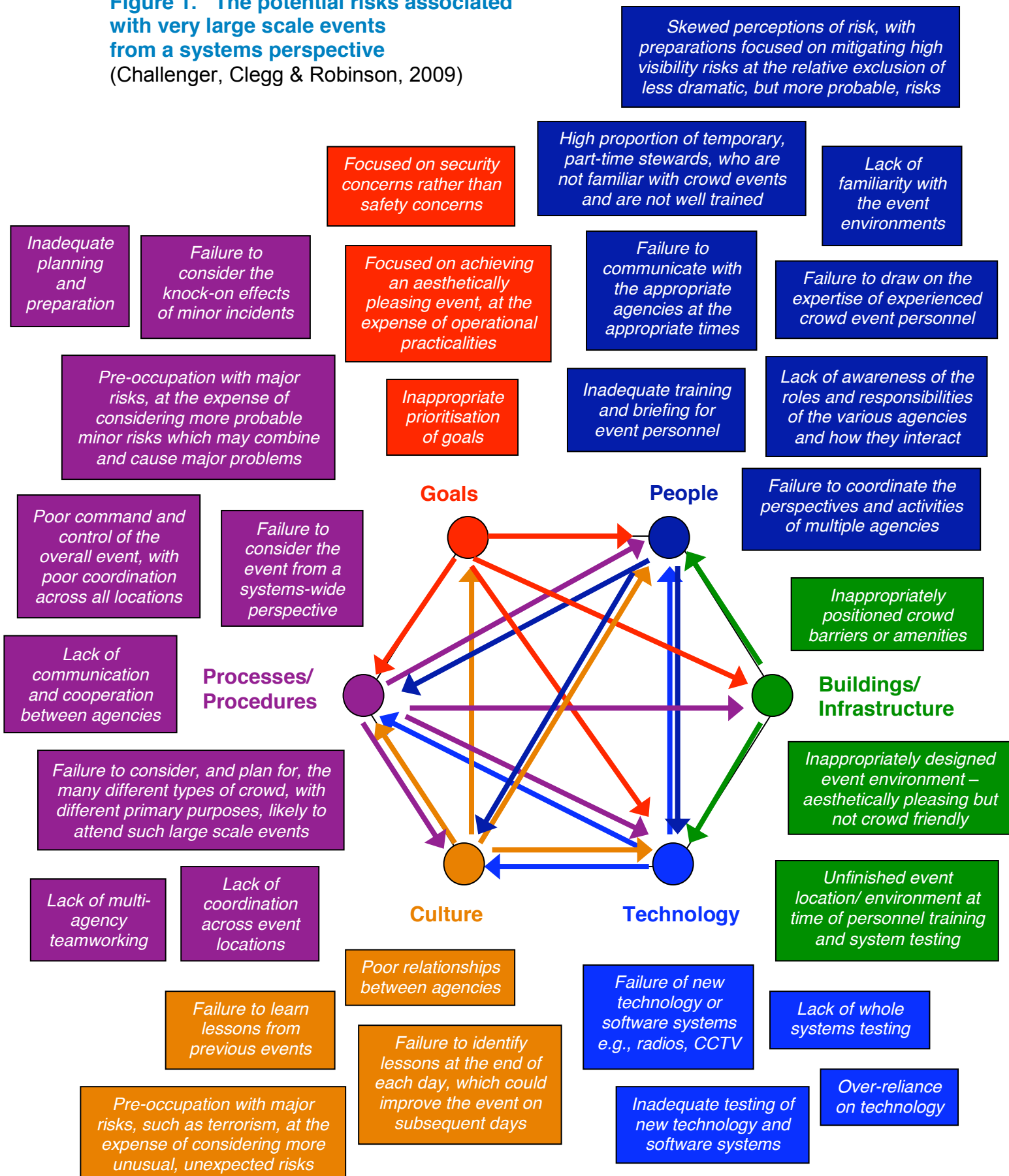
- Given that these very large scale events will be spread over consecutive days, it is highly likely that attendees and others will learn from experiences on previous days, which, for example, will be covered by the media and be passed on by word of mouth.
 - If there are problems that affect people's behaviour, such as their travel plans – e.g., they may need to allow additional time to reach a venue due to restricted or congested transport routes – are contingencies in place that allow crowd planners and event managers to respond accordingly?
 - For instance, can false impressions and rumours be corrected and/or alternative plans be implemented?
- If events external to the very large scale event occur – such as a bomb scare early on in the schedule – what subsequent impact will this have on both crowd management concerns and wider issues, including subsequent security practices, travel times and event entry times?
 - Are contingency plans in place that will enable crowd planners and event managers to respond accordingly?
- Given the range and numbers of specialist agencies and stewards which will need to be involved, how do we ensure that all personnel are consistently and adequately educated, trained and briefed?
 - For example, how do we guarantee that all involved understand their respective roles and responsibilities?
- Given the range and numbers of specialist agencies and stewards which will need to be involved, and their geographical dispersion, how do we ensure that actions taken to resolve issues – both foreseen and unforeseen – in one area take due consideration of their impacts elsewhere in the system?
 - What kinds of education and information systems will be required to ensure this happens?
 - What kinds of multi-agency operational command and control systems are required?
- Given the huge importance of preparation, how do we ensure all the necessary “What if...?” scenarios are covered?

- How do we ensure that the major risks – such as terrorist activity and suicide bombers, given the current political climate – are fully prepared for (e.g., using scenario planning) but, at the same time, do not override the importance of fully preparing for other risks which may appear to be of less significance.
 - For instance, prior to the Hillsborough Stadium Disaster, the risks of hooliganism – highly prevalent at the time – biased preparation for the event and prevented adequate consideration of other potential risks, such as overcrowding.
- How do we plan for the kinds of crowds that may be expected to attend these very large scale events, and which are likely to differ from those normally attending smaller scale events?
 - In particular, consideration should be given to: the presence of families and social groups; people having a day out and wanting to shop, eat, and sightsee; crowds who will not be familiar with the venues, the local areas, or the travel links, and therefore will be prone to getting lost and/or needing help; and individuals who will not have English as a first language.
- How do we plan for people without tickets who just wish to be part of the event, savouring the atmosphere?
- How do we plan for the other people who will be drawn to the areas to make a living, both legally and illegally?
- How do we accommodate people who live and work in the areas where the events will take place, who are trying to go about their daily business and do not wish to be part of the events?
- What new simulation capabilities and facilities need to be put in place to cope with these very different scenarios involving different types of crowd?
 - Very large scale, multi-day, multi-site events are likely to incorporate many different types of crowds, as highlighted by our proposed typology.
 - For example, particular crowds will include avid fans, attending such an event to observe particular sports or particular bands, dependent on the type of event. At the same time, the same crowds will include others, such as tourists who wish to sightsee, but are unlikely to be familiar with the environment, and therefore may require additional guidance.

- In addition, crowds are likely to include significant numbers of family groups or groups of friends attending the large scale event primarily for a social outing and, therefore, wanting to embrace additional activities, such as eating, drinking and shopping.
 - However, crowds such as these – and groups within them in particular – do not appear to be well catered for in existing simulation techniques. At present, most simulation packages appear to focus on single individuals, who have a sole travel purpose and predominantly know where they are going.
 - We believe it is important for the next generation of simulation tools to focus on expanding their capabilities in order to accommodate varying types of crowd in varying environments.
-
- Risks such as these, for very large scale, multi-day, multi-site events, can be mapped onto an organisational systems diagram (see [Understanding Crowd Behaviours: Guidance and Lessons Identified](#), 'The Need for a Systems Approach', pages 86 to 93 for further details), to demonstrate their inter-related nature (see Figure 1).

Figure 1. The potential risks associated with very large scale events from a systems perspective

(Challenger, Clegg & Robinson, 2009)



PART 2

A Cautionary Tale: Heathrow Terminal 5 (T5)

Part 2 – A Cautionary Tale: Heathrow Terminal 5 (T5)

This part of the report contains: -

- A detailed review of the problematic opening of Terminal 5 (T5) at Heathrow Airport on 27th March 2008, as a case study example of how crowd events can turn into PR shambles if not prepared for, and managed, appropriately.

The Opening of T5

The Opening of T5

- This section outlines what we believe to be the root causes of the problematic opening of Terminal 5 (T5) at Heathrow Airport on 27th March 2008.
- The information presented and contributory factors identified are based on the evidence presented in the official report published by the House of Commons Transport Committee – *“The Opening of Heathrow Terminal 5”* (HC 543) – and newspaper articles published at the time¹.
- Our aim is to use what happened at T5 as a case study example – a cautionary tale – of how a very large scale crowd event, occurring over consecutive days and across multiple locations, could turn into a PR nightmare if not prepared for, and managed, appropriately.
- More specifically, this section will: -
 - Outline the evolution of the T5 debacle.
 - Use a systems-based approach to demonstrate the inter-related nature and ‘knock-on’ impact of the multiple contributory factors.
 - Discuss in detail the multiple factors which contributed to the problems.
 - Abstract lessons identified which can be applied as recommendations for crowd events.

¹ Despite the official report findings, the exact causes of the problematic opening of T5 are a contentious issue, with different stakeholders offering alternative perspectives on the factors involved and the appropriate attribution of blame. However, having not been directly involved in researching the incident, we are only able to base our conclusions on the evidence we have available, primarily the witness statements presented in *“The Opening of Heathrow Terminal 5”* report.

Evolution of the T5 Debacle

Evolution of the T5 Debacle

- Heathrow's Terminal 5 (T5) was opened by the British Airports Authority (BAA) on 27th March 2008, after six years of construction at a total cost of £4.3 billion. It was on time and within budget, and the first stage in realising BAA's vision².

BAA's vision...

"...to create the world's greatest international hub airport in the world's greatest city."

(Mick Temple, MD, BAA Heathrow)

- British Airways (BA) is the only airline to operate out of T5, and has invested substantially (£330 million) in the new facilities. Approximately 92% of BA's flights – previously departing from Terminals 1, 3, and 4 – now depart from T5, with the remaining 8% still operating from Terminal 3.
- On the day of opening, BA moved 70% of its flights from Terminals 1, 3, and 4 to depart from T5.
- However, multiple problems were experienced that day, particularly in relation to the baggage handling system, security searches, car parking and aspects of the building itself.
- Consequently, 36 584 passengers were affected on the first day of operation alone.
- In particular, the failure of the baggage handling system resulted in 23 205 bags needing to be sorted manually – some even shipped to Milan and the USA to be sorted – before being reunited with their owners.
- 68 flights were also cancelled on the opening day.

² See <http://www.baa.com/assets/B2CPortal/Static%20Files/HeathrowEastpresstatementFINAL.pdf>

- Although there were no casualties, the opening of T5 was, without doubt, a shambles in terms of public relations.

“What should have been an occasion of national pride was in fact an occasion of national embarrassment.”

(House of Commons Transport Committee, 2008, HC 543, p.3)

Inter-Related Factors and Knock-On Effects at T5

Inter-Related Factors and Knock-On Effects at T5

- As will be subsequently discussed in more detail, a wide range of factors appear to have contributed to the problematic opening of T5, namely: -
 - Technology and software failures
 - Inefficient staff training and familiarisation
 - Lack of new system testing
 - Staff delays
 - Incomplete building
 - Lack of end-user involvement
 - Inflexible management style
 - Poor industrial relations
 - Failure to learn lessons
 - Lack of a systems approach

- Overall, however, we believe that one of the central reasons for the T5 debacle was the substantial impact which resulted from these factors occurring in combination. In other words, had each of these problems occurred on their own, it is much less likely that the opening day of T5 would have been the public relations calamity that transpired.

- This also appears to be the perspective of BAA and BA.

“In my own view, there was not one problem which caused that: it was the accumulation of a large number of relatively smaller things, each one of which on its own would not have caused that scale of difficulty.”

Colin Matthews, CEO, BAA
(Q.44)

“...there were a number of teething troubles, things like car parks and staff checking, which in themselves would not have led to chaos breaking out, and then there were baggage-handling, computing, software issues.”

David Wilshire,
Transport Committee
(Q.71)

“I think the focus needs to be on all of the issues, because you cannot separate - as I said, we could have coped with a lot of the issues...It was the combination of all of these things that led to the problems...it genuinely was the combination of all of these factors and, most particularly, it was the combination of all of these factors impacting on the operation at the very beginning of the operation...Had they happened on a phased basis through the day, again, I believe we would have been able to cope.”

Willie Walsh, CE, BA
(Q.106)

- Thus, it is the fact that these issues – some of them seemingly minor when considered in isolation – occurred in succession that caused the greatest problems.
 - For example, the building delays – combined with management’s determination to open as scheduled – resulted in system testing being compromised. This subsequently prevented potential problems being acknowledged, the scope of the new software and technology systems being tested, and appropriate contingency plans being formulated.
 - Moreover, because systems were implemented without due consideration of the wider social and organisational issues, there was an over-reliance on technology. Consequently, when problems with the technology and software arose, staff were unable to respond appropriately. This was also made worse by the inadequate training and familiarisation provided.

- This, coupled with the systems being installed without the involvement of end-users and without consulting experienced ground staff, also meant that the structures in place were not altogether appropriate in the first instance.

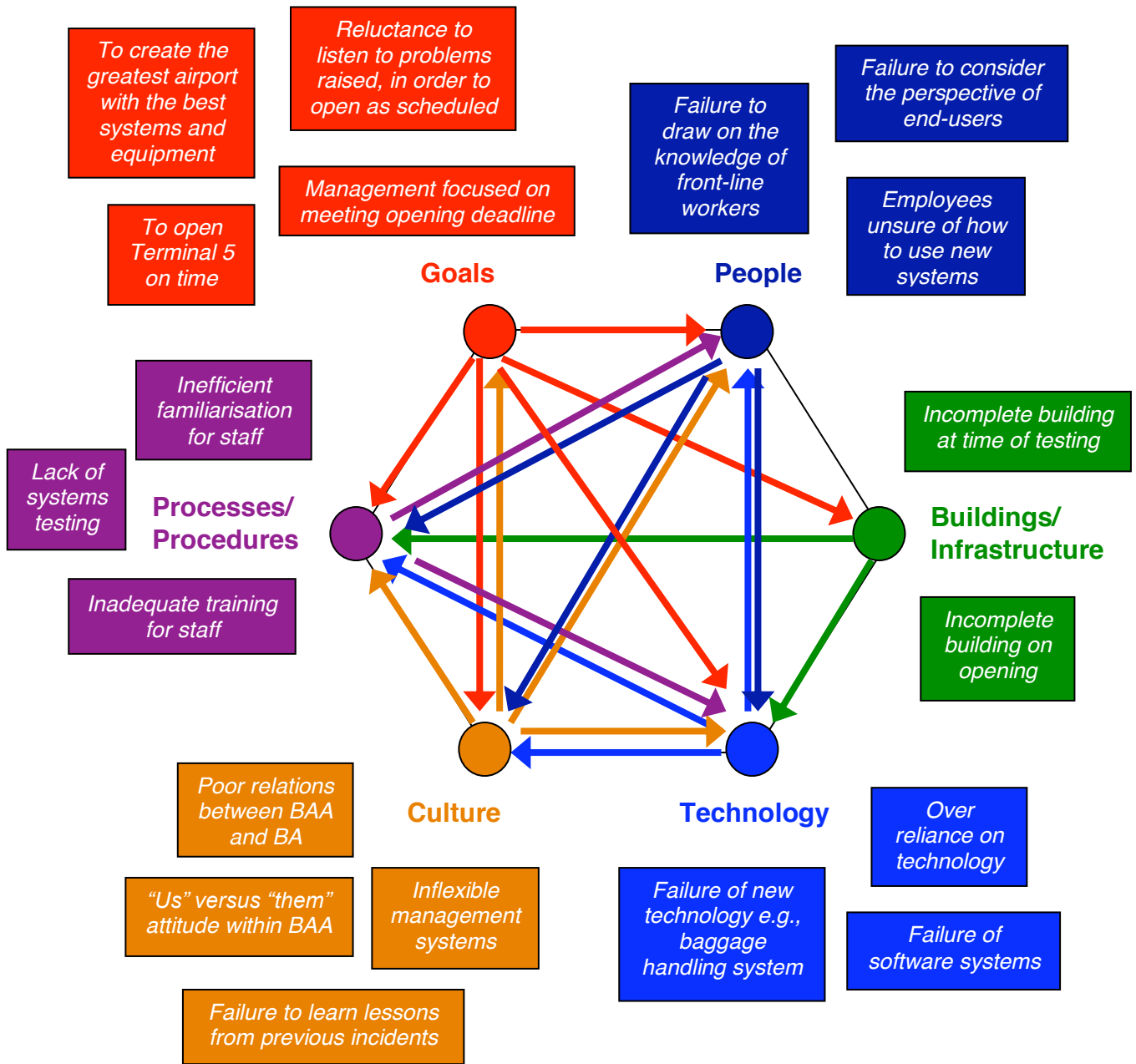
“...it was due to a number of factors. I think it would be wrong to say it was solely related to the software, although the software clearly did impact on the operation of the system. I think there was a combination of events that led to the poor performance. It started with issues that you have already heard about: staff being delayed getting into car parks, which delayed their arrival at the terminal building, delays getting through the central search area (which is the security search for staff going from the land side areas of the terminal to the air side). Clearly, the performance was impacted by familiarisation and training. Our staff were not as familiar as they should have been and that impacted on their performance. It was also impacted by software issues that led to difficulties with the baggage system. So it was a combination of factors; I do not think it was any one issue. I think any one of those items, indeed, a combination of a couple of those we could have coped with, but the significance of all of the problems hitting us, in effect, at the very beginning of the operation led to the problems that cascaded through the day”

Willie Walsh, CE, BA
(Q.96)

- It is possible to map these contributory factors onto an organisational systems diagram (see **Understanding Crowd Behaviours: Guidance and Lessons Identified**, ‘The Need for a Systems Approach’, pages 86 to 93 for further details), in order to demonstrate such knock-on effects and their inter-related nature (see Figure 2).

Figure 2. The problematic Terminal 5 opening from a systems perspective
(Challenger & Clegg, 2009)

"In my own view, there was not one problem which caused that: it was the accumulation of a large number of relatively smaller things, each one of which on its own would not have caused that scale of difficulty."
Colin Matthews, CEO, BAA



"So it was a combination of factors; I do not think it was any one issue. I think any one of those items, indeed, a combination of a couple of those we could have coped with, but the significance of all of the problems hitting us, in effect, at the very beginning of the operation led to the problems that cascaded through the day"
Willie Walsh, CE, BA

Contributory Factors to the T5 Debacle

Contributory Factors to the T5 Debacle

- The House of Commons Transport Committee report states two main reasons for the problems experienced at T5.
 - Insufficient collaboration and communication between operator (British Airways, BA) and owner (British Airports Authority, BAA).
 - Lack of staff training and familiarisation.

- Having reviewed the evidence detailed in the report, along with the sparse literature available, we believe the key factors which contributed to the debacle are: -
 - Technology and software failures
 - Inefficient staff training and familiarisation
 - Lack of new system testing
 - Staff delays
 - Incomplete building
 - Lack of end-user involvement
 - Inflexible management style
 - Poor industrial relations
 - Failure to learn lessons
 - Lack of a systems approach

Technology and Software Failures

- According to the official House of Commons Transport Committee report, a whole range of problems and failures with the new technology and software systems occurred on the opening day of T5, including: -
 - Problems with wireless internet connections.
 - Software interface problems.
 - Systems not being reset following testing.
 - Problems with the work allocation devices – known as RMSs – which are small, handheld computers through which staff are assigned work.
 - Difficulties with staff being able to log-in to the baggage system, due to passwords being incorrectly generated and inputted into the system.
 - Staff being unable to access the car park, due to a software fault which prevented 50 staff passes being able to activate the barrier. Ultimately this delayed their arrival and, consequently, delayed the time they started work.
 - One of the x-ray machines used in the staff security search process was out of service due to a technical problem. This slowed the search process and, again, delayed staff arrival for work.

- However, the greatest problem was probably that experienced with the baggage handling system, which failed to perform as it should have done.
 - For instance, there were problems with the automatic baggage sorting system, which is responsible for sorting passengers' bags and sending them to the appropriate place. This system was not working correctly on the opening day and, hence, the problems with missing luggage.
 - There were problems with the 'reconciliation gun', used by the baggage handlers to reconcile every bag with its owner, in order to check that the passenger is on board and, therefore, that the bag can be loaded.
 - The system also failed to recognise some bags, which needed to be transferred from a non-BA airline carrier to a BA aircraft.
 - In addition, the baggage system became gridlocked – as a result of baggage not being removed quickly enough by baggage handlers – which prevented further passengers from checking in.

Inefficient Staff Training and Familiarisation

- According to the evidence presented in the official report, training and familiarisation for airport staff were both inadequate.
- Not all staff were trained – approximately 94% of staff in total received some form of training. Moreover, only approximately 85% of staff actually completed the training each day. Therefore, to say 94% of staff were familiar with the new T5 system is misleading.
- The form of training itself was also insufficient. It was not hands-on – which would have provided staff with the opportunities to practice using the new equipment and the new systems – but instead consisted of an off-site presentation of the new T5 building along with some ‘familiarisation’ training.
- During this familiarisation process, staff were simply shown around the areas of T5 in which they would be working, including what equipment they would be using, how the process would work and where they would need to report.

“They were then given familiarisation training for three days to cover an area as big as Hyde Park.... Two days out of the three were devoted to putting them into a coach to show them x, y and z, and where to enter and exit and so on, but what was missing was hands on training as to where the spurs were, where the bags would come in and so on.”

Iggy Vaid, Senior Shop Steward
(Q.193)

- Familiarisation also took place in an incomplete environment – as the building work was still ongoing – and, consequently, staff were being ‘familiarised’ with an environment which was ultimately different to that in which they found themselves working on opening day.

- Moreover, the procedures and systems – such as the baggage handling system – to be used in T5 were very different to those employed in Terminal 1 and Terminal 4 and, therefore, required additional, specific training.
- As a result of this insufficient training and familiarisation, airport staff felt insecure, uncomfortable and “*totally confused*” (Iggly Vaid, Senior Shop Steward, Q.193).

Time Pressures

- Despite concerns being raised with management about the level of training provided, it does not appear that these concerns were listened to, and no changes to the procedures were made.
- The primary reason offered in explanation for this insufficient training and familiarisation period, was the pressure to open T5 on time. Thus, in order to allow the terminal to open to the public as planned, training was compromised.

“We believed that we had prepared sufficiently for the opening of Terminal 5 on 27 March. With the benefit of hindsight, it is clear that we had made some mistakes. In particular, we had compromised on the testing regime as a result of delays in completing the building programme for T5 and the fact that we compromised on the testing of the building did impact on the operation at T5 in the first few days after its opening.”

Willie Walsh, CE, BA
(Q.86)

Lack of New System Testing

- Due to building delays, full system testing was compromised, in order to open T5 on schedule.
- The priority of BAA and BA was to open on time – delay was not considered a viable option. Therefore, in order to achieve this target, compromises had to be made and, despite acknowledging the risks, these compromises were made in relation to system testing.

“...it was a calculated risk.”

Willie Walsh, CE, BA
(Q.165)

“We did look at the way that other airport openings went. I believe we did learn valuable lessons. I think the mistake we made...was having learned those valuable lessons we compromised on the testing of the building as a result of delays in the building programme. If I was to pick on one issue that I would do differently if I could go back and do it again, it is that particular issue. Having recognised the importance of testing and having designed into this project a full six months of testing from 17 September to 27 March, we subsequently compromised on that testing programme, and that was a mistake. I think that is a lesson we should have recognised at the time and we certainly recognise now.”

Willie Walsh, CE, BA
(Q.162)

- For instance, many of the systems were tested in isolation and, consequently, it was not possible to adequately assess how effectively the systems would work as a whole.
- Trials of the security search process did not account for a large enough capacity or wide enough range of personnel entering the airport.
 - For example, testing did not consider repeat entry by staff, or entry by retail staff and non-BA personnel coming to observe the new terminal, all of which increased the flow through the security system on the opening day, thereby increasing the length of queues.

- Nor did testing consider staff with temporary security passes, who would require mandatory physical searches, again slowing the whole process and increasing queuing time.
- Moreover, much of the testing – particularly in relation to the baggage handling system – appeared to be unrealistic and not to scale.
 - For example, although a wide range of baggage – of varying size, shape and weight – was used to test the system, it did not realistically represent the diversity of baggage experienced at the opening.

“Maybe the reality of the baggage that people put in the system was more diverse than our tests represented.”

Colin Matthews, CEO, BAA
(Q.72)

- The end part of the baggage handling process – i.e., getting the bags from the baggage hall onto the aircraft – underwent less testing than the earlier parts of the process.
- Furthermore, tests did not accurately replicate the number of baggage containers to be loaded onto each flight, but instead typically trialled the system with a much smaller number of containers.
- Baggage was not separated in the trials as it would have been on the opening day, for example, into first class, business class and standard class.
- In addition to these compromises on system testing, there was a failure to thoroughly consider what the potential consequences of insufficient testing could be, and to develop appropriate contingency plans.

“Clearly, inadequate contingency was made for the new systems not working.”

David Morton, Uniglobe Travel
(T5 03)

Staff Delays

- Many problems on the day of opening – most of which have been highlighted already – led to airport staff being delayed in reporting for work which, inevitably, had subsequent effects on passengers. For instance: -
 - Software faults – e.g., with car park access and security searches – caused delays.
 - Inadequate testing of the security searching process resulted in lengthy queues, again delaying staff being able to begin their work.
 - Car parks became full much more quickly than anticipated and staff were not redirected to the overflow car park in sufficient time. Therefore, roads became congested and staff were delayed.

Incomplete Building

- When T5 opened to the public, there were multiple aspects of the building itself which were not completed to the design specification and/ or did not meet standards for operational adequacy. This impacted on both staff and customers.
- For instance: -
 - 28 out of 192 lifts for both passengers and staff in T5 were not operational on the day of opening. Half of these non-operational lifts were from the short-stay car park.
 - Passenger toilets were not working.
 - Staff and passenger search facilities were not functioning as intended.
 - Temperature control for the building required manual operation.
 - Staff access routes and accommodation areas were not completed or fitted out.
 - Jetties – the sealed walkways which connect the departure gate to the aircraft – failed to perform as specified. This caused frequent stoppages and delays to arrivals and departures, as maintenance engineers were required to reset the operating system on each jetty before it could be reused.
- These incomplete aspects of T5 also had knock-on effects on system testing and staff training. For example: -
 - Staff were being familiarised with an unfinished environment.
 - Given that parts of the system were not functioning as they should, it could not have been possible to test sufficiently how T5 would function as a whole.
- However, in spite of these issues, the decision was made to open T5 to the public as scheduled – delaying the opening was not considered to be a viable option.

Lack of End-User Involvement

- A further factor which contributed to the problems encountered on the opening day of T5 was the lack of end-user – i.e., front-line staff – involvement in the whole process.
- Indeed, as evidenced in the official report, the Chief Executive Officer of BAA – Colin Matthews – himself acknowledged the need to involve end-users if the success of a new initiative is to be enhanced.
- To their credit, however, BA do appear to have begun the process with the best of intentions and initially involved all their Heathrow staff in a programme called “Fit for Five”. This programme, which ran for several years prior to the opening, was intended to engage staff in the change process and enhance their awareness of the benefits of moving to T5.
- However, this engagement was not maintained, and as the process continued, staff felt their opinions were not listened to, nor was their expertise as front-line workers involved in the day-to-day functioning of the Heathrow terminals considered.

“It is the people who do the job who know it best.”

Colin Matthews, CEO, BAA
(Q.273)

“As far as concerns the trade union side, I believe they made the decision to involve what we call process engineers who came in and decided what type of process needed to be installed. They only wanted the union to implement that process and it was decided by somebody else, not the people who really worked it. The fact is that they paid lip service to, ignored or did not implement any suggestion we made”

Iggy Vaid, Senior Shop Steward
(Q.197)

- Indeed, according to the evidence given in the official report, BAA and BA did not consult with the front-line personnel or the trade unions, both of whom had specific concerns about the opening of T5 and the functioning of the new systems which had been implemented.

“Certainly there has been no meaningful consultation and none of the views expressed by the trade union has been taken seriously by the company.”

Steve Turner, National
Secretary for Civil Air
Transport
(Q.238)

“Based on our experience we said that they must listen to what we said and do it this way, but we were told that, no, it was a state-of-the-art building and everything would work and be all right.”

Stanley Peters, BAA Shop
Steward, Unite the Union
(Q.201)

- Moreover, it appears that these new systems were installed by process engineers, without involvement from front-line personnel – i.e., without input from those individuals who use the systems on a daily basis.

“They tried to introduce a different operating method based on process engineers who designed a new system without consulting our people who collectively have many thousands of years’ experience on the ground.”

Steve Turner
National Secretary for Civil Air Transport
(Q.207)

- However, it is vital to listen to – and involve throughout the design process – front-line personnel with first-hand experience of such systems in action, in order to design and implement a more successful, user-friendly system.

Inflexible Management Style

- Throughout the House of Commons Transport Committee report, there are multiple references to the management style of both BAA and BA being autocratic and inflexible.

“If you surround yourself with yes men you do not get many noes, and that pretty much sums up BA’s managerial style. It has fiefdoms”

Steve Turner
National Secretary for Civil Air Transport
(Q.244)

- As outlined previously, senior level management for T5 were focused on opening the new terminal on time. Therefore, they were very reluctant to listen to the concerns of – or ask for the expert opinions of – the front-line workers and trade unions, and to adapt any of the systems accordingly.

“In 2005 they set up the allocation system and probably spent millions of pounds on it. In no way were they going to change that. It did not matter what we suggested or did; that system was in and had to be used. For that reason there was no way that any other electronic system could be introduced even in the last three or four months, so we had to make do with whatever the system was even if we tried to tell them that it did not work and extra resources were needed. You turn human beings into zombies with these types of things, but it was too late and it could not be changed at that stage. They made the decision much earlier to go with that system and spent a lot of money on it”

Iggy Vaid, Senior Shop Steward
(Q.215)

- It also appears that the attitude of senior level executives was one of complacency; they expected perfection in all the systems implemented and, therefore, did not fully consider what problems could potentially arise.
 - For instance, in an article published in *Times Online* (29th March, 2008; see www.timesonline.co.uk³), Mike Forster, strategy director for BAA, is quoted as saying *“We have a world-class baggage system that is going to work perfectly on day one.”*
 - However, it is attitudes such as this that lead to a false sense of security and a failure to formulate appropriate contingency plans.

“...serious questions raised over mismanagement of resources and failure to plan adequately for contingencies which were far from unexpected, let alone inconceivable.”

(House of Commons Transport Committee, 2008, HC 119, p.18)

³ Article retrieved from <http://www.timesonline.co.uk/tol/travel/news/article3643039.ece>

Poor Industrial Relations

- It is evident in the House of Commons Transport Committee report that the working relationship between BAA and BA was poor, with a conflict in management styles and a distinct lack of cooperative, integrated team working – i.e., as the report itself states, a lack of “*togetherness*” (2008, HC 543, p.8).

*“...insufficient communication
between owner and operator.”*

(House of Commons Transport
Committee, 2008, HC 543, p.3)

- According to an article published in *Times Online* (28th March, 2008; see www.timesonline.co.uk⁴), each organisation blamed the other for the disastrous opening of T5.
 - BA accused BAA of allocating too few security personnel to process the baggage handlers as they arrived for work, whilst BAA accused BA of providing too few employees to unload bags from the conveyor belt, hence it becoming congested with bags.
- In addition, as evidenced by the lack of end-user involvement described previously, it also appears that industrial relations between BAA on one side and front-line employees and the trade union on the other, were also strained – i.e., an “us” versus “them” mentality.
- Along similar lines, Bennett and Shaw (2003), in their article concerning accidents on the ramp in the aviation industry, discuss the issue of poor relations between management and front-line employees.
 - Front-line employees interviewed in the study suggested that management were too far removed from the day-to-day functioning of the ramp to effectively decide how best to manage ramp operations.

⁴ Article retrieved from <http://www.timesonline.co.uk/tol/travel/news/article3636107.ece>

“...anyone can turn an aircraft round in an office writing a manual.”

“You can’t be an expert unless you’re doing it day in, day out.”

(Interviewees, quoted in Bennett & Shaw, 2003, p.340)

- Ramp workers also reported feeling alienated from supervisors and management, and believed that they, and their opinions, were not valued.

“No, we don’t get asked, listened to or anything.”

“They don’t value us at all, never mind our opinion.”

(Interviewees, quoted in Bennett & Shaw, 2003, p.341)

- However, if the organisation is to function at its most efficient, relations between all parties involved must be of good quality.
- In relation to T5, this means that all parties involved – i.e., BAA, BA, front-line employees, union members, software providers, system installation companies – need to work together as an integrated team. BAA and BA not only need to communicate with each other, but also with the trade union and employees involved in the day-to-day operational processes. Moreover, they need to listen to – and value the expert opinion of – such front-line staff, who have realistic knowledge of what will and will not work.

Failure to Learn Lessons

- Having reviewed the evidence detailed in the House of Commons Transport Committee report, there appears to be a lack of learning on the part of BAA and BA.
- Problems such as those experienced on the opening day of T5 have affected the openings of many major airport terminals in the past, as stated in the official report.
 - For example, severe problems with baggage handling systems were experienced previously, most notably at Denver Airport in 1995.
 - Problems also resulted at Hong Kong International Airport in 1998 and Kuala Lumpur Airport in 1997, primarily due to lack of staff familiarity.
- Indeed, in a letter published in the Financial Times (2nd April, 2008; see www.ft.com⁵), T5 was accused of having a “*lack of corporate memory and learning*”, for failing to draw on the lessons learned in previous airport debacles.
- Although Willie Walsh, Chief Executive of BA, stated that the problems encountered at these other airports were reviewed and, as such, that valuable lessons were learned for T5, by compromising on system testing and staff training, any such learning was rendered ineffectual.

“We did look at the way that other airport openings went. I believe we did learn valuable lessons. I think the mistake we made...was having learned those valuable lessons we compromised on the testing of the building as a result of delays in the building programme.”

Willie Walsh, CE, BA
(Q.162)

⁵ Letter retrieved from http://www.ft.com/cms/s/0/5d3997da-0059-11dd-825a-000077b07658.html?nclick_check=1

- Moreover, if lessons had truly been heeded, a more cautious and considered approach to the opening of T5 may have been adopted.
 - For example, the executive board may not have been so dismissive of problems with T5 systems which were brought to their attention.

- In a study of warehouse automation projects – involving similar technology for sorting and conveying products as that involved in the baggage handling systems at T5 – Baker and Halim (2007) reported problems comparable to those experienced at T5.
 - For instance, disruptions to warehouse operations were suggested to be due to IT system failures, lack of consideration of human factors and the impact that new systems would have on individuals, and an insufficient ‘ramp up’ time to transfer from the old to the new system.

Lack of a Systems Approach

- Overall, it appears there was a failure to adopt a socio-technical approach – i.e., a system-wide approach – in relation to the opening of T5 and, consequently, a failure to consider the wider aspects of the T5 system as a whole.
- Rather, throughout the preparation for the opening of T5, there was an emphasis on technology and software, at the expense of considering the more social and organisational aspects.
- However, this reliance on technology and neglect of other issues leads to a false sense of security – i.e., just because the best technological systems are installed and the highest quality software used, does not automatically mean that the overall system will be a success, as was experienced at T5.
- If the people using the technology – i.e., the front-line workers using the baggage handling system – are not given equal consideration, along with the wider organisational systems, then problems are likely to occur.

“...too much reliance was placed on automated technology and systems in T5.”

David Morton,
Uniglobe Travel
(T5 03)

“You have dehumanised a system with complete reliance upon technological advances which means that should there be a failure in the system at any point it will not self-rectify.”

Steve Turner, National Secretary for Civil Air Transport
(Q.198)

- Indeed, if a system, such as T5, is to be a success, then all aspects – i.e., technology, people and process – must be considered in parallel.

“For a terminal as a whole to work, you need to have the people and the equipment working effectively together.”

Colin Matthews, CEO, BAA
(Q.9)

Recommendations for Crowd Events from the T5 Debacle

Recommendations for Crowd Events from the T5 Debacle

Having outlined the combination of errors which contributed to the problematic opening of T5, the following recommendations for crowd events can be made.

- Thorough testing of all systems and equipment is essential. Moreover, systems should not be tested in isolation, but as an integrated system, as they would be functioning at the actual event.
- Contingency planning is vital and must consider a wide range of issues.
- The knock-on effects of incidents must be given particular consideration during event preparation and contingency planning. The impact that events occurring in succession or combination can have should not be underestimated.
- There must be adequate flexibility built into plans, to accommodate the specific factors which could arise prior to and during the event.
- Good industrial relations between all parties involved are critical. All parties must work together in harmony, as a united team working towards mutually agreed goals.
- It is essential to listen to the first-hand knowledge and experience of front-line employees, who are most familiar with the systems and processes as used on a daily basis.
- End-user involvement throughout the process is critical.
- Thorough training for all staff is vital, to ensure that everyone involved is familiar with – and confident in using – all the systems involved.
- All events should be considered using a socio-technical systems approach, to ensure social, technical and organisational aspects are all given equal consideration and jointly optimised.
- It is important to avoid becoming heavily reliant on technology, and to ensure that personnel are capable of manually over-riding systems if necessary.
- Lessons should be identified from previous events of a similar nature, both successful and disastrous ones.

PART 3

Review of the Literature

Part 3 – Review of the Literature

This part of the report contains: -

- An in-depth review of the literature concerned with crowds, their behaviours, and psychological theories used to explain their behaviours.
- An in-depth review of the literature concerned with the behaviours of crowds in emergency situations and evacuations.
- A detailed discussion of relevant crowd disasters, based on a thorough literature review.
- An in-depth review of the literature concerned with methods of simulating crowd behaviours.
- An assessment of apparent gaps in the current research literature.

Literature on Crowd Behaviours

Literature on Crowd Behaviours

- This section details the findings of the in-depth literature review conducted regarding crowds, their behaviours, and theories used to explain their behaviours.

The section is structured as follows: -

- Brief note on the neglect of crowd behaviours in psychological literature and research.
- Discussion of the ways in which crowds and crowd behaviours can be defined.
- Discussion of different types of crowd, their corresponding characteristics and underlying rules and assumptions thought to govern crowd behaviours.
- Review of the key theories underlying crowd behaviours, including: -
 - Classic theories
 - Deindividuation theory
 - Emergent norm theory
 - Social Identity Theory of Crowd Behaviour
 - Elaborated Social Identity Model of Crowd Behaviour
 - Social Identity Model of Deindividuation Effects
 - Place Scripts
- Consideration of potential moderators of crowd influence on crowd members' behaviours, such as: -
 - Gender
 - Personality
 - Identifiability
 - Intoxication

Neglect in the Literature

“Crowds are the elephant man of social sciences. They are viewed as something strange, something pathological, something monstrous. At the same time they are viewed with awe and with fascination. However, above all, they are considered to be something apart. We may choose to go and view them occasionally as a distraction from the business of everyday life, but they are separate from that business and tell us little or nothing about normal social and psychological realities. Such an attitude is reflected in the remarkable paucity of psychological research on crowd processes and the fact that it is all but ignored by the dominant paradigms in social psychology.”

(Reicher, 2001, p.182)

- Crowds and their behaviours are a relatively understudied area in psychological research, despite their prominence in everyday life.
- At present, the key researchers in the field appear to be Professor Stephen Reicher, Dr John Drury, Dr Chris Cocking and Dr Clifford Stott. Therefore, much of their work has been included in this review.
- In addition, due to the close alignment between groups and crowds, literature concerned with groups and their behaviours – of which there is plenty – has been reviewed. This serves to broaden the literature base from which recommendations for good practice when planning and managing crowd events can be formed.

Defining a Crowd

Collective behaviour...

"...two or more persons engaged in one or more behaviors judged common or concerted in one or more dimensions."

(McPhail, 1991, p.185)

A crowd...

"...a large group of individuals in the same physical environment, sharing a common goal (e.g. people going to a rock show or a football match). The individuals in a crowd may act in a different way than when they are alone or in a small group."

(Musse & Thalmann, 1997, p.39)

Collective action...

"...people acting together in the pursuit of common interests."

(Tilly, 1978, p.7)

A group...

"...two or more people who, for longer than a few moments, interact with and influence one another and perceive one another as 'us'."

(Myers, 2005, p.305)

A gathering...

"...a large number of people in the same place at the same time."

(Lofland, 1985, p.3)

A crowd...

"...a compact gathering or collection of people with connotations of homogeneity of characteristics and unanimity of behavior."

(Brown & Lewis, 1998, p.649)

Crowds...

"...they are present in a common environment, and all the individuals present in the crowd usually share a common goal."

(Sharma, 2000, p.298)

- Defining a crowd precisely has proved problematic for researchers. As demonstrated on the previous page, nebulous descriptions of ‘a crowd’ and related concepts – concerning ‘a gathering of many people’ – abound. Yet, few detailed definitions exist.
- However, we believe it is important to try to develop a definition – or at least agree some broad criteria which can form the basis of a potential typology of crowds⁶ – so that when future researchers and practitioners talk of a ‘crowd’, the meaning is unambiguous and all parties are clear about precisely what is being referred to. If meaningful research on crowds is to be conducted further, and a set of practitioner guidelines regarding crowd events and behaviour to be produced, we should all be broadly in agreement about what constitutes a ‘crowd’.
- Through comparing the definitions of the related concepts on the previous page, it seems likely that the following may be used in relation to a crowd: -
 - A sizeable number of people.
 - Gather at a specific location or share the same physical environment.
 - Together for a measurable period of time (i.e., longer than momentarily).
 - Share a common goal or common interests.
 - Display similar behaviours or act as one united group.
 - Interact with one another.
- According to Turner (1982), there are three criteria which must be present in order for a group to be characterised as a crowd: -
 1. Group members must be face-to-face.
 2. The situation in which the group acts must be novel or ambiguous in some way.
 3. Formal means of reaching group consensus must be blocked.

“Crowds tend to exist in novel, ambiguous and fluid situations.”

(Reicher, 1996a, p.116)

⁶ Precise definitions are particularly desirable in the academic field; however, since this report is primarily designed to practically assist event planners and managers, we feel that developing a detailed typology of crowds (as outlined in [Understanding Crowd Behaviours: Guidance and Lessons Identified](#), ‘Recommendations for Further Research’ - ‘A Typology of Crowds’, pages 128 to 134) is more beneficial than a detailed definition.

- In other words, to constitute a crowd, individuals should come together in an unfamiliar situation and behave in a socially coherent manner without prior awareness, or communication, of group norms and values to guide their behaviour (Turner, 1982; Reicher, 1996a).
- Indeed, Reicher (e.g., 1984b, 1996a) argues that this – their ability to behave in a socially coherent manner, without any apparent pre-planning, communication or direction – is what makes crowds, in particular, such a fascinating area of study. How is it that crowds ‘know’ how to behave as one? What is it about being in a crowd that brings about this social coherence? Is there a psychological explanation?
- Current researchers in the field of crowd behaviours (e.g., Reicher, 2001; Drury & Cocking, 2007) also stress the need to draw a distinction between a ‘physical crowd’ or aggregate – i.e., a group of people in the same location, each with their own personal identity – and a ‘psychological crowd’ – i.e., a group of people united by a common social identity as part members of a particular category.

“...different psychological crowds with different identities and different intentions co-existing within the physical crowd.”

(Reicher, 2001, p.201)

A 'Crowd' – Defining Criteria

- Based on the definitions, criteria and research already outlined, it would appear that the key criteria which may jointly determine whether a group of people can be considered a crowd are⁷: -
 - Size
 - Density
 - Time
 - Collectivity
 - Novelty

Size

- How many people constitute a gathering sufficiently large to be a crowd?
- The size of a group is typically defined as two or more people (e.g., Myers, 2005), but at what point does it become a crowd?
- To be considered a crowd, we propose that there should be sizeable number of people.

Density

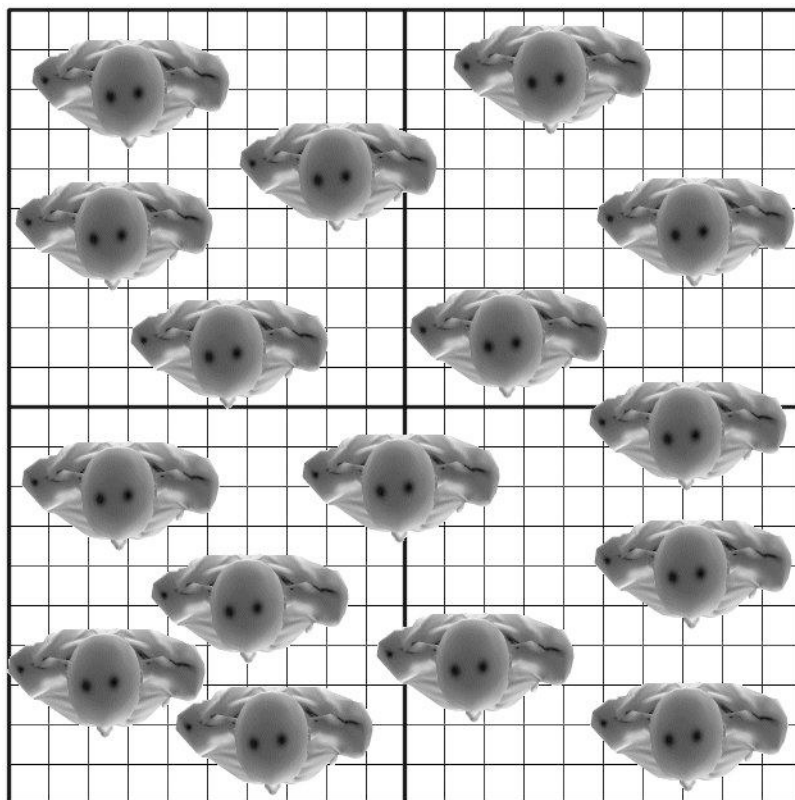
- How closely must people be situated to each other to constitute a crowd?
- While 100 people spread throughout a large park would not generally qualify as a crowd, the same people gathered in a small area of that park for a specific event – a concert, for example – would.

⁷ We have deliberately refrained from including specific figures in our crowd criteria, particularly in relation to size and density. This is due to: the numerous different types of crowd and crowd event, thereby making the inclusion of numerical data unsuitable; the way in which the different criteria interact with one another (e.g., size and density); and the ongoing debate in official guidance (e.g., the Green Guide, the Purple Guide) and between crowd experts, over what should constitute a crowd. Therefore, we did not feel it was appropriate to include specific figures in our definition.

- Similarly, research suggests that social density is related to subjective perceptions of crowding in residential neighbourhoods (Fleming, Baum & Weiss, 1987).
- Thus, there are interaction effects between density and size, such that a certain number of people located over a very large area (i.e., very low density) would not constitute a crowd in the same way as that same number of people would if located over a small area (i.e., high density).
- Official guidelines concerning safe crowd density levels at sporting events – i.e., *Guide to Safety at Sports Grounds* (the Green Guide) – recommend a maximum of 47 people per 10 square metres when standing, and a maximum of 40 people per 10 square metres if moving (Department for Culture, Media and Sport, 2008).

Figure 3. A density distribution of 40 people per 10 square metres

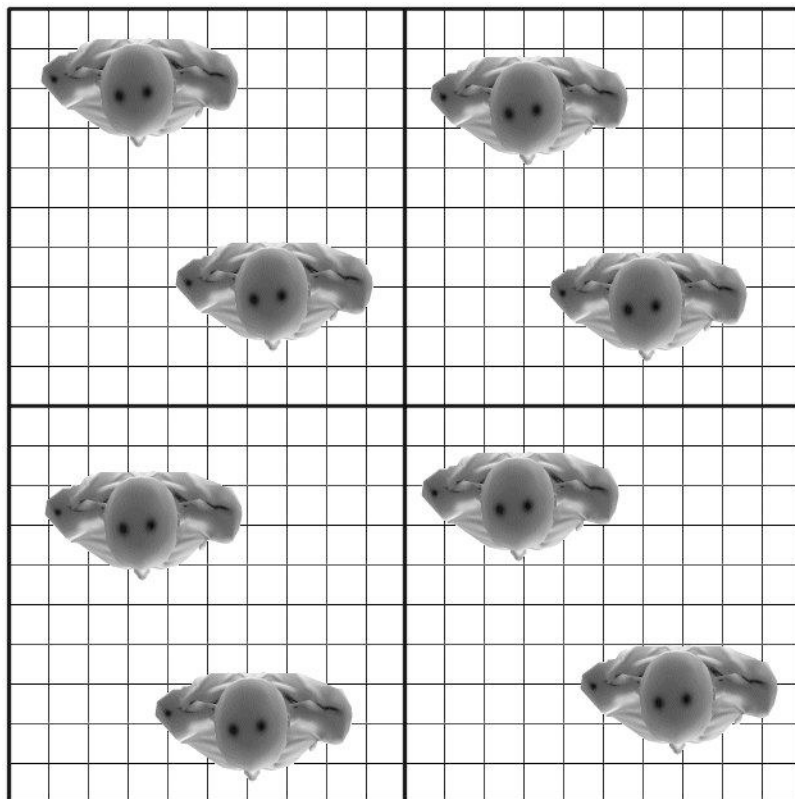
(Taken from <http://www.crowddynamics.com/Myriad%20II/Anthropomorphic.htm>)



- Alternatively, official guidelines concerning safe crowd densities at Greenfield music (and similar) events, such as Glastonbury – i.e., *The Event Safety Guide: A Guide to Health, Safety and Welfare at Music and Similar Events* (the Purple Guide) – recommend only 20 people per 10 square metres (Health and Safety Executive, 1999).

Figure 4. A density distribution of 20 people per 10 square metres

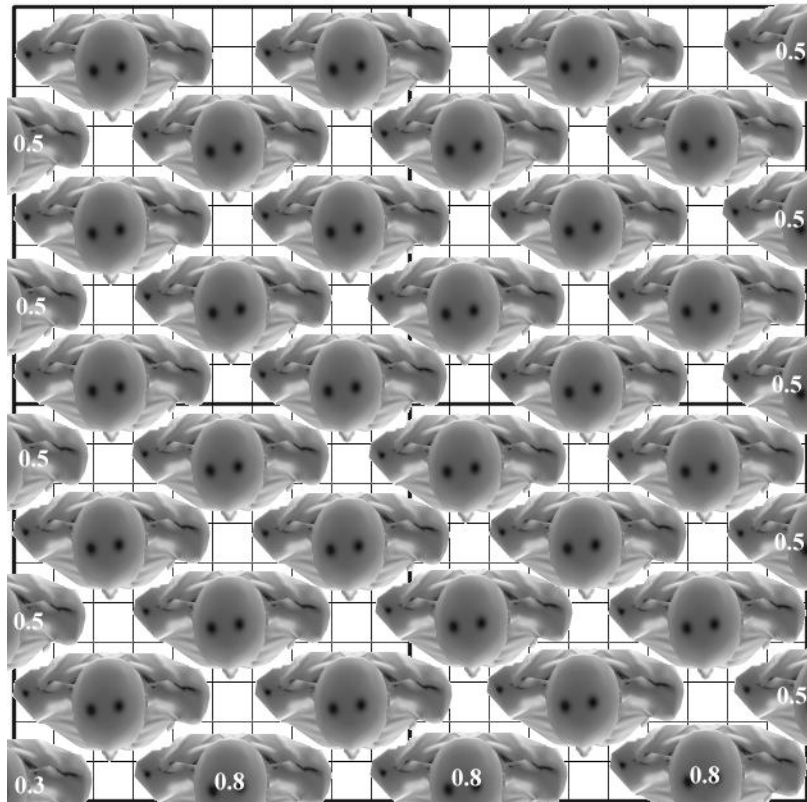
(Taken from <http://www.crowddynamics.com/Myriad%20II/Anthropomorphic.htm>)



- Therefore, both the type of event and movement of the crowd influence the recommended density distributions.
- Consequently, we suggest that to be considered a crowd, people should be in close enough proximity over a given area to constitute a sufficient density distribution. However, people should not be so densely packed as to cause crushing, for example – i.e., the density must be safe. Figure 5 (overleaf) illustrates what would be considered a dangerous level of density.

Figure 5. A density distribution of 84 people per 10 square metres

(Taken from <http://www.crowddynamics.com/Myriad%20II/Anthropomorphic.htm>)



- These different crowd density levels are similar to Fruin's (1971) notion of Level of Service, in which six levels of pedestrian flow rate – from level of service A to level of service F – are defined. These levels of service, which indicate varying levels of walking speed, flow of movement and restrictions in passing, crossing or reverse movements, are shown in Table 1⁸. It is also possible to represent these levels of service visually, as shown in Figure 6. There are levels of service specific to walkways, queuing areas and stairways.

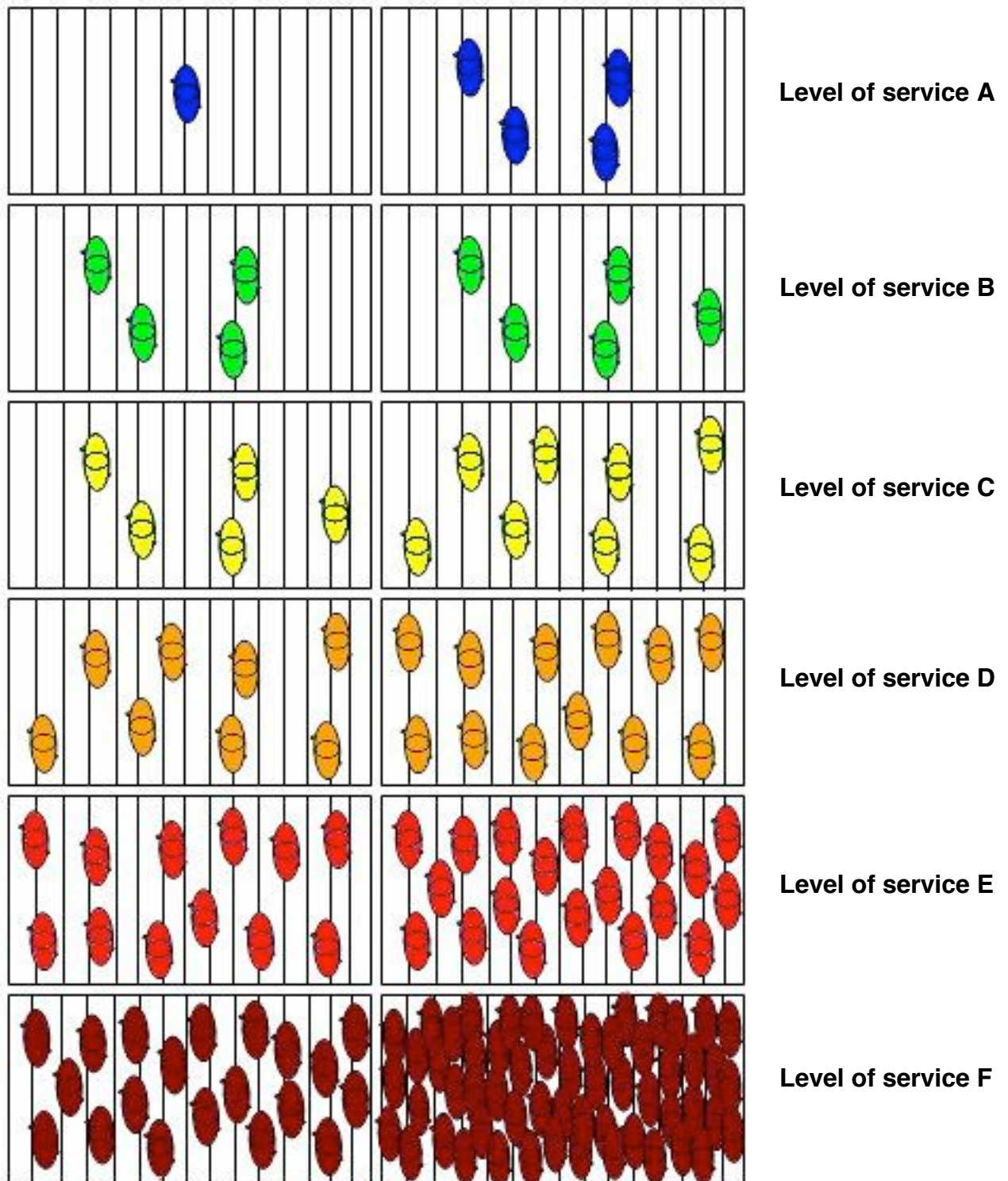
⁸ Fruin uses the measurement units of 'feet per minute' and 'area per person' when referring to the differing levels of service. However, for consistency within this report, the figures detailed have been converted to the units of 'people per metre per minute'.
(See <http://www.crowddynamics.com/Myriad%20II/Anthropomorphic.htm>).

Table 1. Fruin's levels of service(Taken from <http://www.crowddynamics.com/Myriad%20II/Anthropomorphic.htm>)

Level of Service	Description
A	<ul style="list-style-type: none"> • Flow rate of less than 23 people per metre per minute. • Virtually unrestricted choice of walking speed. • Minimum manoeuvring needed to pass fellow pedestrians. • Unrestricted crossing and reverse movements.
B	<ul style="list-style-type: none"> • Flow rate of between 23 and 33 people per metre per minute. • Normal walking speeds, restricted only occasionally. • Occasional interference in passing fellow pedestrians. • Occasional interference in crossing and reverse movements.
C	<ul style="list-style-type: none"> • Flow rate of between 33 and 49 people per metre per minute. • Partially restricted walking speeds. • Restricted passing movements, but possible with manoeuvring. • Restricted crossing and reverse movements, with significant manoeuvring needed to avoid conflict. • Reasonably fluid flow.
D	<ul style="list-style-type: none"> • Flow rate of between 49 and 66 people per metre per minute. • Restricted and reduced walking speeds. • Passing fellow pedestrians rarely possible without conflict. • Severely restricted crossing and reverse movements, with multiple conflicts. • Momentary flow stoppages possible when critical densities are intermittently reached.
E	<ul style="list-style-type: none"> • Flow rate of between 66 and 82 people per metre per minute. • Restricted walking speeds, occasionally reduced to shuffling. • Passing fellow pedestrians impossible without conflict. • Severely restricted crossing and reverse, with unavoidable conflicts. • Flow achieves maximum capacity under pressure, but with frequent interruptions and stoppages.
F	<ul style="list-style-type: none"> • Flow rate variable. • Walking speed reduced to shuffling. • Passing movements are impossible • Crossing and reverse movements are impossible • Frequent and unavoidable physical contact • Sporadic flow, on the verge of complete breakdown and stoppage.

Figure 6. Visual representation of Fruin's levels of service

(Taken from <http://www.crowddynamics.com/Myriad%20II/Anthropomorphic.htm>)



Time

- Some large gatherings of people, such as those at sporting stadia, are relatively stable in membership for the duration of a prolonged event.
- Other gatherings, in transport stations for instance, are relatively transient, in that the membership of the crowd changes constantly as people arrive and depart.
- However, in order to be considered a crowd, literature would suggest that individuals should come together as a group, in a specific location for a specific purpose, for a measurable amount of time.

Collectivity

- As highlighted by the need to distinguish a physical crowd from a psychological crowd (e.g., Reicher, 2001; Drury & Cocking, 2007), individuals must share a social identity if they are to be thought of as a true 'crowd'.
- In accordance with the other definitions, crowd members should also share common goals and interests, and act in a coherent manner (e.g., McPhail, 1991; Musse & Thalmann, 1997; Brown & Lewis, 1998; Sharma, 2000).
- Therefore, collectivity – in terms of social identity, goals, interests and behaviours – would appear to be a crucial aspect of being a crowd.

Novelty

- What appears to make crowds unique is their ability to act in a socially coherent manner without any prior awareness, or communication, of group norms and values to guide their behaviour (e.g., Turner, 1982; Reicher, 1996a).
- Thus, in order to constitute a crowd, individuals should come together in an unfamiliar or ambiguous situation, yet be able to act as a united mass.

KEY LEARNING POINTS

– Defining a Crowd –

- There is no agreed definition of ‘a crowd’, but multiple – and often vague – descriptions based around the concept of a crowd being ‘a large gathering of people’.
- Characteristics which appear common to these various definitions include: a sizeable number of people; at a specific location; for a measurable time period; with common goals; and displaying common behaviours.
- It is helpful to distinguish a physical crowd – i.e., a group of people who simply share a location – and a psychological crowd – i.e., a group of people who share a social identity.
- Key criteria which may jointly characterise a crowd include: -
 - Size – to be considered a crowd there must be a sizeable number of people.
 - Density – crowd members must be co-located in a particular area with a sufficient, but safe, density distribution.
 - Time – individuals must come together in a specific location for a specific purpose for a measurable amount of time.
 - Collectivity – crowd members should share a social identity, common goals and interests and act in a coherent manner.
 - Novelty – individuals must be able to act in a socially coherent manner, despite coming together in an ambiguous or unfamiliar situation.

Types and Characteristics of Crowds

Types of Crowd

- It may not be realistic to try to develop one all-encompassing definition of 'a crowd'. Rather, it may be more appropriate to devise distinct – although, most likely, closely related – definitions to correspond with the distinct types of crowd, each with their own distinct behaviours and characteristics.

“Saying that a crowd is a large number of persons gathered closely together is as serious a mistake as saying that mushrooms are an enlarged complex aerial fleshy fruiting body of a fungus.....If you cannot distinguish one mushroom from another, this lack of distinction may kill you when you pick and eat them at random.”

(Berlonghi, 1995, p.239)

- It is important to distinguish different types of crowd, in order to successfully prepare for, manage and act towards a crowd at a given event. Generalised or random actions based on an oversimplification of a 'crowd' may result in inappropriate crowd management which, ultimately, could have disastrous consequences (e.g., Berlonghi, 1995).
- Crowds for special events, for example, can be thought of as comprising numerous smaller crowds, each of which can be considered to have its own 'personality' (Berlonghi, 1995) or its own shared social identity (e.g., Reicher, 2001).
- These crowd types, and their differing personalities and social identities, must be simultaneously managed if an event is to be effectively supervised. Moreover, those involved with crowd management and control must be able to differentiate these individual crowd types within the larger mass, in order to act – or react – appropriately towards each (e.g., Adang, 2003; Stott & Adang, 2003; Adang & Stott, 2004).

- However, there appears to be very little research into crowd typologies. After carrying out an extensive literature review, only two relevant publications – Momboisse (1967) and Berlonghi (1995) – were found.
- Momboisse (1967) distinguishes four types of crowd: -
 - Casual crowds – i.e., ones which are not organised or unified, but comprise individuals who are simply in the same place at the same time.
 - Conventional crowds – i.e., ones which are gathered for a specific purpose or to observe a specific event, with crowd members who share common interests.
 - Expressive crowds – i.e., ones with members who are involved in some form of expressive behaviour, although not in a destructive way, for instance, dancing or singing.
 - Aggressive or hostile crowds – i.e., ones which are unorganised and lacking in unity, but with members who are willing to be enticed into disorder and unlawful behaviour.
- Berlonghi (1995) offers a more detailed categorisation of crowds and identifies eleven different types (see Table 2, overleaf).
- Berlonghi (1995) argues that it is important to consider – or anticipate – these different crowd types when planning a crowd event, so that appropriate interventions and timely responses can be prepared in response to each of the different types, should they emerge during the event.
- For instance, the successful management of an event involving a spectator crowd – gathered to watch a particular event of interest – is likely to involve very different preparation and management to an event involving a demonstrator crowd protesting against a particular cause. Whereas more forceful action may be needed to effectively manage the protesting crowd, a less intrusive style may be more appropriate for a crowd peacefully observing an event.

Table 2. Types of Crowd

(Taken from Berlonghi, 1995, pp.241-242)

Type of Crowd	Characteristics of Crowd
Ambulatory crowd	A crowd entering or exiting a venue, walking to or from car parks, or around the venue to use the facilities.
Disability or limited movement crowd	A crowd in which people are limited or restricted in their mobility to some extent, for example, limited by their inability to walk, see, hear, or speak fully.
Cohesive or spectator crowd	A crowd watching an event that they have come to the location to see, or that they happen to discover once there.
Expressive or revellous crowd	A crowd engaged in some form of emotional release, for example, singing, cheering, chanting, celebrating, or moving together.
Participatory crowd	A crowd participating in the actual activities at an event, for instance, professional performers, athletes, or members of the audience invited to perform on stage.
Aggressive or hostile crowd	A crowd which becomes abusive, threatening, boisterous, potentially unlawful, and disregards instructions from officials.
Demonstrator crowd	A crowd, often with a recognised leader, organised for a specific reason or event, to picket, demonstrate, march, or chant.
Escaping or trampling crowd	A crowd attempting to escape from real or perceived danger or life-threatening situations, including people involved in organised evacuations, or chaotic pushing and shoving by a panicking mob.
Dense or suffocating crowd	A crowd in which people's physical movement rapidly decreases – to the point of impossibility – due to high crowd density, with people being swept along and compressed, resulting in serious injuries and fatalities from suffocation.
Rushing or looting crowd	A crowd whose main aim is to obtain, acquire, or steal something – for example, rushing to get the best seats, autographs, or even commit theft – which often causes damage to property, serious injuries, or fatalities.
Violent crowd	A crowd attacking, terrorising, or rioting with no consideration for the law or the rights of other people.

Characteristics of Crowds

- In addition to the crowd types, Berlonghi (1995) identifies specific, observable characteristics which may assist in the evaluation of how a particular crowd is likely to behave (see Table 3).
- Additional factors which can influence crowd behaviours and, therefore, must be considered when preparing for and managing a crowd, include: -
 - Size of the crowd.
 - Demographics of the crowd, e.g., age, gender.
 - Mobility of the crowd.
 - Location of the event.
 - Geometry of the location.
 - Time of event.
 - Type of event.
 - Density of crowd in different areas of the event.
 - Timetable of event activities.
 - Weather conditions.

Table 3. Characteristics of Crowds
(Taken from Berlonghi, 1995, pp.242-244)

Characteristic	Behavioural Indicators
Organisation How organised is the group?	<ul style="list-style-type: none"> • A demonstrator crowd is likely to be highly organised. • An ambulatory crowd is likely to be unorganised. • A revellous or cohesive crowd may organise themselves spontaneously.
Leadership How established is the leadership?	<ul style="list-style-type: none"> • A spectator crowd will have no leadership. • A demonstrator crowd will have a pre-specified leader. • An escaping crowd being evacuated will have clear leadership whereas an escaping crowd being panic mobbed will not. • Leadership roles for groups of rival fans at sporting events may develop spontaneously.
Cohesiveness Have members of the crowd bonded with each other?	<ul style="list-style-type: none"> • Members of an expressive crowd are likely to form close bonds and may turn on rival crowds, either playfully or with harmful intent.
Unity of purpose Is the crowd united for a common purpose?	<ul style="list-style-type: none"> • A participatory crowd often has a clear purpose e.g. running a marathon.
Common motive for action Are crowd members united in their motives for action?	<ul style="list-style-type: none"> • An expressive crowd chanting at a key moment in a football match have a common motive, of encouraging their team and distracting the opposition.
Psychological unity Is the crowd psychologically united?	<ul style="list-style-type: none"> • A participatory crowd has a strong sense of psychological unity because members are all performing or working together. • A demonstrator crowd is likely to be psychologically united • A spectator crowd at a charity concert or event to raise social awareness are likely to be psychologically united.
Emotional intensity Is the crowd emotionally intense?	<ul style="list-style-type: none"> • Depends on the nature and purpose of the event, e.g., emotional intensity is likely to be high at sporting event finals or play-offs.
Volatility Has the crowd reached an explosive point?	<ul style="list-style-type: none"> • Are people acting as responsible individuals or as reckless members of a crowd, indicating the potential for disorder?
Individual behaviour How much individual control and responsibility do people express?	<ul style="list-style-type: none"> • A crowd is characterised by individual behaviour when crowd members exercise responsibility for their own actions and for the actions of other crowd members.
Group behaviour To what extent are individuals dominated by the group?	<ul style="list-style-type: none"> • Individuals highly dominated by the group act with little self-awareness, self-consciousness and little sense of responsibility.
Degree of lawlessness How much criminal activity is taking place?	<ul style="list-style-type: none"> • Throwing objects, damaging property, fighting, and pushing and shoving are all indicative of a lawless crowd.
Level of violence How violent is the crowd?	<ul style="list-style-type: none"> • This can be based on both historical assessment of previous incidents and on current observations of crowd behaviour.
Level of property damage How much damage to property is likely to occur?	<ul style="list-style-type: none"> • The extent of likely damage can be anticipated by reviewing damage at previous events of similar nature, with a similar crowd or at the same location.
Likelihood of injuries and deaths How likely are injuries and deaths?	<ul style="list-style-type: none"> • This depends on the event type and location. For instance, the age, condition and design of certain venues influence the likelihood of accidents. • Escaping, rushing, dense or violent crowds are also more likely to suffer injuries or even deaths.

Decision Making in Crowds

- Animals which form groups – such as human crowds – repeatedly have to make important consensus decisions concerning the activities they perform, the timing and duration of those activities, and their direction of movement (e.g., Conradt & Roper, 2003, 2005; Dyer, Ioannou, Morrell, Croft, Couzin, Waters & Krause, 2008).
- However, the information required to make these important decisions is often only available to few members of the group (e.g., Reeb, 2000; Reader & Laland, 2000; Seeley, 2003), most commonly as a result of differences in spatial positioning within the group or differences in group members' learning and experience (e.g., Dyer et al., 2008). Couzin, Krause, Franks and Levin, (2005), for instance, demonstrated – using computer simulations – that a group predominantly comprised of naive individuals can be guided towards a target location by only a few informed group members. Moreover, Couzin et al. (2005) propose that these few informed individuals are able to reach consensus decisions without knowing whether they are in the majority or minority, or whether their information conflicts with other informed members of the group.
- More specifically, research indicates that the presence of informed individuals – i.e., acting as leaders – within the crowd influences both the speed and accuracy of crowd movement (Dyer et al., 2008), particularly when their spatial positioning is optimal (Aubé & Shield, 2004). More specifically, leaders positioned in the core, rather than the periphery, of the crowd – i.e., in close proximity to other crowd members – are more likely to influence crowd movement (e.g., Leca, Gunst, Thierry & Petit, 2003; Dyer et al., 2008).
- This dominance of informed individuals over crowd movement is likely to be particularly important in emergency evacuations, when only a few crowd members typically have information about the unfolding situation. Thus, when planning a crowd event, careful consideration must be given to the number of individuals within the crowd (whether these be stewards or crowd volunteers) who should be made aware of the location of emergency exits – i.e., informed individuals – and where these informed individuals should be positioned within the crowd to most effectively act as leaders in the event of an emergency evacuation (Aubé & Shield, 2004; Dyer et al., 2008).
- With regards to communication between informed individuals and the rest of the crowd, Dyer et al. (2008) propose that subtle behaviours or cues are frequently used to guide the crowd towards a target location. For instance, leaders at the front of a crowd will often glance back over their shoulders, to ensure they are being followed, or will turn to face the crowd and walk backwards towards the target. Alternatively, informed individuals may walk back and forth along the edge of the crowd, to check that all crowd members are moving in the desired direction.

Crowd Management versus Crowd Control

- Although the two terms are often used interchangeably, it is important operationally to acknowledge the distinction between crowd management and crowd control, to enable more appropriate preparation for an event, along with more suitable action or intervention during the event (Sime, 1993; Berlonghi, 1995).
- Crowd management concerns the facilitation of both the activities and crowd members at an event, to not only ensure that the crowd are able to safely enjoy the event which they came to observe or to be part of, but also to encourage the crowd to behave in the desired manner (e.g., Fruin, 1993). For example, ticket sales, seating, parking, noise control, public announcements, concession stands and communication are all aspects of crowd management.

“Crowd management includes all measures taken in the normal process of facilitating the movement and enjoyment of people.”

(Berlonghi, 1995, p.240)

- Crowd control, on the other hand, concerns the actions taken to organise the crowd once they begin to exhibit undesirable behaviours, such as disorder. More forceful measures then need to be taken to quickly bring the crowd back under control, such as limiting access, controlling admissions and making arrests (e.g., Fruin, 1993).

“Crowd control includes all measures taken once crowds are beginning to or have got out of control.”

(Berlonghi, 1995, p.241)

- Literature suggests that crowd management is preferable to crowd control (e.g., Sime, 1999; Stanton & Wanless, 1995). If management is well-planned and well-organised, it should be possible to prevent – or quickly resolve – the majority of problems arising at crowd events (Berlonghi, 1995). Crowd control should only be used as a last resort, since implementing it too soon can have adverse consequences (Stanton & Wanless, 1995).
- Berlonghi (1995) proposes that ‘crowd catalysts’, which contribute to or trigger a crowd from needing to be managed to needing to be controlled, include: -
 - Operational circumstances – e.g., lack of parking, cancellations, or sold-out events.
 - Event activities – e.g., music, loud noises, or special effects.
 - Performers’ actions – e.g., violent, sexual or offensive gestures or comments.
 - Spectator factors – e.g., crowd cheering, Mexican wave, rushing for seats, drinking alcohol, or throwing objects.
 - Security or police factors – e.g., abuse of authority, provocations, use of excessive or unreasonable force, or arguments with crowd members.
 - Social factors – e.g., rioting, gang activities, or racial tension.
 - Weather factors – e.g., rain, heat, humidity, or lack of ventilation.
 - Natural disasters – e.g., floods, earthquakes, or tornadoes.
 - Man-made disasters – e.g., structure failures or toxic chemicals.

KEY LEARNING POINTS

– Types and Characteristics of Crowds –

- There are many different types of crowd, each with their own characteristics.
- It is important to distinguish different crowd types, in order to successfully prepare for and manage a particular crowd at a particular event.
- It is important to differentiate distinct crowd types within a larger crowd, and to treat each type appropriately.
- Thus far, very little research has been conducted into crowd types – a paper by Berlonghi (1995) identifies 11 different types, including a spectator crowd, a demonstrator crowd, a violent crowd, and an escaping crowd.
- Numerous factors can influence crowd behaviour, such as crowd size, demographics, type of event, geometry of the location, alcohol consumption, and weather conditions.
- Specific crowd characteristics can also be used to help assess likely behaviour, including how organised the crowd is, the extent to which leadership is established, how cohesive and psychologically united the crowd is, and levels of volatility and emotional intensity.
- Crowds are able to make cohesive decisions regarding direction and speed of movement when only a few members have the necessary information, with the degree to which they are influential dependent on their spatial position within the crowd. This is particularly important during an emergency evacuation.
- Crowd management – i.e., the facilitation of crowd movement and activities – is preferable to crowd control – i.e., the actions taken to control the crowd once behaviours become undesirable.

Key Theories of Crowd Behaviours

- The following section reviews the key psychological theories which could be applied to explain crowd behaviours. The main ideas of each theory are outlined, criticisms are given, and lasting value – should the theory be considered to have any – is stated.

- The theories concerned are: -
 - Classic theories
 - Game theory
 - Deindividuation theory
 - Social facilitation⁹
 - Social loafing
 - Emergent norm theory
 - Minimal group paradigm
 - Social identity theory
 - Self-categorisation theory
 - Social identity model of crowd behaviour
 - Elaborated social identity model of crowd behaviour
 - Social identity model of deindividuation effects
 - Place scripts theory

⁹ Although both social facilitation theory and social loafing theory do concern groups, they are more concerned with group performance levels than group behaviour. Therefore, they are less relevant to the study of crowd behaviour, but have been included in this review for theoretical completeness.

Acknowledgement of Theoretical Evolution

- Before these numerous theories are reviewed, the importance of acknowledging how they have evolved over time must be noted.
- As will be demonstrated in this section, theories of crowd behaviours have progressed significantly since the early, classic models. Consequently, the ideas proposed by Le Bon and deindividuation theory, for instance, are now typically disregarded when considering crowd behaviours, in favour of more recent, elaborate theories, such as the elaborated social identity model of crowd behaviour.
- Nevertheless, it is important that they are still considered in this review, so that the evolution of academic thinking is evidenced. Thus, rather than simply dismissing older ideas in favour of new concepts, it is necessary to consider how modern-day thinking about crowd behaviours has evolved from the classic models. As a result, the development of specific ideas regarding crowd behaviours, along with consistency of certain themes, should be apparent.

Classic Theories

Key Authors: -

- Le Bon (1908)
- Freud (1921)

Group Mind Theory – Le Bon (1908)

Main Ideas

- Le Bon proposed one of the earliest – and highly influential in its time – theories of crowd behaviours: group mind theory. He believed crowd behaviours to be pathological and abnormal, whereupon civilised consciousness vanishes and is replaced by savage animal instincts.

“...by the mere fact that he forms part of an organised crowd, a man descends several rungs in the ladder of civilisation. Isolated, he may be a cultivated individual; in a crowd he is a barbarian – that is, a creature acting by instinct.”

(LeBon, 1908, p.12)

- Le Bon proposed that individuals, when submerged in a crowd, lose all sense of self and responsibility. They no longer identify themselves as individuals with responsibility for their own actions, but instead become anonymous members of a group. At the same time, through their large numbers and group mentality, these individuals gain a sense of power and invincibility.

- Once identified as a member of the crowd, individuals are subject to contagion, which serves to quickly and unpredictably spread ideas and sentiments among the group, resulting in rapid and unpredictable shifts in behaviour. Consequently, unconscious, anti-social and uncivilised motives are released and the crowd behave according to primitive, savage instincts.
- Individuals are “*reduced to the lowest common denominator when immersed in a crowd.*”

(Lindholm, 1992, p.295)
- The crowd behaves in accordance with Le Bon’s ‘law of the mental unity of crowds’, which posits that the characteristics of a crowd are distinctively different to the characteristics of the individuals comprising it (Bendersky, 2007).

Criticisms

- Le Bon’s approach removes crowd action from its social context (Reicher, 1996a, 1996b) since it considers crowd behaviours in isolation to the context in which the behaviours arise and are acted out. Consequently, behaviours which occur as a result of contextual factors are incorrectly considered to be inherent attributes of the crowd and, therefore, are incorrectly considered to be generalisable crowd behaviours. Thus, by failing to account for the social shape of crowd action, meaning that behaviours cannot be analysed according to their contextual meaning, Le Bon renders crowd action mindless and meaningless (Reicher, 1996b, 2001; Stott & Reicher, 1998a).
- “...events cannot be reduced to a generic set of behaviours.”

(Reicher, 1996a, p.115)
- Le Bon’s ideas also serve to legitimise repression; since crowds cannot be reasoned with – being mindless and destructive by nature – the only way to effectively control them and prevent violence, is to repress the crowd before it has chance to form (Reicher, 1996a, 1996b, 2001).
 - Similarly, Le Bon’s conceptualisation of the crowd as mindless and without meaning leaves them voiceless, and unable to express their grievances or perspectives on society (Reicher, 1996a, 1996b, 2001).

Lasting Value

- Le Bon's theory does acknowledge the importance of power in crowd behaviours, which, as subsequent theories described later in this section will demonstrate, proves to be an important factor in collective action (e.g., Drury & Reicher, 1999).

Freud (1921)

- According to Freud, the crowd serves to 'unlock' the unconscious mind of individuals. Moral standards in society and civilised behaviours are usually maintained and controlled by the super-ego part of an individual's psyche – akin to a person's conscience.
- However, when part of a crowd, the super-ego is surpassed by the leader of the crowd. As a result of individuals' deep-hidden primitive instincts to regress to primal behaviours when in a crowd, the leader is able to release unconscious and uncivilised impulses in the crowd members from the id part of their psyches – akin to a person's instinctual drives.

Criticisms

- Freud's theory is criticised for its portrayal of crowd behaviours as abnormal, pathological and instinctual, with members' actions controlled by the innate emotional forces of the id, ego and super-ego. Thus, since behaviour is beyond their conscious control, individuals are absolved of their personal responsibility and, hence, anti-social behaviour is rendered inevitable (e.g., Hogg & Vaughan, 2002).

Game Theory

Key Author: -

- Berk (1972, 1974)

Main Ideas

- Berk (1972a, 1972b, 1974a, 1974b) proposed a 'rational calculus' model of crowd behaviours, based on the principles of Decision Theory (e.g., Chernoff & Moses, 1959; Raiffa, 1970), involving five key steps: -
 1. Crowd members seek information.
 2. Possible events are predicted from this information.
 3. Behavioural options are listed.
 4. An order of preference for the probable outcomes of alternative options is established.
 5. A course of action is decided upon, aimed at maximising rewards whilst minimising costs.
- Hence, the probability of a crowd member behaving in a particular way is determined both by the likely payoff of the action – in terms of rewards outweighing costs – and the perceived likelihood of support for the action (Berk, 1974a, b). For instance, if an individual perceives greater support from others for carrying out a specific behaviour, in addition to believing that the benefits will outweigh the costs, he or she is more likely to perform that behaviour.
- Consequently, in contrast to the irrational behaviour of crowds advocated by Le Bon (1908) and Freud (1921), Berk (1974a, b) proposes crowd action to be rational and – just as in a game – based on probabilities.

Criticisms

- Game theory has been criticised – and has generated very little research – because the causal concepts specified by Berk, namely perceived payoff and perceived support, are almost impossible to determine in advance (e.g., McPhail 1991). Therefore, as Berk (1974b) himself acknowledges, any analyses of the impact of these two concepts on crowd behaviours are likely to suffer from circularity and, consequently, little useful information could be gained.

Deindividuation Theory

Key Authors: -

- Festinger, Pepitone and Newcombe (1952)
- Zimbardo (1970)
- Diener (1980)
- Prentice-Dunn and Rogers (1989)

Main Ideas

- Stemming from the group mind tradition of Le Bon, 'deindividuation' was introduced to social psychology by Festinger, Pepitone and Newcombe (1952) as a means of explaining individuals' atypical – and often antisocial – behaviour when part of a group. It is one of the most widely cited consequences of social groups (Postmes & Spears, 1998).
- Deindividuation describes the process whereby individuals' normal behavioural restraints – based on guilt, shame, commitment and fear – become weakened when part of a group (e.g., Zimbardo, 1970). Their self-awareness and self-observation decrease, and they lose their sense of socialised individual identity (e.g., Duval & Wicklund, 1972; Diener, 1980). Consequently, they become more susceptible to external cues and to the group's motives and emotions (e.g., Diener, Luck, DeFour & Flax, 1980). Ultimately, these factors may lead group members to engage in unsocial, and possibly antisocial, behaviours (e.g., Festinger et al., 1952; Zimbardo, 1970; Diener et al., 1980).
- These ideas are very similar to those proposed by 'mob sociology' (e.g., Momboisse, 1967; Schweingruber, 2000), which attempts to explain how a typically law-abiding crowd become transformed into a disorderly mob.

“...decreased self-observation or self-awareness, and minimization of concern for social evaluation, causing weakening of controls based on guilt, shame and fear, leading to a lowered threshold for exhibiting inhibited behaviours.”

(Kugihara, 2001, p.576)

- According to this perspective, as tensions mount within the group – often in reaction to a particular incident, for instance, police action deemed to be inappropriate – individuals are absorbed into the crowd, and become increasingly responsive only to the crowd itself. Subsequently, crowd members lose their sense of self-control and self-consciousness, making it easier for disorder to be incited by crowd leaders (Schweingruber, 2000).
- Deindividuation research has tended to focus on the effects of anonymity when in a group. Being part of a group or crowd is proposed to provide individuals with a ‘cloak of anonymity’, which diffuses personal responsibility for actions and leads to a loss of self-identity and reduced concern for social evaluation. Therefore, no longer seeing themselves as individuals – with individual identities and individual responsibilities – but as anonymous members of a collective group no longer in control of, or responsible for, their own actions – i.e., deindividuated – they feel legitimate in behaving in a more uncivilised and antisocial manner (e.g., Festinger et al., 1952; Singer, Brush & Lublin, 1965; Zimbardo, 1970; Zimbardo, Haney, Banks & Jaffe, 1982).
- Research (e.g., Diener et al., 1980; Mann, 1981; Mullen, 1986) suggests that this sense of anonymity is increased as the size of the group increases and in darker conditions. Consequently, deindividuation – and its associated antisocial behaviours – is more likely to occur in larger groups and in the dark.

“People use the cover of the crowd to do stuff that they would never have the bottle to do as an individual, but when they were in that crowd they felt they had the power to do it, they had the mentality, they were willing to take a step further.”

Temporary Assistant Commissioner
Chris Allison
Metropolitan Police

- However, not all research agrees that increased anonymity leads to increased antisocial and aggressive behaviour. Instead, some research (e.g., Zabrick & Miller, 1972; Diener, 1976; Johnson & Downing, 1979; Lea & Spears, 1992; Lea, Spears & de Groot, 2001) argues that deindividuation and anonymity may in fact result in lowered aggression and improved group relations, indicating that uncivilised, antisocial behaviours are not automatic or inevitable consequences of anonymity. There also appears to be inconsistency in relation to the mechanisms behind deindividuation, responsible for linking antecedents with behavioural outcomes (Diener, 1977, 1980; Postmes & Spears, 1998).

- In response to these difficulties, Diener (e.g., 1979, 1980; Diener et al., 1980) sought to reformulate deindividuation theory, turning the emphasis away from anonymity and towards Duval and Wicklund's (1972) concept of objective self-awareness – the awareness of oneself as an object of attention.
- In a state of low objective self-awareness – brought about through environmental conditions of anonymity, high levels of arousal, a focus on external events and close group unity (Diener, 1980) – group members' attention is drawn away from themselves to focus, instead, on the group as a whole. Therefore, because their attention is directed towards the group of which they are part, they become less self-conscious and less self-aware. Group members are unable to retrieve their internal, moral standards, and so lose the ability to monitor and plan their own behaviour, along with the capacity to evaluate their own actions. Instead, group members become more susceptible and reactive to environmental cues. Consequently, their behaviours become more disinhibited, often resulting in impulsive, irrational and antisocial actions.

“A deindividuated person is prevented by situational factors present in a group from becoming self-aware. Deindividuated persons are blocked from awareness of themselves as separate individuals and from monitoring their own behaviour.”

(Diener, 1980, p.210)

- Prentice-Dunn and Rogers (1982, 1989) further extended the notion of objective self-awareness, drawing on Carver and Scheier's (1981) distinction between public and private self-awareness. Whilst the former concerns how an individual wishes others to view him/herself, the latter concerns an individual's thoughts, feelings and attitudes. When private self-awareness is lowered, individuals – in a similar manner to that suggested by Diener (1980) – become deindividuated as a result of losing their abilities to self-regulate and evaluate their own behaviours, and of becoming more responsive to emotional cues. In contrast, when public self-awareness is lowered, individuals are less concerned about the opinions of others and lose their inhibitions, resulting in antisocial behaviour.
- Despite their differences, these various approaches to deindividuation have three factors in common (Reicher et al., 1998): -
 1. Submergence in a group and anonymity are viewed as key antecedents of deindividuation.

2. The 'self' is depicted as a single construct, which is either operative – when behaviour is controlled and rational – or inoperative – when behaviour is uncontrolled and irrational.
3. Deindividuation is characterised by loss of self, leading to uncontrollable, antisocial behaviours.

Criticisms

- Despite early literature proposing that deindividuation factors such as anonymity, loss of self-awareness and group size are associated with antisocial and aggressive behaviours, findings of more recent analyses (e.g., Reicher, Spears & Postmes, 1995; Postmes & Spears, 1998) suggest that deindividuation manipulations are actually related to increases in pro-social normative behaviour.
- Literature fails to consider the context of behaviour or to distinguish anonymity when in a group from anonymity when isolated (Reicher, 1984b). As mentioned above, research suggests that some individuals who are deindividuated in a group actually show increased adherence to group norms (e.g., Diener, 1976; White, 1977; Reicher, 1982).
- Members of a crowd are rarely truly anonymous; individuals are often known to some other members of the crowd and, therefore, only appear anonymous to outsiders (McPhail, 1971).
- All the models proposed focus on loss – i.e., loss of identity, loss of individuality and loss of self-awareness. This is a negative, and highly unproductive, way to think about collective behaviour; it is much more productive to think about change (Reicher et al., 1995).

Lasting Value

- Despite its weaknesses, deindividuation theory has remained prominent in social psychology as an explanation for group behaviour (Reicher et al., 1995).
- The fundamental principle of anonymity being influential over crowd members' behaviour has been retained in more recent theories, such as the social identity model of deindividuation effects (SIDE; Reicher et al., 1995), as outlined below.

Social Facilitation Theory

Key Authors: -

- Zajonc (1965)
- Cottrell (1972)

Main Ideas

- Social facilitation (e.g., Triplett, 1898; Allport, 1920; Zajonc, 1965; Cottrell, 1972) concerns how an individual's performance is affected by the 'mere presence' of others – i.e., when individuals are not competing, do not reward or punish, and are present only physically as co-actors or as a passive and unresponsive audience (Myers, 2005).
- According to social facilitation theory, there is a tendency for people to be aroused into better performance on simple tasks, well-learned tasks or ones which people perform automatically, when in the presence of others. This arousal, thought to be caused by cognitive processes – i.e., evaluation apprehension and distraction – facilitates dominant, prevalent or most likely responses.

“An improvement in the performance of well-learned/easy tasks and deterioration in the performance of poorly learned/difficult tasks in the mere presence of members of the same species.”

(Hogg & Vaughan, 2002, p.270)
- Zajonc (1965) proposed the drive theory of social facilitation, which posits that the physical presence of members of the same species instinctively causes arousal, which drives dominant responses and motivates performance. Thus, increased arousal or motivation is an instinctual response to social presence. Arousal drives whatever response tendency is dominant in a particular situation (e.g., best learned, most habitual). Therefore, increased arousal enhances performance on easy tasks, for which the dominant response is correct – i.e., arousal promotes the dominant, correct response – but impairs performance on complex tasks for which the dominant response is not correct – i.e., arousal promotes the dominant, but incorrect, response.

- Supportive evidence for social facilitation theory includes Bond and Titus (1983), Guerin (1993, 1999), Hunt and Hillery (1973), Michaels, Blommel, Brocato, Linkous and Rowe (1982), and Zillman and Paulus (1993).
- Evaluation apprehension (Cottrell, 1972; Cottrell, Wack, Sekerak & Rittle, 1968) – concern for how one is evaluated by others – is one explanation given for increased arousal in the presence of others. The model argues that individuals, having learned that social rewards and punishments are based on the evaluations of others, are instinctively apprehensive about being evaluated and are, therefore, driven to perform in the physical presence of members of the same species. In other words, increased apprehension leads to increased arousal, with dominant responses most enhanced when individuals believe they are being evaluated.
- There is both supportive (e.g., Guerin & Innes, 1982; Seta, 1982; Geen & Gange, 1983; Seta & Seta, 1992) and unsupportive (e.g. Markus, 1978; Schmitt, Gilovich, Goore & Joseph, 1986) evidence for evaluation apprehension as an explanation of social facilitation effects.
- Distraction-conflict theory (Baron, 1986; Sanders, 1981; Sanders, Baron & Moore, 1978) is an alternative explanation offered for social facilitation. This theory argues that individuals are distracted in the physical presence of members of the same species, resulting in conflict between attending to a task and to the audience. Subsequently, the individual's cognitive system becomes overloaded, increasing his or her arousal and drive to perform. Hence the phrase "driven by distraction".

Criticisms

- Social facilitation theory is criticised for failing to consider the context in which the individual is behaving, or the nature of the audience, and for failing to account for the content of behaviours (Reicher, 1984b).
- Distraction-conflict theory is also criticised for lacking falsifiability (e.g., Geen, 1981), since too many alternative explanations can be given for why performance effects may not be found.

Lasting Value

- The central principle of social facilitation theory – i.e., that increased arousal drives automatic, dominant, behavioural responses – is akin to the notion of place scripts, wherein individuals typically perform well-learned behaviours in familiar environments, with very little conscious attention (Donald & Canter, 1992; see 'Place Scripts' section, pages 121 to 124, for more details).

- This principle also has important implications for crowd behaviours in emergency situations. For instance, if aroused by both the crowd and the emergency itself, individuals are more likely to revert to their dominant automatic behaviours, i.e., their routine, well-learned behaviours. However, these may not be appropriate in an emergency. Therefore, regular emergency drills and practices should be undertaken by those who frequent particular environments, so that the emergency procedures themselves become dominant responses in those situations.

Social Loafing Theory

Key Authors: -

- Latané, Williams and Harkins (1979)

Main Ideas

- Social loafing (Latané, Williams & Harkins, 1979) concerns the amount of effort an individual exerts when part of a group in comparison to when alone.
- According to social loafing theory, there is a tendency for individuals to exert less effort when their efforts are pooled towards a common goal and when their individual contributions are anonymous – i.e., when part of a group – compared with when they are working towards their own goals and are individually accountable for their efforts – i.e., when working alone. Thus, in a group situation, individuals may ‘free ride’ on the group effort (Kerr, 1983), taking advantage of, and benefitting from, the effort exerted by the group without offering much in return.

“...a reduction in individual effort when working on a collective task (in which one’s outputs are pooled with those of other group members) compared to when working either alone or coactively.”

(Williams, Karau & Bourgeois, 1993, p.131).
- Decreased evaluation apprehension (concern for how one is evaluated by others) is offered as one explanation of social loafing (e.g., Karau & Williams, 1993). Individuals believe that their behaviours can only be properly evaluated by others when they are acting alone and, therefore, when part of a group, they are less apprehensive about being evaluated. Consequently, their drive to perform is reduced and social loafing results (Karau & Williams, 1993). Loafing is particularly likely when group members are strangers and, thus, do not identify with each other, as is typical in a crowd (Karau & Williams, 1997; Worchel, Rothgerber, Day, Hart & Butemeyer, 1998).

- Social loafing is reported to occur less when a task is challenging – since individuals perceive their contribution to be more important on challenging tasks (e.g., Harkins & Petty, 1982; Kerr, 1983) – or when a task is appealing or involving, as interest and motivation levels are maintained (e.g., Zaccaro, 1984; Karau & Williams, 1993).
- In addition, individuals will work harder if they believe high performance will bring benefits and rewards, or if incentives are offered (e.g., Shepperd & Taylor, 1999; Shepperd & Wright, 1989). Group members will also compensate for individuals perceived to be social loafers, by exerting more effort on important group tasks (e.g., Plaks & Higgins, 2000).

Criticisms

- The theory is criticised for failing to sufficiently acknowledge that loafing behaviour is a complex psychological function of both the individual and the situation (e.g., Stark, Shaw & Duffy, 2007).
- Research into social loafing theory is criticised for focusing on the relationship between loafing behaviour and individual differences and attitudes, whilst neglecting research concerned with situational influences (e.g., Comer, 1995).
- Further consideration should be given to the influence of gender differences on social loafing behaviour (e.g., Kugihara, 1999).

Lasting Value

- Social loafing is a robust and pervasive phenomenon (e.g., Karau & Williams, 1993; Williams et al., 1993). In addition to laboratory experiments, it has been observed in real-life situations, on a wide range of tasks (e.g., shouting, clapping, generating ideas, maze performance, etc) across a variety of different cultures (Hogg & Vaughan, 2002).
- The central influence of anonymity over behaviour has been applied in more recent theories of crowd behaviours, such as the social identity model of deindividuation effects (SIDE; Reicher et al., 1995).

Emergent Norm Theory

Key Authors: -

- Turner (1964)
- Turner and Killian (1957)

Main Ideas

- Emergent norm theory (Turner, 1964; Turner & Killian, 1957, 1987) – in contrast to earlier theories treating crowd behaviours as pathological or instinctual – focuses on collective action as a norm-governed behaviour, just as any other group behaviour. It attempts to explain how crowd action can be considered ‘normal’ despite behaviours not being guided by traditional, pre-established group norms. In other words, it seeks to explain how collective action is governed by norms that emerge from within the crowd.
- According to emergent norm theory, when a crowd gathers for a particular event or situation, there are no clear norms indicating how to behave (Turner, 1964). The distinctive actions of more prominent members of the crowd – known as ‘keynoters’ – are attended to by the rest of the crowd during an initial period of ‘milling’ – the initial social interaction which takes place between crowd members as they attempt to define and make sense of the situation. These distinctive actions come to be seen as characteristic of that crowd – i.e., as behavioural norms.

“...an attempt to combine symbolic interactionism with psychological research on the formation of group norms...in order to account for the social coherence of collective action.”

(Reicher, 2001, p.192)

- As more crowd members follow these norms, they become more established and more influential over other crowd members. Hence, norms typically emerge from the distinctive actions of prominent individuals within the crowd. In addition, there is pressure within the group to conform to these norms and against non-conformity. However, distinctive actions are likely to be ones which are relatively rare in most individuals' lives, for instance, antisocial behaviours. Therefore, norms which emerge are likely to be antisocial behavioural norms and, as a result of conformity, crowd members will be pressured into antisocial behaviour. Hence, the tendency for crowds to behave in an antisocial manner.

“Collective behaviour is regulated by norms based on distinctive behaviour that arises in the initially normless crowd.”

(Hogg & Vaughan, 2002, p.419)

Criticisms

- If a crowd is to be regulated by norms it must be self-aware, since there is no reason for individuals to conform if they are de-individuated and unaware of the norms (Diener, 1980; Mann, Newton & Innes, 1982). Yet, research (e.g., Duval & Wicklund, 1972; Diener, 1980) suggests that crowds generally have low self-awareness and, therefore, could not be norm governed.
- Crowds usually gather together for a specific occasion and, therefore, bring a clear set of shared norms which regulate their behaviours as members of a specific group (Reicher, 1987). Thus, crowds are rarely normless.
- The theory is inadequate to explain situations in which crowds act and change rapidly, where there is insufficient time for milling (McPhail, 1991; Reicher, 1996a).
- If, as the theory posits, norms emerge from the predispositions of prominent individuals within the crowd, they will have an individualistic underpinning, which makes explanations of cultural variations in crowd behaviours difficult (Reicher, 1996a).

Lasting Value

- In a crucial separation from the classic models, emergent norm theory was one of the first theories not to consider crowd behaviours to be abnormal and pathological (Reicher, 2000).
- Emergent norm theory was one of the first attempts to explain the social coherence evident in collective behaviour (Reicher, 1996a).
- The theory also helped to restore the link between crowd members' self-understandings of the situation and subsequent crowd behaviours, whilst also highlighting the inherent social nature of such understandings (Reicher, 2000).

Minimal Group Paradigm

Key Authors: -

- Tajfel, Billig, Bundy & Flament (1971)
- Tajfel (1978)

Main Ideas

- The Minimal Group Paradigm (e.g., Tajfel, Billig, Bundy & Flament, 1971; Billig & Tajfel, 1973; Tajfel, 1978; Turner, 1978) posits that group members favour members of their own in-group at the expense of the out-group, despite groups being minimal – i.e., created according to trivial, artificial, or even random criteria – and, therefore, there being no apparent reason for this favouritism (e.g., Hogg & Abrams, 1988; Dobbs & Crano, 2001).
- According to the paradigm, this inter-group discrimination occurs simply as a result of social categorisation. In other words, simply by being categorised into the same group, individuals identify themselves as a united in-group and, through continual comparisons with out-groups, seek to generate a more positive self-esteem for the in-group and to enhance their perceived superiority status (e.g., Tajfel, 1982; Diehl, 1990; Chow, Lower & Knowles, 2008).

“...the mere fact of being categorised as a group members seems to be necessary and sufficient to produce ethnocentrism and competitive intergroup behaviour.”

(Hogg & Vaughan, 2002, p.400)

Criticisms

- The procedures, measures and statistics used to investigate the minimal group phenomenon have been subject to debate (e.g., Bornstein, Crum, Wittenbraker, Harring, Insko & Thibaut, 1983; Turner, 1983).
- The theory is criticised with regards to the extent to which the favouritism displayed by group members is as a result of rational economic self-interest as opposed to inter-group discrimination based on social categorisation (Turner & Bourhis, 1996).

Lasting Value

- The minimal group paradigm provided a useful basis for the development of social identity theory and self-categorisation theory (Dobbs & Crano, 2001).

Social Identity Theory

Key Authors: -

- Turner (1975)
- Tajfel (1978)
- Tajfel and Turner (1979, 1986)

Main Ideas

- Social identity theory (Tajfel & Turner, 1979, 1986) was developed to try and make sense of – and capitalise on – the findings observed in relation to the minimal group paradigm (Dobbs & Crano, 2001).
- It offers a model of group membership and intergroup relations, in an attempt to define the social group, and understand its behaviour, in terms of the collective – rather than individual – self (Hogg & Williams, 2000).
- The theory makes a sharp distinction between personal identity – an individual's self understanding defined in terms of his or her own attributes and close relationships – and social identity – an individual's self understanding defined in terms of his or her specific group memberships (Turner, 1982). Typically, every individual belongs to a variety of different social groups, which become more or less salient depending on the particular circumstances. Thus, when attending a football match, an individual would consider him/herself primarily as a football fan, whereas, when at work, that same individual may think of him/herself primarily as a doctor (Reicher, 2004).

Social identity is *“that part of an individual's self-concept which derives from his knowledge of his membership in a social group (or groups) together with the value and emotional significance attached to that membership.”*

(Tajfel, 1978, p.63)

- Given that identity is only sustainable to the extent to which it can be expressed in practice (Haslam & Reicher, 2007), individuals strive to achieve and maintain a positive social identity, through appropriate inter-group comparison. Hence, individuals compare – at a collective, and not individual, level (Reicher, 2004) – their in-group to relevant out-groups, i.e., they judge how their in-group as a whole compares to an out-group as a whole. As such, social identity theory can be considered primarily a motivational theory, suggesting that self-esteem drives individual behaviour in inter-group situations (Dobbs & Crano, 2001).
- Hence, social identity theory proposes that, as individuals, we are continually involved in the processes of categorising, identifying and comparing (Tajfel & Turner, 1979, 1986).
 - Categorisation process – Individuals find it useful to categorise themselves and other individuals.
 - Identification process – Individuals associate themselves with certain groups, known as in-groups – groups who share a sense of identity and belonging, i.e., “us” – and gain self-esteem from doing so.
 - Comparison process – Individuals contrast their own groups with other groups, known as out-groups – groups that individuals perceive to be distinct from their in-groups.

Criticisms

- The collective self – i.e., social identity – and the individual self – i.e., personal identity – are depicted as being cognitively distinct. However, more recent research (e.g., Deaux, 1996; Reid & Deaux, 1996) has explored an intimate connection between the two.
- Distinctions are not made between the many different kinds of groups from which individuals can gain a sense of shared social identity (e.g., Deaux, Reid, Mizrahi & Ethier, 1995).
- The theory is said to be lacking in falsifiability, i.e., it is very difficult to experimentally test its fundamental assumptions (e.g., Hogg & Williams, 2000).

Lasting Value

- The theory makes clear the distinction between an individual's personal identity and shared social identities, and introduces the notion that individuals could simultaneously belong to differing social groups, each with its own social identity (Hogg & Williams, 2000).
- Social identity theory proposes identity to be multiple, rather than singular, and to be a complex, rather than unitary, system (Reicher, 2000).
- The theory recognises that collective behaviour should be considered in terms of collective – rather than individual – identities. Accordingly, it emphasises the importance of considering social identity when accounting for group action (Reicher et al., 1995).
- The basic principles of social identity theory have been applied in more recent theories of crowd behaviours, such as the social identity model of crowd behaviour (e.g., Reicher, 1984b, 1987) and the elaborated social identity model of crowd behaviour (e.g., Stott & Reicher, 1998a; Drury & Reicher, 1999) (see 'Social Identity Model of Crowd Behaviour', pages 106 to 109, and 'Elaborated Social Identity Model of Crowd Behaviour', pages 110 to 116, for further details of these theories).

Self-Categorisation Theory

Key Authors: -

- Turner (1985)
- Turner, Hogg, Oakes, Reicher & Wetherell (1987)

Main Ideas

- Self-categorisation theory (Turner, 1985; Turner, Hogg, Oakes, Reicher & Wetherell, 1987) is a development of social identity theory, which refocuses attention on the role of categorisation in social identity development, specifically in terms of in-groups and out-groups (Hogg, 1996; Hogg & Williams, 2000). According to the theory, social identity is able to regulate group behaviour because it is underpinned by the process of self-categorisation. Thus, self-categorisation, underlying a shared social identity, provides the social psychological basis for group behaviour (Turner & Oakes, 1986; Reicher, 1996a).

“...defining oneself as a member of a social category is the precondition for group behaviour.”

(Reicher, 1996a, 116)
- When in a group situation, individuals create a ‘prototype’ – either recalled from memory or constructed according to the range of in-group and out-group individuals present – to represent their social category. Prototypes are context-specific, fuzzy sets of features, which define and characterise the attitudes, behaviours and feelings of one group – i.e., the in-group – as distinct from another group – i.e., the out-group (e.g., Hogg & Williams, 2000; Hogg & Vaughan, 2002).
- Prototypes are said to form according to the principle of ‘metacontrast’ (e.g., Turner et al., 1987) – i.e., the maximum ratio of the perceived inter-group (between groups) differences to the perceived intra-group (within groups) differences. In other words, prototypes tend to maximise the perceived differences between groups whilst minimising perceived differences within groups.

- Thus, when individuals self-stereotype themselves as members of a particular in-group, they define and perceive themselves in terms of their in-group prototype and behave according to its norms and values. When individuals categorise others as members of the in-group or of particular out-groups, perceived similarities to the relevant prototypes are accentuated, creating distinct group stereotypes.
- The salience of a particular social identity at a given time shapes group processes – such as cohesion and social influence – alongside cognitive processes – such as stereotyping, social judgement and self-perception (e.g., Turner, Oakes, Haslam & McGarty, 1994; Spears, Oakes, Ellemers & Haslam, 1997; Ellemers, Spears & Doosje, 1999). Consequently, group members are more likely to be influenced by, and feel attracted to, other group members with whom they share a social identity – i.e., members of the in-group – compared with group members who espouse a different social identity – i.e., members of the out-group.
- Self-categorisation also involves the process of depersonalisation in terms of in-group and out-group prototypes (e.g., Turner, 1985), namely a change in the process of self-categorisation and in the basis of how individuals perceive others. Thus, the individual self is replaced by the collective self – i.e., there is a shift from individual to social identity (e.g., Reicher, 1996b; Stott & Reicher, 1998a; Drury & Reicher, 2000) – and, subsequently, group members are perceived, and behave, according to the shared in-group prototype rather than individual characteristics (e.g., Turner et al., 1987; Hogg & Mullin, 1999; Hogg & Williams, 2000).
- Moreover, since self-categorisation produces conformity to norms of conduct, distinct groups within a crowd will often behave differently, depending on how they categorise themselves. For example, police and football hooligans are exposed to the same environmental stimuli and cues, but behave very differently because they are conforming to the norms of the two very different groups of which they are members.

Criticisms

- The theory does not consider self-categorisation in terms of self-esteem or self-enhancement motivations, nor does it explore the wider social context of relationships between differing groups (Hogg & Williams, 2000).
- Self-categorisation theory is also criticised for being overly cognitive – i.e., although it does consider how social identities arise in varying social contexts, it does not consider how these identities are activated and presented in differing social relations (Reicher et al., 1995).

Lasting Value

- Self-categorisation theory offers explanations to aid understanding of collective phenomena evident in crowd behaviours, such as group cohesiveness (e.g., Hogg, 1992) and intergroup distinctiveness (e.g., Ellemers et al., 1999).
- The fundamental principles have been utilised in more recent crowd theories, such as the social identity model of crowd behaviour (e.g., Reicher, 1984b, 1987) and the elaborated social identity model of crowd behaviour (e.g., Stott & Reicher, 1998a; Drury & Reicher, 1999) (see 'Social Identity Model of Crowd Behaviour', pages 106 to 109, and 'Elaborated Social Identity Model of Crowd Behaviour', pages 110 to 116, for further details of these theories).

Social Identity Model of Crowd Behaviour

Key Authors: -

- Reicher (1984a, 1984b, 1987)
- Reicher & Levine (1994a, 1994b)

Main Ideas

- The social identity model of crowd behaviour extends the ideas of social identity theory and self-categorisation theory, specifically in relation to crowds. In contrast to the earlier theories of crowd behaviours, the social identity model argues that crowd action is socially meaningful (e.g. Reicher, 1984a; Turner & Killian, 1987). Moreover, more recent research contends that crowd action does not only reflect social meaning, but also helps to create and develop new social meaning (Reicher, 1996a; Drury & Reicher, 2000).
- The concept of 'self' has evolved considerably since the early theories. For instance, deindividuation theory considers individuals to have only one, unique personal self which guides their behaviour through espoused values and beliefs. This 'self' can either be operative – whereby behaviour is rational and constrained – or obscured and inoperative – whereby behaviour is irrational and unconstrained (Reicher & Levine, 1994a).

“Personal identity refers to specific attributes of the individual, such as personal tastes, while social identity is defined as an individual’s knowledge of his or her membership of a social group together with the emotional significance of that membership.”

(Reicher, 1984a, p.342)

- More recent work advocating the social identity approach (e.g., Reicher, 1984b, 1987) argues to the contrary, that alongside a unique self – a personal identity – each individual will have a self that can be conceptualised according to his or her memberships of different social groups – a social identity (Reicher & Levine, 1994a). This wider social identity then provides the norms for group behaviour.
- The social identity model of crowd behaviour proposes that when part of a crowd, individuals do not lose their identity – as early theories such as deindividuation theory suggest – but simply shift from an individual identity to a shared social identity (e.g., Reicher, 1996b, 1997a; Drury & Reicher, 1999).
- Accordingly, individuals do not lose control of their behaviours – again as theories such as deindividuation suggest – but shift from behaving in terms of their distinct, individual identities to behaving in terms of their shared social identity and its accompanying norms and values (Stott & Reicher, 1998a; Drury & Reicher, 2000).
- Thus, when individuals behave in terms of a particular social identity, their behaviour is guided by the norms, values and beliefs which define that particular social identity (Reicher, 2004).

“...individuals do not lose identity when they become crowd members but rather shift from acting in terms of personal identity to acting in terms of social identity. Correspondingly, crowd members do not lose control over their behaviour but, rather, control shifts to the values and beliefs which define social identity.”

(Reicher, 1996b, p.541)

- Turner (1982) refers to ‘referent informational influence’ (RII) as a process whereby individuals within a group seek out the stereotypical norms which define their group membership and, subsequently, behave according to those norms. In essence, it is a process of self-stereotyping.

“In the process of identifying themselves as part of a crowd, individuals are able to infer not only the most appropriate way that they must behave, but also whatever limitations to apply to their conduct.”

(Waddington & King, 2005, p.495.)

- Yet, individuals in crowds – in contrast to groups – typically come together, or find themselves together, as members of a specific crowd for a specific purpose. Therefore, they typically have no formal means of communicating their social identity. As a result, crowd members instead need to infer the stereotypical norms defining their group identity – known as the ‘inductive aspect of categorisation’ (Turner, 1982) – from the behaviours of those perceived to be typical crowd members. However, these norms will only be adopted if the individuals expressing the behaviours are seen to be true members of the in-group and if the behaviours are consonant with the attributes of the group’s social identity (Reicher, 1984b).
- Through defining an appropriate social identity for themselves within the crowd, individuals are able to act in accordance with that identity, which explains how crowds are able to spontaneously act in a socially coherent manner (Reicher, 1984b). Moreover, since social identities and their meanings are a product of culture, it explains why culturally meaningful patterns of behaviour can be produced spontaneously by crowd members (Drury & Reicher, 2000).
- Thus, it follows that if a crowd’s behaviour depends upon its social identity, the way in which its identity is defined will determine the basis of that crowd’s behaviour (Reicher, 1996b). A thorough understanding of crowd behaviours is crucial to ensure efficient crowd management skills (Raphael, 2005).
- There is much evidence – across multiple crowd events in multiple contexts – in support of the social identity approach to crowd behaviours, positing that crowd members act in terms of social identity (e.g., Drury & Reicher, 1999, 2000; Reicher, 1996a; Stott & Drury, 1999; Stott & Reicher, 1998a).

“If you understand their social identities, you’ll understand how they behave.”

Professor Stephen Reicher
University of St Andrews

- For example, Reicher (1984b), through studying the St Paul's Riots that occurred in Bristol in April 1980, found evidence in support of social identity guiding crowd behaviours. Actions perceived to be congruent with the crowd's social identity became generalised amongst the crowd members, whilst actions dissonant with this identity were ignored.

Criticisms

- Collective identity emerges out of interactions with differing audiences, enabling some actions but negating others (Polletta & Jasper, 2001). Therefore, it is important to study how the actions of one party impact on the actions of another party (Reicher, 1996a). However, the social identity model (along with all the other theories mentioned previously) does not take intergroup dynamics into account. Theories instead try to explain crowd events by only studying crowd perceptions, without consideration of other parties, such as the police (Reicher, 1996a).
- The social identity model is also less successful in explaining social and psychological change (Reicher, 2001).
- The model is also unable to express fully how collective conflict evolves during a crowd event (Stott, Hutchison & Drury, 2001).

Lasting Value

- The notion that individuals, when part of crowd, do not lose their identity but simply shift from an individual identity to a shared social identity, is a key strength to this model and has remained as a core concept in subsequent models of crowd behaviours.
- The theory also acknowledges – importantly – that crowds, and crowd action, are socially meaningful phenomena (Drury & Reicher, 2000).

Elaborated Social Identity Model of Crowd Behaviour (ESIM)

Key Authors: -

- Reicher (1996a, 1996b, 1996c, 1997a)
- Drury & Reicher (1999)
- Stott & Drury (1999)

Main Ideas

- The elaborated social identity model of crowd behaviour (ESIM; e.g., Reicher, 1996a, 1996b, 1996c, 1997a; Stott & Reicher, 1998a; Drury & Reicher, 1999; Stott & Drury, 1999) is based on the principles of both social identity theory (Tajfel, 1978) and self-categorisation theory (Turner et al., 1987), proposing that collective action can only take place when group members share (or perceive themselves to share) a common social identity (Veenstra & Haslam, 2000). The model is specifically concerned with crowd behaviours and crowd conflict (Drury & Reicher, 2005).
- The ESIM extends the social identity model of crowd behaviour to consider group interactions and the dynamic interplay between differing groups at crowd events (Reicher, 2001). It acknowledges that crowds rarely gather in isolation and that crowd events typically occur in the presence of other groups, most commonly the police¹⁰ (e.g., Drury & Reicher, 2005).

“...crowd behaviour does not take place in isolation; rather...crowds typically interact with the police. Psychological change is suggested to be a function of the dynamic relation between crowd participants and such external forces.”

(Drury & Reicher, 2005, p.37)

¹⁰ Throughout this section on the ESIM, the example of the police as the ‘other group’ interacting with the crowd is used, since this is the example used in the literature and is predominantly the case during a crowd event.

- Therefore, it is important to consider and study the interactions between crowds and other groups, such as the police, and to examine the impact of these interactions on the actions of each party (e.g., Drury & Stott, 2001; Drury, Stott & Farsides, 2003b; Cronin & Reicher, 2006). As such, crowd behaviours can be conceptualised as an inter-group phenomenon (Reicher & Potter, 1985), whilst crowd events can be considered inter-group encounters (e.g., Reicher, 1996a, 2001; Stott & Reicher, 1998a; Drury & Stott, 2001).
- Three key areas of the social identity model of crowd behaviour have been reconsidered in the ESIM (e.g., Reicher, 1997a; Drury & Reicher, 2000): -

1. Context has been reappraised.

- Thus, instead of viewing context as an external influence over identity and behaviour, the ESIM suggests that context should be understood in terms of the actions of one group in relation to the actions of another group. In other words, the way in which one group understands the situation – and subsequently acts according to that understanding – will directly impact on the way in which another group understands – and reacts to – the situation, and so forth (e.g., Reicher, 1997a).
- For example, the typically defensive actions of the police – in accordance with their generalised understanding that the whole crowd is dangerous – forms the reality from which the crowd develop their understanding of the situation – viewing the police as opposition – and, subsequently, determines their actions – e.g., to riot against the opposition (Drury & Reicher, 2000; Stott & Drury, 2000).

“...the context in which any one group acts is constituted partially if not wholly by other groups.”

(Drury & Reicher, 2000, p.581)

2. The concept of social identity has been reconsidered.

- The notion that identity is a collection of traits or attributes has been discarded in favour of bringing the concept of identity into line with the identity process. Hence, social identity has been redefined in terms of an individual's social positioning within a set of social relations and in terms of the moral and practical implications of being in that social position. Thus, social identity is tied to actions in the world (Drury & Reicher, 2000).

“...crowd members act in terms of social identity; that is, an understanding of their social location in a set of social relations along with the actions that are proper and possible, given such a location.”

(Drury et al., 2003b, p.1481)

3. The relationship between identity, intention and consequence has been explicitly addressed in the ESIM.

- It is proposed that the way in which a group identifies themselves determines their intentions and their actions. The group’s actions – irrespective of their intentions – may then be reinterpreted by another group, which subsequently determines how that group reacts. This reaction then creates a new context within which the first group exists. Thus, actions, intentions and consequences become uncoupled – i.e., intentions are not always realised – and, therefore, actions may lead to unintended consequences (e.g., Drury & Reicher, 2000).
- Accordingly, if social identity is defined in terms of social positioning, it follows that a change in social position during a crowd event should lead to a change in social identity – in terms of identity content (i.e., “who we are”) and identity boundaries (i.e., “who is one of us”) – which should then entail a change in actions endorsed and undertaken by the crowd (e.g., Drury & Reicher, 2000, 2005; Polletta & Jasper, 2001).

“...owing to the intergroup dynamics of crowd events, crowd members who act on the basis of one understanding of their social location may find themselves in a new social location and thereby change their identity through acting upon it.”

(Drury & Reicher, 2000, p.596)

- More specifically, the ESIM advocates two features of group interactions which are necessary for behavioural change – and most likely conflict – to occur in collective crowd action (e.g., Drury & Reicher, 2000, 2005; Drury, Reicher & Stott, 2003a; Drury et al., 2003b; Drury & Winter, 2004; Drury, Cocking, Beale, Hanson & Rapley, 2005; Waddington, 2007): -

- 1. An asymmetry between the way in which the in-group – i.e., the crowd – perceive their social position and the way in which the out-group – i.e., the police – perceive the in-group’s social position.**

- For instance, if the crowd view themselves as respectable citizens expressing their right to peaceful protest, whilst the police view the crowd as troublesome protesters, there is a discrepancy in perceptions of collective identity, increasing the likelihood of conflict.

- 2. An initial asymmetry of power relations between the in-group and the out-group.**

- For example, the out-group – i.e., the police – will have the power to act against what they perceive to be the illegitimate behaviour of the in-group – i.e., the crowd – and the power to impose what they perceive to be legitimate practice. Thus, the police not only see the whole crowd as troublesome protesters but treat them all as such.

“...out-group power may serve to create the context within which crowd members define themselves.”

(Drury & Reicher, 1999, pp.383-384)

- According to the ESIM, if these two conditions hold for a crowd event, then two consequences are likely (e.g., Drury & Reicher, 2000, 2005; Drury et al., 2003a): -

- 1. The perception of the out-group may become a self-fulfilling prophecy.**

- For example, if the police perceive that all crowd members are dangerous and act against the crowd accordingly, the crowd are likely to unite against the hostile treatment and come to view themselves in opposition to the police, expressing hostility (e.g., Stott & Reicher, 1998a; Stott & Drury, 2000; Drury et al., 2003a).

- In particular, if the crowd perceive the police action to be illegitimate, they perceive their oppositional actions to be legitimate and, consequently, feel empowered to act (e.g., Drury & Reicher, 1999, 2005; Stott & Drury, 1999). Often, crowds will reconceptualise their actions to improve legitimacy, for instance, redefining violence as self defence (Drury et al., 2003b; Drury & Winter, 2004).
- Hence, conflict is more likely if the actions of one group – i.e., the police – are perceived to be illegitimate in terms of the understandings of the other group – i.e., the crowd (Stott & Reicher, 1998a).

“...the genesis of conflict derives from the relationship between identities (and the associated understandings) of different groups.”

(Stott & Reicher, 1998a, p.512)

- Resultantly, in acting to prevent disorder – for instance, through deploying more resources and using greater force – the police may actually serve to create disorder (Veno & Veno, 1992; Drury et al., 2003a; Stott & Adang, 2003, 2004; Stott, Adang, Livingstone & Schreiber, 2007).
- However, legitimacy of behaviours is critical. In order for violence to result, the crowd must consider it a legitimate form of action – indeed, some groups will not entertain violence even when subject to extreme provocation (Reicher, 1996a). Furthermore, unless the crowd see violence as an effective means of achieving their desires, it is unlikely that conflict will occur (Reicher, 1996a).

“...conflict arises in contexts where two groups hold incompatible and irreconcilable notions of proper social practice and to the extent that the action of one group is construed as violating conceptions of what is right in terms of the social identity of the other.”

(Reicher, 1996b, p.128)

2. Social relationships within the crowd will also be transformed.

- Barriers between differing groups within the crowd – most notably the peaceful majority and the troublesome minority – will be overpowered by the unitary action of the crowd against the police, for example, and a new, more inclusive categorisation will result (Drury & Reicher, 2005). The crowd, perceiving their treatment by police to not only be illegitimate but also indiscriminate, come to adopt a more inclusive self-categorisation (Drury et al., 2005).

- As a result of this common categorisation, a sense of collective empowerment emerges within the crowd (Drury & Reicher, 1999, 2005) along with expectations of mutual social support from in-group members towards the attainment of group goals (e.g., Drury et al., 2003b; Drury & Winter, 2004; Haslam & Reicher, 2006). The crowd then feel

“Prior divisions will be superseded by a single and more inclusive self-categorization.”

(Drury & Reicher, 2005, p.37)

empowered to act united against the opposition. In turn, the crowd's actions impact on subsequent police actions, creating a cycle of escalating tension and conflict (Reicher & Stott, 1991; Stott, 1996). However, that is not to say all crowd members will feel equally empowered – it will vary depending on their prior assumptions and expectations of the event (Drury & Reicher, 1999).

- Studies report that members of the crowd are more willing to help others, at a risk to their own safety, once a sense of shared social identity has emerged within the crowd – i.e., a sense of the crowd against the police (e.g., Drury & Reicher, 1999, 2000; Stott et al., 2001).
- There is much supportive evidence for the ESIM, from studies of crowd events including football hooliganism, (e.g., Stott & Reicher, 1998b; Stott, et al., 2001; Van Hiel, Hautman, Cornelis & de Clercq, 2007; Stott, Adang, Livingstone & Schreiber, 2008a), disorder at public demonstrations (e.g., Reicher, 1996a, Drury & Reicher, 1999; Stott & Drury, 1999, 2000) and mass environmental protests (e.g., Drury & Reicher, 2000).

Football Hooliganism

- In particular, football hooliganism has generated a great deal of interest from researchers (e.g., Stott & Reicher, 1998b; Stott et al., 2001; Stott, 2003; Stott et al., 2007, 2008a; Van Hiel et al., 2007; Stott, Livingstone & Hoggett, 2008b).

- Primarily, researchers have observed the extent to which inter-group context is influential over whether ‘hooligans’ transform their social identity towards violence or towards non-violence.
- Whilst observations of football violence sit well with the propositions of the ESIM as described above, there were also observations to the contrary, involving the absence of disorder (e.g., Stott, Adang, Livingstone & Schreiber, 2006; Stott et al., 2007, 2008a; Stott et al., 2008b). Situations where police intervention was low-profile and information led, based on fans’ actual behaviour – as opposed to heavy handed and assuming of violent intentions, based on fans’ reputations – have been shown to minimise cases of hooliganism (e.g., Stott & Adang, 2003, 2004; Stott et al., 2008a). This indicates that the police must try to facilitate and actively communicate with the crowd, and differentiate between fans behaving legitimately and illegitimately (e.g., Adang, 2003; Stott & Adang, 2003; Adang & Stott, 2004; Reicher, Stott, Cronin & Adang, 2004)
- Studies (e.g., Stott et al., 2007; Stott et al., 2008b) also report cases of ‘self-policing’, whereby the majority of the crowd attempt to maintain their non-confrontational, non-violent social identity by differentiating and marginalising inappropriate behaviour from the hooligan minority. If fans interpret police actions as legitimate behaviour – i.e., as facilitating rather than controlling – a culture of self-policing is more likely to emerge (Waddington, 2007).

Criticisms

- The theory is predominantly focused on the interactions which occur between crowds and the police, as, most often, the police are the group with which crowds come into contact during an event. However, to offer a more rounded perspective, interactions between crowds and other groups, such as stewards, should also be considered and investigated.

Lasting Value

- The elaborated social identity model of crowd behaviour makes a valuable contribution towards explaining the process of psychological change (e.g., Drury & Reicher, 1999; Stott & Reicher, 1998).
- The fact the crowd events are inter-group encounters and, therefore, that crowds should not be considered in isolation, is emphasised.
- The theory provides a useful model for understanding the development of crowd disorder during an event.

Social Identity Model of Deindividuation Effects (SIDE)

Key Authors: -

- Reicher, Spears and Postmes (1995)
- Klein, Spears and Reicher (2007)

Main Ideas

- The social identity model of deindividuation effects (SIDE) offers an explanation for the deindividuation phenomenon in terms of social identity processes, in an attempt to explain why deindividuation manipulations – contrary to the suggestions of the original theory (e.g., Zimbardo, 1970; Diener et al., 1980) – are often found to increase normative behaviour and positive affect towards group members (e.g., Reicher et al., 1995; Postmes & Spears, 1998; Polletta & Jasper, 2001; Moral-Toranzo, Canto-Ortiz & Gomez-Jacinto, 2007).
- SIDE reconceptualises the notion of deindividuation, drawing on the idea that individuals can define themselves at multiple levels – i.e., in terms of personal identity (how they, as individuals, differ from other individuals) and social identity (how they, as group members, differ from members of other groups) – as described previously in the social identity models (e.g., Reicher, 1984a, 1984b).
- Two important dimensions of SIDE can be distinguished: -
 - A cognitive dimension
 - A strategic dimension
- The cognitive dimension relates to how the salience of group identity and, thereby, self-categorisation, can be influenced by the more classic aspects of deindividuation, such as anonymity (Spears, Lea & Postmes, 2000; Klein, Spears & Reicher, 2007). It is concerned with the anonymity of others to the self – i.e., it is a self-definitional aspect.

- Conversely, the strategic dimension relates to the expression of normative behaviour as affected by identifiability (e.g., Reicher & Levine, 1994a, 1994b). It is concerned with the anonymity of the self to others – i.e., it is a self-presentational aspect.
- According to the cognitive component of SIDE, increased anonymity as a result of being in a group, does not lead to a loss of identity but instead increases the salience of different social identities whilst decreasing the salience of personal identity (Reicher, 1984a; Reicher, Levine & Gordijn, 1998).
- Far from being disinhibited and antisocial – as the original deindividuation theories would suggest – crowd behaviours are regulated according to in-group norms (Reicher & Levine, 1994a, 1994b). As such, the process of depersonalisation – the concept central to self-categorisation theory (Turner et al., 1987) – rather than deindividuation is perhaps a more appropriate explanation for the behaviours observed (Klein et al., 2007).
- Anonymity may enhance or attenuate social identity, dependent on the context (e.g., Reicher et al., 1995). Thus, if the group salience is already high, increased anonymity is likely to further enhance the salience of social identity by obscuring personal differences between group members (e.g., Spears, Lea & Lee, 1990; Postmes, Lea, Spears, Croft, van Dijk, & van der Pligt, 1995; Postmes, Spears, Sakhel & De Groot, 2001). However, if group salience is low and group boundaries are poorly defined, anonymity is likely to decrease social identity salience by further obscuring group boundaries (Reicher et al., 1995).

“...crowd behaviour, far from being de-regulated, is determined by the nature of the in-group stereotype.”

(Reicher, 1984a, p.349)

“Where manipulations of visibility reduce cues to interpersonal difference while increasing cues to collective similarity (for instance, through immersion in a group), then personal identity will become less salient and social identity will become more salient.”

(Reicher et al., 1998, p.17)

- Indeed, stereotypical behaviours – in accordance with in-group norms – have been found to increase along with increased anonymity, specifically when individuals identify strongly with their group (e.g., Lea & Spears, 1991; Spears & Lea, 1992). In addition, group-based self-categorisation – i.e., self-categorisation at the local group level rather than according to wider, pre-defined social categories (Postmes & Spears, 1998) – has been shown to increase individuals' attraction to their group (Lea et al., 2001). Group-based stereotyping of others is then enhanced and, subsequently – as a result of social identity becoming more salient – conformity to group norms is increased (Lea et al., 2001).
- Nevertheless, increased salience of group identity alone is not sufficient to encourage normative behaviour (Ng, 1980, 1982a, 1982b). Rather, SIDE argues that group members must also have the power to express their social identity and behave according to the social norms, even when facing opposition from the out-group (Reicher et al., 1998).
- Similar to anonymity, accountability is an important factor in determining group action (e.g., Kroon, Vankreveld & Rabbie, 1991; Williamson, Rowe & Reicher, 1991; Cronin & Reicher, 2006, 2009). Thus, when the out-group has the power to hold in-group members accountable for their actions, behaviours which would make the in-group more identifiable to the out-group – i.e., behaviours consonant with the in-group identity – and, therefore, more likely to be sanctioned, are less likely to be expressed (Reicher & Levine, 1994a, 1994b).

“...group members will express those behaviours which are consonant with their social identity but disapproved of by the out-group only to the extent that they have the power to overcome any actual or anticipated resistance and/or retaliation by that out-group.”

(Reicher & Levine, 1994a, p.147)

“Perhaps it is only in the crowd, where the size of the in-group weakens out-group attempts to identify people and hold them to account, that people can act as fully social subjects and give unconstrained expression to their collective understandings of the social world.”

(Reicher & Levine, 1994a, p.161)

- In contrast, making members of the in-group more identifiable to each other should increase their ability to support one another against out-group sanction and, therefore, behaviours consonant with the in-group identity are more likely to be expressed (Reicher et al., 1998). This purposive expression – or suppression – of behaviours consonant with in-group norms is termed “identity performance” (Klein et al., 2007).
- There is much supportive evidence for SIDE (e.g., Spears et al., 1990; Lea & Spears, 1991; Spears & Lea, 1992, 1994; Reicher et al., 1995; Spears, 1995; Postmes & Spears, 1998).

Criticisms

- Cronin and Reicher (2006) criticise research into SIDE for lacking in realism, since research typically manipulates factors, such as visibility, which should impact on strategic decisions and, subsequently, on the behaviour observed.
- More recently, Cronin and Reicher (2009) have suggested that SIDE should incorporate a broader examination of the consequences of accountability concerns.
- Research by Reicher et al. (1998) has raised questions regarding the details of the strategic process suggested by SIDE.
- SIDE research appears to consider anonymity as an abstract concept, rather than as a multi-faceted variable (Wang, 2007).

Lasting Value

- The principles of SIDE serve to reinforce and extend self-categorisation theory (Reicher et al., 1995).
- SIDE clearly differentiates between personal identity and social identity (e.g., Wang, 2007), again a principle which has been maintained in more recent theories.
- A study by Kugihara (2001) – demonstrating that cooperative or aggressive responses to fellow crowd members during an emergency could be attributed to the norms associated with particular group identities – indicates that the theory holds as an explanation for behaviour during an emergency evacuation.

Place Scripts

Key Authors: -

- Donald & Canter (1992)

Main Ideas

- Individuals typically follow rules – not only prescribed and legal rules, but also conventional and informal rules based on previous experience, perceptions and expectations – to guide their behaviour (e.g., Donald & Canter, 1990, 1992; Mills & Murgatroyd, 1991). Under normal circumstances, it is individuals' understanding of, and adherence to, these rules which enables them to function effectively.
- These rules also fit within individuals' schema, which are used to describe events and are often represented as scripts – sequences of behavioural patterns in which individuals automatically engage when in a particular environment or experiencing a particular event (e.g., Langer, Blank & Cahnowitz, 1978; Donald & Canter, 1992).

“Scripts; a coherent sequence of events expected by the individual, involving him either as a participant or as an observer.”

(Abelson, 1976, p.33)

- Scripts are also used to help individuals interpret the behaviour of others, in addition to guiding their own behaviour (Fayol & Monteil, 1988). Moreover, once ingrained, such scripts are remarkably resistant to change – even in extraordinary circumstances such as emergencies – as individuals are instinctively drawn towards the familiar (Sime, 1983, 1985, 1993). Considerable effort must be applied in order to abandon their schema (e.g., Abelson, 1981; Canter, 1990).

- Scripts are often related to places, with individuals developing specific 'place schema' for environments with which they are familiar – determined in part by the rules associated with the environment. These place schema represent the sequence of actions likely to take place when in a particular environment, for example, using the same entrance and exit each day (Donald & Canter, 1992).

“People will define, understand or formulate a script in relation to where they are, and interpret the behaviour of others, and define what a place is by what happens there.”

(Donald & Canter, 1992, p.205)

- However, place schema are only useful to the extent to which they can inform and guide behaviour appropriately. In an emergency situation, for instance, it is unlikely – given the rarity of emergencies and, therefore, the limited experience individuals are likely to have of such situations – that individuals will have suitable schema to guide their actions. Consequently, they typically refer to their scripts for the particular environment under normal circumstances, and behave accordingly, despite the inappropriateness and probable danger (e.g., Canter, 1990; Donald & Canter, 1992). Thus, the more familiar people are with a particular setting, the more at risk they may actually be in emergencies (Donald & Canter, 1992).
- In an emergency evacuation for example, individuals are often reluctant to evacuate via an emergency exit, instead preferring to use the exit with which they are most familiar, typically their usual entrance and exit route (e.g., Sime, 1983, 1985; Canter, Comber & Uzzell, 1989; Donald & Canter, 1990; Johnson & Feinberg, 1997; Benthorn & Frantzich, 1999; Helbing, Farkas & Vicsek, 2000a; Pelechano & Malkawi, 2008).
 - For instance, a report into 'The Station' nightclub fire in Rhode Island in February 2003 (Gosshandler, Bryner, Madrzykowski & Kuntz, 2005) estimates that up to two thirds of people attempted to escape from the fire via the main entrance – i.e., the way they entered the nightclub.

- Thus, in emergencies, people must receive information and cues from several sources – e.g., from the behaviour of others, the presence of specialised staff such as police, or specific instructions from staff or authority figures – in order to diagnose a situation. They are then able to break from their schema and act as appropriate (e.g., Donald & Canter, 1990, 1992).

“...what people see as being the appropriate actions is shaped by a combination of what they expect of the circumstances and what figures of authority do and say to help re-define those circumstances.”

(Donald & Canter, 1990, p.19)

- Donald and Canter (1992) based on their analysis of people's behaviour during the major fire at the King's Cross underground station in London in 1987 (see 'King's Cross Underground Fire (1987)', pages 179 to 183, for further details), note that rather than panicking, individuals continued their scripted behaviours, however inappropriate. Only when fresh information was provided, to guide appropriate evacuation behaviours, were these schema abandoned, often saving lives.
 - To counter this, they recommended the provision of clear and appropriate information during such events, together with regular emergency drills to generate new emergency schema specifically for such situations.

Criticisms

- Place scripts theory assumes that in emergency situations, individuals' innate tendencies to follow their place scripts and behave as normal are detrimental and likely to endanger their lives. However, this may not always be the case; indeed, there may be situations in which continuing to behave as normal may be beneficial. For instance, had passengers in King's Cross underground station, on the night of the fire in 1987, continued to follow their schema and boarded their trains as usual, they would most likely have escaped the fire (Donald & Canter, 1990, 1992; see 'King's Cross Underground Fire (1987)', pages 179 to 183, for further details).
- Also, the theory assumes that being overly familiar with an environment can be harmful in an emergency situation. However, if individuals are able to quickly break away from their scripts at the beginning of an emergency situation, they may benefit from familiarity in terms knowing where evacuation routes are located and, therefore, being able to evacuate more quickly.

Lasting Value

- The theory of place scripts offers a useful explanation to help understand individuals' behaviour, and particularly their decision-making processes, in emergency situations.
- It also has important practical implications for the management of emergency situations. In order to help people abandon their schema, clear and timely information must be provided, and regular evacuation drills should be practiced to generate new schema for emergencies. These should then help to over-ride any inappropriate place scripts related to routine day-to-day behaviours.

- The complexity of human behaviour is reinforced by the counter intuitive nature of the theory's fundamental principles, i.e., being more familiar with a place can actually be detrimental and slow evacuation time.

KEY LEARNING POINTS

– Theories of Crowd Behaviour –

- **Early models of crowd behaviour – e.g., Le Bon (1908) – which propose that individuals behave in a pathological and instinctually savage way when submerged in a crowd, are heavily criticised and now disregarded as an explanation of crowd behaviours.**
- **De-individuation theory could explain the ‘mob mentality’ often witnessed in crowd disorder, wherein normally law-abiding citizens feel empowered to commit disorder under the ‘cover of the crowd’.**
 - **The theory suggests that individuals – as anonymous crowd members – lose their sense of self-awareness, self-observation, self-responsibility and individualised identity, resulting in weakened moral restraints, and unsocialised and antisocial behaviours.**
- **Social facilitation theory proposes that in the presence of others, individuals’ performance on easy or well-learned tasks improves, due to increased arousal driving dominant responses. Thus, when part of a crowd, individuals may be motivated to perform their most habitual behaviours.**
- **Social loafing theory suggests that individuals, when part of a crowd, exert less effort than when they are working alone because their efforts within a group are more anonymous. Hence, social loafers within a crowd are likely to let other crowd members make key decisions regarding movement, for example, and are happy to do as the majority do.**

- **Emergent norm theory could explain the antisocial behavioural tendencies of crowds.**
 - **According to the theory, crowd behaviour is governed by norms which emerge from the distinctive actions – i.e., rare actions, such as antisocial behaviours – of prominent crowd members. As more members adhere to these norms, they become more influential, and pressure to behave antisocially increases.**
- **The social identity model of crowd behaviour – based on social identity theory and self-categorisation theory – offers an explanation for a crowd’s ability to spontaneously behave in a socially coherent manner without any apparent pre-planning, communication or direction.**
 - **The theory proposes that individuals do not lose their sense of identity, but simply shift from an individual to a shared social identity. Accordingly, individuals do not lose control over their behaviours, but shift from behaving in terms of their individual identity to behaving in terms of the norms and values espoused by their shared social identity. Hence, through defining and accepting an appropriate shared identity, crowd members are able to act as a united group.**
- **The social identity model of deindividuation effects (SIDE) offers an explanation for increased normative behaviours under conditions of increased deindividuation.**
 - **The theory suggests that the increased anonymity experienced when part of a crowd does not lead to a loss of identity and, subsequently, to a loss of behavioural control, but instead decreases the salience of individual identities in favour of shared social identities. Thus, the crowd behaves according to the norms and values espoused by the shared social identity.**

- **The impact of interactions between crowds and other groups, such as the police, on crowd behaviour – and the tendency for conflict in particular – can be explained by the elaborated social identity model of crowd behaviour (ESIM).**
 - **Conflict is more likely if the police perceive the whole crowd to be troublesome, for example, whereas the crowd perceive themselves to be peaceful protesters, or if the police not only view the whole crowd as troublesome but treat them as such. Consequently, the crowd is likely to unite against what they perceive to be illegitimate and indiscriminate police action and express hostility and antisocial behaviour in return.**
 - **The risk of conflict may be reduced by using low-profile and information-led policing, based on the crowd's actual behaviour and differentiating between individuals behaving legitimately and illegitimately, as opposed to heavy handed and assuming of violent intentions, based on prior expectations.**
 - **Crowds may also 'self-police' – the majority attempt to maintain their non-confrontational, non-violent social identity by differentiating and marginalising inappropriate behaviour from the hooligan minority – if they perceive police actions as legitimate.**
- **Crowd behaviour during emergency evacuations – specifically the tendency for individuals to maintain their normal behaviours for as long as possible – can be explained by place scripts theory.**
 - **Individuals develop scripts or schema – sequences of behavioural patterns in which they automatically engage when in a particular environment – which are remarkably resistant to change.**
 - **Hence, clear, appropriate information must be provided during an evacuation, in order to override individuals' schema and encourage more appropriate behaviours.**

Moderators of Crowd Influence on Individual Behaviours

- This section reviews factors which have the potential to moderate the influence of the crowd, as a whole, on the behaviour of individual crowd members. These potential moderators can be stable or situational factors: -
 - Stable moderators of crowd influence on crowd members' behaviour include: -
 - Gender
 - Personality
 - Situational moderators of crowd influence on members' behaviour include: -
 - Identifiability
 - Social identity
 - Environmental familiarity
 - Intoxication

Moderators of Crowd Influence on Members' Behaviours

- Many of the theories of crowd behaviours and the empirical evidence from which they are derived suggest that people in crowds often behave in a common manner, *en masse*, as a collective entity. This is a recurring theme in several of the theories discussed above, for example social identity theory (Tajfel & Turner, 1979; Reicher, 2001) and de-individuation theory (Festinger, et al., 1952; Reicher et al., 1995; Postmes & Spears, 1998). Broadly speaking, in such circumstances crowd members are succumbing to the social influence of the wider crowd (see e.g., Myers, 2005).
- Such collective behaviour does not always occur, however. Some crowds are merely physical, in the sense that the members still behave as individuals while in the presence of others – i.e., the concept of a physical crowd as proposed by Reicher (2001) and Drury and Cocking (2007). Other crowds are mixed, such that while some members behave collectively – i.e., as a psychological crowd united by a sense of shared social identity (Reicher, 2001; Drury & Cocking, 2007) – others do not. There may also be distinct sub-groups within crowds that behave differently from each other.
- Although social influence is a powerful force, it can affect different people in different ways and some people more powerfully than others. This is an important point, for crowd membership is not homogenous; rather, crowds are comprised of individual members, each of whom may differ in their susceptibility to such social influence. This susceptibility is governed by a number of variables which can be said to *moderate* the effect of the crowd's social influence on the behaviour of its individual members. Some of these variables are relatively *stable* in that certain people will always have higher or lower levels than others. Other such variables are changeable, such that the same person may have different levels of that variable depending on the *situational* context.

Stable Moderators of Crowd Influence

Gender

- Much psychological research has examined gender differences in a wide range of variables and one of the most robust findings appears to be that men are more aggressive than women, as evidenced by meta-analytical review studies examining the research literature in this area (Knight, Fabes & Higgins, 1996).
- The logical implication here would, therefore, be that crowds of men, or those which are male-dominated, are more likely to behave in an aggressive manner than crowds of women, or those which are female-dominated. Indeed, research has borne this out.
- For instance, a qualitative examination of gender differences in crowd behaviours across three different situations – prior to a rock concert, prior to a sports event, and at a political rally – revealed that men engaged in more verbally aggressive behaviour and were more likely to incite both violence and forced entry into venues than their female counterparts (Webb, Neale & Phillips, 1995).

*“Expressing their frustration, some male crowd members urged other crowd members to break through police barricades, yelling, “OK the joke is over, let us in,” “push the door and it will open,” and, “**** these guys, let’s go in.” On the other hand, several female crowd members sat on the ground when they became bored. Males responded aggressively to the long wait, while females did not.”*

(Webb et al., 1995, p.15)

- Officials managing crowd events should therefore be aware of the greater potential for male-dominated crowds to behave in an aggressive manner and prepare accordingly.

Personality

- There is relatively little research examining how the personality traits of individual crowd members affect their susceptibility to crowd influence. Furthermore, such research has tended to focus on highly specific types of crowd behaviour. For instance, questionnaire-based research has suggested that individuals who are highly psychopathic, with assaultive tendencies and low self-consciousness, are more likely to participate in riots at ice hockey matches (Russell, 1995).
- However, the susceptibility of people to social influence more generally has been a particular focus of social psychology research on conformity. Such research is relevant here as collective crowd behaviour can be viewed as individuals conforming to the behaviour of their fellow crowd members, while any individuals behaving in an independent manner would be demonstrating non-conformance. Although situational factors have powerful effects on the level of conformity displayed, there are also differences in conformance between individuals in any given situation (Cialdini & Goldstein, 2004), due to factors such as personality.
- DeYoung, Peterson, and Higgins (2002), for instance, sought to explore whether conformity – measured in their study as the willingness to provide socially desirable responses – was related to the major facets of personality, using a questionnaire methodology. The results revealed that: (a) collectively, emotional stability, agreeableness, and conscientiousness were positively related to conformity, such that the more emotionally stable, agreeable, and conscientious people were, the more likely they were to conform; and (b) collectively, extraversion and openness were negatively related to conformity, such that the more extraverted and open people were, the less likely they were to conform.
- Given the highly specific types of behaviour typically examined by research studies in this area, such as those above, findings tend to be fairly context specific. That is, although people's personality traits themselves are stable, the moderating effects they have are context specific. Furthermore, personality traits are obviously less readily discernable than other individual differences such as gender. Consequently, it is somewhat difficult to offer practical advice to those managing crowds on the basis of such research. However, it does nevertheless serve as a reminder that crowds should not be viewed as a homogenous collection of people who are all equally susceptible to the influence of their fellow crowd members.

Situational Moderators of Crowd Influence

Identifiability

- Several types of collective crowd behaviours occur as a result of the anonymity that the presence of many other people confers upon the members. For instance, the state of de-individuation and its resultant anti-social behaviour – as discussed previously – are believed to occur due to the combined effects of the arousal (Myers, 2005) and anonymity (Mann, 1981) that the crowd provides. Another example is the social loafing effect (Latané et al., 1979) where group members exert less effort towards tasks because their individual outputs are not identifiable, as described earlier in the report.
- Given that these effects are driven by anonymity, the removal of such anonymity – by making individual crowd members identifiable – should counter them, and this is what research has generally shown. For instance, Mann et al. (1982) examined de-individuation experimentally by providing audience members with an opportunity to behave anti-socially towards two speakers, by administering loud noise. The results demonstrated that anonymous audience members administered louder noise than their identifiable counterparts.
- Examination of real-life events also supports the existence of this effect. For instance, disturbing instances of crowds baiting suicidal people to jump to their deaths are more likely to occur at night, and when crowds are larger and more physically distanced from the person concerned, all of which serve to increase the anonymity of crowd members (Mann, 1981).
- Such findings yield potentially useful practical applications for the management of de-individuated crowd behaviours. If those behaving in an anti-social manner can be identified (or at least made more identifiable) then the removal of their anonymity should reduce the levels of such behaviour. There are several ways in which this could be accomplished, for instance: the use of CCTV in a highly visible manner that is apparent to crowd members; the use of spotlights on troublesome areas of the crowd; verifying the identity of those purchasing tickets for events; and allocating them to identifiable seats or areas within venues.

Social Identity

- The extremely influential social identity theory (Tajfel & Turner, 1979) suggests that every person is simultaneously a member of multiple social groups – each of which confers a different social identity with corresponding behaviours and norms – and that the salience of these different identities varies between situations.
- If one considers the situations in which crowds are likely to exist, there is a large degree of variability in the extent to which such situations may generate potent social identities in those crowds present. For instance, spectators at sporting events or at music events are likely to share powerful social identities as supporters of particular teams or bands (see e.g., Myers, 2005). Conversely, members of crowds moving within a transport terminal, who share little more than their transient occupation of the same venue, are far less likely to share a strong social identity.
- The implication of this is that the type of collective crowd behaviour that can be attributed to members sharing a common social identity – such as rioting (see e.g., Reicher, 1984) – is more likely to occur in environments which are more conducive to fostering a shared social identity among crowd members. Those seeking to manage crowds should therefore be aware of the more potent collective behaviour that may potentially be exhibited in such environments.

Environmental Familiarity

- As discussed previously, research by Donald and Canter (1992) has suggested that people develop place scripts, or schema, for venues or routes with which they are highly familiar, and that these can influence their behaviour in these environments. Once ingrained, these scripts are remarkably resistant to change, even in extraordinary circumstances such as emergencies. Indeed, Donald and Canter's (1992) analysis of the King's Cross underground station fire in London in 1987 suggested that rather than acting collectively as a crowd, people behaved as individuals, continuing their scripted behaviours, often inappropriately and with fatal consequences. Hence, the more familiar people are with a particular setting, the more at risk they may be in emergencies.
- One implication of this research is that people who are highly familiar with particular venues or routes are more likely to behave as individuals, rather than as a collective crowd, when moving through such environments, and vice-versa for those who are unfamiliar with these environments. Consequently, those seeking to manage the movement of crowds should be aware that it may not necessarily be appropriate to treat those individuals familiar with that environment as a collective entity moving in unison.

Intoxication

- Aggressive behaviour in crowds is more prevalent when members are drunk than when they are sober (Moore, Flajslik, Rosin & Marshall, 2008). Indeed, drug and alcohol abuse has been identified as a public health concern at crowded events (Earl, Parker, Edwards & Capra, 2004).
- Several reasons have been suggested to explain the link between intoxication and increased violence. For instance, ethnographic studies of real-life incidents suggest that alcohol interacts powerfully with a masculine social identity to exacerbate violent behaviour, with the perceived defence of male honour often being a trigger (Tomsen, 1997).
- Another interesting perspective on the effect of intoxication on levels of crowd violence has been suggested by computer modelling research conducted by Moore et al. (2008). Their simulation model suggested that in moving crowds, the average walking speed decreases as the proportion of drunken members increases and, furthermore, that this decrease in speed is greater as congestion increases. The researchers attributed this finding to the reduced sense of balance experienced by intoxicated people (this was the assumption – derived from previous research – upon which the model was developed). This reduced balance leads to an erratic walking gait, or stumbling, which increases collisions with fellow crowd members. They argued that such collisions constitute an invasion of personal space, and that it is this that triggers the increased violence often found in intoxicated crowds. It would also seem reasonable to assume that such stumbling could constitute a safety hazard in its own right in dense crowds, potentially leading to some crowd members being crushed or trampled underfoot in extreme cases.
- Those managing crowds should, therefore, be aware of the capacity for intoxication to increase crowd violence and physically destabilise crowd members. Actions to address such dangers may include the implementation of drinking restrictions at events deemed to be of high risk, and the close monitoring of crowd members considered to be dangerously intoxicated.

KEY LEARNING POINTS

– Moderators of Crowd Influence –

- The social influence on individual crowd members exerted by the wider crowd can be a very powerful force, but can affect different people in different ways, with some people more susceptible to this influence than others.
- Certain factors can be thought of as behavioural moderators, affecting the extent to which individual crowd members are susceptible to the social influence from the crowd as a whole. These factors may be stable – i.e., they are a (relatively) fixed and unchangeable part of a given individual – or situational – i.e., their presence in a given individual varies from one situation to the next.
- Gender may be considered a stable moderator, with male-dominated crowds displaying more aggressive behaviours in comparison to female-dominated crowds.
- Personality may also be considered a stable moderator, such that that individuals with particular personality traits will always tend to be more or less susceptible to crowd influence with respect to particular behaviours. Given the complexity of this particular research, however, it is difficult to offer practical crowd management advice based on it.
- Identifiability can be thought of as a situational moderator of crowd influence, based upon theories which advocate the influence of deindividuation and anonymity on crowd behaviour, particularly in relation to antisocial tendencies. Accordingly, the removal of anonymity – i.e., making individual crowd members identifiable – appears to reduce the potential for individuals to act in an antisocial manner.

- **Social identity can also be thought of as a situational moderator, based upon the notion that every individual simultaneously has multiple social identities which become more or less salient depending on the situational circumstances. Thus, environments more conducive to fostering a shared social identity – e.g., sporting events, with crowds united by their support for a particular team – are more likely to facilitate collective behaviour.**
- **A further situational moderator could be environmental familiarity, wherein – in accordance with place scripts theory – individuals who are more familiar with an environment or event are more likely to retain their normal behaviours as dictated by their schema, and are, therefore, less likely to be susceptible to social influence.**
- **Intoxication may also act as a situational moderator of crowd influence, with increased levels of intoxication related to increased levels of aggression and violence, and also to decreased physical stability of the crowd as a whole, as more intoxicated individuals are more likely to stumble or collide with other crowd members.**

Literature on Crowd Behaviours in Emergencies

Literature on Crowd Behaviours in Emergencies

- This section details the findings of the in-depth literature review conducted regarding the behaviours of crowds in emergencies.

- More specifically, this section includes: -
 - Discussion of differing theories of crowd behaviours in emergency situations.

 - Consideration of crowd behaviours in emergency evacuations.

Theories of Crowd Behaviours in Emergencies

- The following section outlines the differing views presented in the literature concerned with how crowds behave during emergency situations.
- There are three main perspectives for understanding crowd behaviours in emergency evacuations and disasters (e.g., Drury & Cocking, 2007; Cocking & Drury, 2008): -
 1. Theories of mass panic.
 2. Affiliation and normative approaches.
 3. Social identity approach.

Mass Panic

Key Authors: -

- Quarantelli (1954, 1957, 1977)
- Sime (1980, 1983)

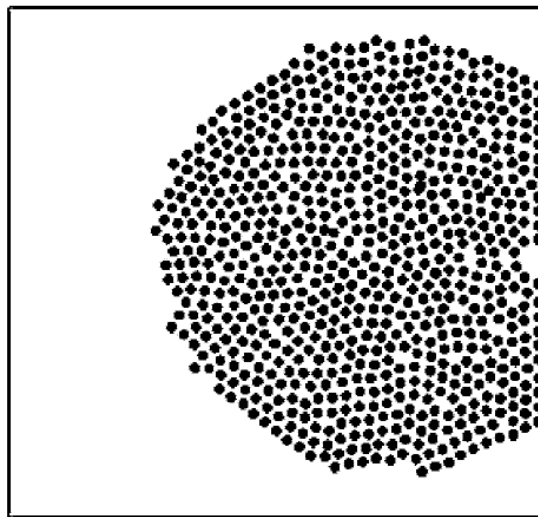
- The notion of 'mass panic' – i.e., the traditional 'panic' model – is typically used to describe the crowd's response to emergency situations. This theory – drawing on Le Bon's (1908) conceptualisation of crowds as more emotional and less intelligent than individuals when acting alone – suggests that, when faced with an emergency or disaster situation, the social bonds between members of a crowd dissolve, resulting in mindless, instinctive, irrational and self-centred behaviour (e.g., Brown, 1954; Quarantelli, 1954; Smelser, 1962). These antisocial behaviours then spread quickly through the crowd in the process of 'contagion' (Ross, 1908; McDougall, 1920).
- Indeed, the classic entrapment theory of panic (e.g., Quarantelli, 1954, 1957, 1977; Killian, 1972) proposes that when major physical danger is imminent but escape routes are limited – i.e., when individuals feel trapped – panic is more likely to occur, resulting in 'flight' behaviours, including pushing, trampling and crushing (Janis & Leventhal, 1968).
- Sime (1980, 1999) suggests that the concept of panic is often used as a way of blaming the crowd in the aftermath of a disaster – for example "the crowd panicked which led to crushing and death". Indeed, the word 'panic' itself typically has negative connotations, reinforcing assumptions made about the irrational, selfish nature of crowd behaviours during an emergency (Sime, 1980, 1995).

"The term 'panic' refers to inappropriate (or excessive) fear and/or flight and highly intense fear and/or flight."

(Mawson, 2005, p.96)

- Panic – according to Helbing et al. (2000a) – has the following characteristics:-
 - Individuals move – or attempt to move – considerably faster than they do normally.
 - Interactions between individuals become more physical in nature, e.g., people start pushing and shoving.
 - Movement becomes uncoordinated, particularly when moving through a bottleneck.
 - Jams build up, causing dangerous crowd pressures.
 - Clogging and ‘arching’ occur at exits. As the large, high density crowd rush towards a narrow exit – wanting to escape as quickly as possible – the exit becomes clogged and the crowd form an arch-shape, radiating outwards behind the exit (see Figure 7).
 - Escape is slowed by fallen or injured individuals who act as ‘obstacles’.
 - Individuals tend to behave en masse, i.e., to follow what other crowd members do.
 - Alternative routes or exits are typically overlooked or inefficiently used.

Figure 7. Arching effect as crowd members try to pass through a narrow exit
(Taken from Yu et al., 2005, p.3)



- Yet, research conducted since the proposition of traditional panic theories (e.g., Sime, 1983, 1995; Johnson, 1988; Comfort, 1990; Yelvington, 1997; Feinberg & Johnson, 2001; Fischer, 2002; Schoch-Spana, 2003; Drury, 2004; Drury & Winter, 2004; Mawson, 2005; Raphael, 2005; Drury & Cocking, 2007, Cocking & Drury, 2008; Cocking, Drury & Reicher, in press; Drury, Cocking & Reicher, in press; Drury, Cocking & Reicher, in submission) argues to the contrary.

“...behaviour in emergencies and disasters has a predictable and relatively consistent set of characteristics.”

(Donald & Canter, 1992, pp.203-204)

- Indeed, in many emergency situations, crowd behaviours remain fairly organised and structured (e.g., Chertkoff & Kushigian, 1999), whilst members of the crowd exhibit helping behaviours, alongside collective concern and cooperation (e.g., Johnson, 1987). For example, the majority of the crowd at ‘The Who’ concert stampede in Cincinnati, 1979, did not actually stampede but tried to help each other (Johnson, 1987). Moreover, if panic does arise, it typically remains confined to individuals, as opposed to spreading through the crowd (Drury & Cocking, 2007).
- In other words, panic – and the selfish or antisocial behaviours typically associated with it – is very rare (e.g., Muir, Bottomley & Marrison, 1996; Galea & Gwynne, 2000; Sorensen, 2000; Glass, 2001; Quarantelli, 2001; Mawson, 2005; Wessely, 2005); it is a misconception (e.g., Fischer, 1998, 2002).

“...the idea of mass panic occurring in emergencies, is largely a myth unsupported by evidence, and that the term is neither a helpful nor accurate description of human behaviour in emergencies.”

(Cocking et al., in press)

- Indeed, many studies of disasters, for instance, report panic and irrational behaviour to be very rare, as was the case in the disasters listed below: -
 - The fire at the Summerland leisure complex in 1973 (Sime, 1983).
 - King's Cross underground station fire in 1987 (Donald & Canter, 1990, 1992).
 - Ladbroke Grove rail disaster in 1999 (Weyman, O'Hara & Jackson, 2005).
 - The collapse of the World Trade Centre on September 11th 2001 (Fischer, 2002; Proulx, 2003; Blake, Galea, Westend & Dixon, 2004).
 - The London bombings on 7th July 2005 (Drury et al., in submission).
- However, behaviour does appear to become more self-centred – although still relatively constrained with social bonds intact – when escape, due to delayed warnings, becomes urgent and, therefore, there is insufficient time to evacuate in an orderly fashion (Sime, 1983, 1999; Johnson, 1988).

People were "*rationally moving from point 'a' to point 'b' or from danger to a safe place.*"

(Fischer, 2002, p.125)

Affiliation and Normative Models

Key Authors: -

- Mawson (1978, 2005)
- Aguirre (2005)
- Sime (1983)

- In contrast to the traditional model of panic, both affiliation and normative approaches stress that during an emergency situation or evacuation, crowd behaviours are not reduced to irrational, selfish tendencies but rather that the crowd retains its sociality.
- The affiliation model (e.g., Mawson, 1978, 2005) proposes that, when faced with an emergency or threatening situation, individuals exhibit 'affiliative behaviour' – i.e., they are motivated to move towards familiar places (e.g., preferring to leave by a familiar route, namely the way they came in, as opposed to an emergency exit; Sime, 1983, 1985) and towards familiar people (e.g., Sime, 1983). This proximity to familiar places and people – in line with the social attachment model (e.g., Mawson, 1978, 1980) – is thought to have a calming effect, reducing the fight or flight instinct (Mawson, 2005).
- For instance, studies of mass evacuation have found that family groups do not break down in an emergency, but attempt to evacuate together and remain united as a group (Sime, 1983; Cornwell, Harmon, Mason, Merz & Lampe, 2001; Cornwell, 2003, 2005), focusing on collective – rather than individual – survival (e.g., Johnson, 1988; Feinberg & Johnson, 2001). People prefer to delay evacuating until all members of the group are able to leave together (e.g., Aguirre, Wenger & Vigo, 1998; Perry, 1994; Fitzpatrick & Mileti, 1991). However, the drawback of this is that families may be slower to begin evacuation which, ultimately, can threaten their survival (Mawson, 2005).
- The normative model (e.g., Aguirre, 2005) proposes that behaviour in emergency situations is still governed by the same social rules as in normal situations. Hence, social, organisational and place-related roles and responsibilities appear to be maintained (e.g., Best, 1977; Canter, Breaux & Sime, 1980; Donald & Canter, 1992).

- For example, studies of the Beverly Hills Supper Club fire (1977) report that women generally received more help than men, whilst more men than women offered to help (e.g., Johnson, 1987; Johnson, Feinberg & Johnson, 1994), and that women typically offered emotional support to victims whilst men tried to fight the fire (e.g., Johnston & Johnson, 1988).

Criticisms

- However, these two models have been criticised for being disconnected from recent theories of group behaviour, such as the Elaborated Social Identity Model (e.g., Drury & Reicher, 1999; Stott & Drury, 1999), and for failing to explain the mutual concern and helping behaviours observed during an emergency in large crowds, comprised of people who do not know each other and who have no pre-existing social bonds (Drury & Cocking, 2007). Why do people take risks to help strangers?
- Moreover, according to the affiliation model, mass panic will arise if familiar places and people are not in close proximity, yet literature indicates mass panic occurs very rarely; thus, the lack of panic observed in emergencies cannot be explained (Aguirre, 2005).

Social Identity/Self-Categorisation Approach

Key Authors: -

- Drury & Cocking (2007)
- Cocking & Drury (2008)
- Drury, Cocking & Reicher (in press)

- In contrast, the social identity/self categorisation approach (e.g., Drury & Winter, 2004; Drury & Cocking, 2007; Cocking & Drury, 2008; Drury et al., in press) – based on both social identity theory and self-categorisation theory – is a model of mass emergent sociality and collective resilience, offered in explanation of the collective sociality of crowds – i.e., helping, cooperation and coordination behaviours displayed by individuals who do not know each other – in emergency situations.

“What is needed is an approach which allows for co-ordination and co-operation amongst a crowd of strangers, and which can explain sociality in emergencies (such as instances of helping strangers at a cost to the personal self) in terms of their crowd membership itself.”

(Drury & Cocking, 2007, p.11)

- This model suggests that the common experience of threat or emergency may transform a physical crowd into a psychological crowd, with a shared social identity (e.g., Reicher, 2001; Drury & Cocking, 2007; Cocking & Drury, 2008). According to the principles of social identity theory and self-categorisation theory, the way in which individuals understand their social identity – i.e., their self understanding defined in terms of specific group memberships, determined by the process of categorisation – depends not only on their knowledge of the group, but also on the specific context and on comparison with other groups.

- Thus, the salience of a shared social identity provides crowd members with perceptions of unity and expectations of mutual support (e.g., Cocking & Drury, 2008; Drury et al., in press) – i.e., a sense of ‘we-ness’ (Clarke, 2002) – whilst also helping to reduce stress levels (Drury & Reicher, 1999; Haslam & Reicher, 2006). This enables the crowd as a whole to act as a source of strength for individual crowd members (e.g., Levine, Prosser, Evans and Reicher, 2005; Drury et al., in submission).

“...disasters can create a sense of ‘we-ness’ leading to a common bond of solidarity amongst participants, where co-operation and altruism predominate rather than selfish behaviour.”

(Cocking et al., in press)
- This helps explain the collective behaviours – i.e., coordination, cooperation, helping behaviours and personal sacrifices – frequently observed amongst unfamiliar crowd members during an emergency (e.g., Johnson & Feinberg, 1997; Raphael, 2005; Drury & Cocking, 2007; Cocking & Drury, 2008; Cocking et al., in press; Drury et al., in press).
- In addition, research reports that increased social support in emergency situations is associated with reduced stress levels (e.g., Haslam, O’Brien, Jetten, Vormedal & Penna, 2005), increased optimism (Dougall, Hyman, Hayward, McFeeley & Baum, 2001), and lowered levels of depression (Tyler & Hoyt, 2000), whilst also moderating the damaging effects of disaster, such as post traumatic stress disorder (e.g., Eustace, MacDonald and Long, 1999).

KEY LEARNING POINTS

– Crowd Behaviour in Emergencies –

- **Panic in an emergency situation – typically characterised by antisocial, irrational behaviours – is actually very rare.**
- **Instead, behaviours typically remain structured and organised, with helping, cooperation and coordination behaviours often displayed.**
- **Behaviours become more self-centred when time to escape is limited and, therefore, orderly evacuation is not possible.**
- **Crowd members are typically motivated to move towards familiar people during an emergency. Thus, family members or groups of friends prefer to evacuate together, and will often wait to exit until all members of the group are able to do so. However, this slows the rate of evacuation.**
- **Crowd members are also typically motivated to move towards familiar places during an emergency – e.g., people prefer to use the exit with which they are most familiar, rather than an emergency exit.**
- **Social, organisational and place-related norms appear to be maintained during an evacuation. For instance, gender roles are typically retained, with women generally receiving more help, and offering more emotional support, than men.**
- **When united by an emergency situation, a physical crowd may be transformed into a psychological crowd, sharing a social identity. This shared identity then enables crowd members to act as a source of strength for one another and exhibit collective behaviours – i.e., coordination, cooperation, helping behaviours and personal sacrifices.**

Emergency Evacuations

Key Authors: -

- Donald & Canter (1990)
- Sime (1984)

- There are three key factors involved with the evacuation process (Canter, Breaux & Sime, 1990; Cepolina, 2005, Kang, 2007): –
 1. Interpretation
 2. Preparation
 3. Action

Interpretation

- This initial stage in the evacuation process concerns the meanings people attach to warnings issued about emergency situations.
- Communication and accessibility of information are vital (e.g., Perry, Greene & Lindell, 1980; Mallett, Vaught & Brnich Jr., 1993; Muir, 2004; Raphael, 2005; Ripley, 2005; Alsnih & Stopher, 2006; Drury & Cocking, 2007; Cocking & Drury, 2008; Cocking et al., in press). Indeed, Drury and Cocking (2007) argue that systems of communication should be prioritised over and above physical features, such as exit widths.
- The time pressures and stress of an evacuation situation affect the way in which individuals process environmental information and, consequently, the decisions they make (e.g., Proulx, 1993; Ozel, 2001). Therefore, clear information concerning the threat along with clear instructions about how to exit are needed to improve evacuation efficiency (e.g., Proulx & Sime, 1991; Proulx, 1993; Johnson, 1988; Johnston & Johnson, 1989; Johnson et al., 1994; Johnson & Feinberg, 1997). Even when physical safety standards are satisfied, limited information about a threat makes the whole crowd more vulnerable (e.g., Sime, 1991).

Emphasis on the physical aspects of an evacuation means the crowd is treated as “a homogenous mass of bodies or ‘ballbearings’, rather than.....a collection of individuals and social groups who need accurate and timely information if they are to remain safe.”

(Sime, 1995, p.1).

- Warnings – in order to be both interpreted accurately and believed – must: -
 - Be specific (e.g., Proulx & Sime, 1991; Sime, 1999).
 - Be comprehensible (Mileti & Fitzpatrick, 1991).
 - Be timely (Dombroski, Fischhoff & Fischbeck, 2006).
 - Be historically valid (Edelman, Herz & Bickman, 1990).
 - Come from a credible source (Kimura & Sime, 1988).

- Convey the nature and extent of the danger (Ikeda, 1982).
- Enable rapid verification.
- Provide cues to help people prepare for action (Mallett et al., 1993).
- Warning sirens alone have been shown to be insufficient, i.e., interpreted as meaningless noise (e.g., Ramachandran, 1990). Rather, specific information is needed (e.g., Proulx & Sime, 1991; Benthorn & Frantzich, 1999; Sime, 1999), along with visual display signs (Horasan, 1999) and a public address system to provide verbal instructions (Bryan, 1982; O'Neill, 1991; Sime, 1999; Li, Sun & Zhang, 2007).
- Authorities are often reluctant to issue warnings, for fear of causing panic (Sime, 1980), yet this delay could actually increase the risk of casualties since individuals then have less time to evacuate (Sime, 1994, 1999; Mawson, 2005). Thus, through actions intended to avoid panic, authorities may actually increase the likelihood of it occurring.

“Traditionally managers of public buildings have considered that in the event of an emergency it is better not to tell people the truth if panic is to be avoided. This belief has been translated into safety procedures which in disasters have characteristically withheld information about a threat of a fire from the public beyond the point when escape has been possible... The delay is paradoxically a major determinant of flight behaviour, crushing and deaths in major crowd disasters.”

(Proulx & Sime, 1991)

- Providing more, rather than less, information about the nature of the threat or emergency should help the crowd respond more effectively¹¹ (Proulx & Sime, 1991; Wessely, 2005; Cocking et al., in press).

¹¹ Although we have not seen any relevant literature, it would seem plausible that a possible exception to the consistent research finding that it is beneficial to keep crowds fully informed about the nature of any emergency, could be in the case of terrorism warnings. In situations such as these, for example, there may not be an actual (i.e., it is purely a threat) or immediate (i.e., there is a specific time frame) danger from which to evacuate. Therefore, fully informing the crowd of such a warning – i.e., making them aware of a possible terrorist act – rather than simply providing general information about needing to evacuate due to an ‘incident’, may greatly heighten the crowd’s anxiety and serve to create a dangerous situation, with people rushing, pushing and potentially causing crushing, in order to leave. Given the police’s vast experience in dealing with this particular issue, we would therefore recommend that they decide on the most appropriate course of action in such circumstances.

- Moreover, provision of information should encourage the crowd to trust authorities, which is crucial for effective evacuation (Drury & Cocking, 2007; Cocking & Drury, 2008); withholding information simply leads the crowd to mistrust authorities, and to question whether they are providing accurate information in future emergencies.
- Telling people “not to panic” represents the same lack of trust in the crowd as withholding information and may actually increase anxiety, as crowd members may feel they are expected to panic (Durodié & Wessely, 2002).

Preparation

- This depends on the extent of individuals' understanding of their own roles in the emergency and their corresponding appropriate actions, gained from information and communication before and during the crisis (Turner & Toft, 1989).
- Those trained for an emergency will be able to react and respond more quickly (Donald & Canter, 1990), whilst those who are clearly told what to do are likely to respond in a more timely and appropriate manner, since communication lessens the uncertainty of the situation, thereby enabling people to prepare for action more efficiently (Donald & Canter, 1990; Aubé & Shield, 2004).
- Thus, leader figures – either from the authorities or from within the crowd itself – play an important role preparing crowd members for the evacuation process (e.g., Dyer et al., 2008). However, the spatial positioning of those leaders is influential over both the speed and accuracy of crowd movement (Aubé & Shield, 2004), with leaders positioned in the core, rather than the periphery, of the crowd – i.e., in close proximity to other crowd members – more likely to be influential over crowd movement (e.g., Leca et al., 2003; Dyer et al., 2008).
- Therefore, careful consideration must be given to the number of individuals within the crowd (whether these are stewards or crowd volunteers) who should be made aware of the location of emergency exits – i.e., informed individuals – and where these informed individuals should be positioned within the crowd to most effectively act as leaders in an emergency evacuation (Aubé & Shield, 2004; Dyer et al., 2008).

Action

- Since emergencies are relatively rare and, therefore, non-routine, individuals are predisposed to deny an incident is taking place, preferring instead to believe that an emergency situation is in fact normal for as long as possible and, subsequently, to carry on behaving as normal for as long as possible (e.g., Meltzer, Petras & Reynolds, 1975; Donald & Canter, 1990, 1992; Yoshida, 1996; Johnson, 2005; Yang, Zhao, Li & Fang, 2005; Proulx & Reid, 2006).

“Under normal circumstances it is people’s understanding of, and adherence to, the rules of place that allow a place to function. However, in an emergency such rule following may be inappropriate.”

(Donald & Canter, 1992, p.205)

- This failure to initiate some form of evacuation response is often termed ‘behavioural inaction’ (e.g., Muir, Bottomley & Marrison, 1996; Leach, 2004).
- As detailed earlier, people develop – and, subsequently, follow habitually – scripts or schema for environments with which they are familiar (Donald & Canter, 1992). These schema become ingrained and very hard to break; hence, in an emergency situation individuals will typically act as normal for as long as possible, despite the inappropriateness and danger (Donald & Canter, 1992; Yoshida, 1996; Proulx & Reid, 2006).
- Therefore, it is vital that evacuees are provided with clear information and specific instructions, in order to override their schema and break with their familiar behaviours (Donald & Canter, 1990, 1992).

“People seemed to be faithful to their duties. It can be said that this response is proof of their coolness. However, people in an emergency seldom recognize the urgency and generally do not respond immediately to a hazard. Instead, they try to carry on their daily behaviors and follow the established rules until the circumstances become urgent. In addition, people in groups do not make decisions by themselves, but rather, wait for orders from a leader. Therefore, it can be said that they acted naturally.”

(Yoshida, 1996, p.181)

- Thus, evacuation time concerns not only the time taken for individuals to move towards an exit, but also the time taken before movement is initiated (e.g., Kimura & Sime, 1988; Johnson & Feinberg, 1997) – i.e., the time taken to recognise there is a danger and to then decide which is the most appropriate course of action (Graat, Midden & Bockholts, 1999). Therefore, to enhance evacuation efficiency and, in particular, to start people moving, communication and information are vital (e.g., Still, 2000).

“...the problem in disasters is not that people tend to panic and act precipitously in response to danger, but that people typically delay or fail to take appropriate evasive action when it is needed.”

(Mawson, 2005, p.107)

- For example, speaking on the BBC’s Horizon Programme (“*How to Survive a Disaster*”, Tuesday 10th March 2009, BBC2, 9pm¹²) about his analysis of the evacuation of the World Trade Centre on 11th September 2001 (see also Blake et al., 2004), Professor Ed Galea, Director of the Fire Safety Engineering Group at the University of Greenwich, emphasised just how slow many individuals were to react.
 - The average time for individuals to abandon their usual activities and begin evacuating was between 5 and 8 minutes, although some people continued their normal behaviours for up to 30 or 40 minutes after the planes hit, sending emails, shutting down their computers, or going to the toilet before leaving the building.
 - This may be because people were predominantly unaware of what was happening and, consequently, were unsure of the most appropriate form of action. Therefore, they followed their routine place scripts for as long as possible.
 - Additionally, this lack of immediate response may be due to individuals underestimating the acute need to react and respond quickly in an emergency situation.

¹² For further details see <http://www.bbc.co.uk/programmes/b00j7p7z> and <http://news.bbc.co.uk/1/hi/magazine/7933386.stm>

“Every second can mean the difference between life and death.”

Professor Ed Galea
University of Greenwich
Speaking on the BBC Horizon Programme
10th March, 2009

- Similarly, eyewitness accounts of a fire at a Woolworths store in Manchester in 1979, report that many people were reluctant to leave the canteen without paying for their food or finishing their meals (e.g., Johnson, 2005). In other words, people continued their behaviours as normal, following their routine place scripts for the canteen, rather than evacuating immediately. Tellingly, nine of the ten deaths in the fire occurred in the canteen (Johnson, 2005).
- It is also important to acknowledge that when initially responding to an alarm, or the threat of danger, people’s responses are heavily dependent on the responses of those around them. For instance, if other people remain where they are, ignoring the alarm, then a person may assume there is no urgency required, or that it is merely a drill of some kind.
 - This was powerfully demonstrated in a classic social psychology experiment conducted by Latané and Darley (1968). Participants were required to sit in a room completing a questionnaire. After several minutes, smoke was pumped into the room through a wall vent. In reality, this smoke was harmless, and generated solely for the experiment, but the participants were unaware of this.
 - There were two experimental conditions: participants were either alone, or in a group of three people (the other two members of which were confederates of the researchers, who were aware of the purpose of the study and did not react to the smoke).
 - When alone, over 70% of the participants left the room to report the smoke, and 50% had done so within two minutes. However, in the group condition, where the two other people ignored the smoke, 90% of participants failed to report it, staying in the room for the whole six-minute period, whereupon the experiment was terminated.

- According to Canter and colleagues (e.g., Canter et al., 1980; Canter, 1990; Donald & Canter, 1990, 1992) – based on the theory of place scripts described previously – individuals' behaviour in an emergency situation is best understood in terms of: -
 - The type of place in which the emergency occurs.
 - The role an individual occupies in that place.
 - The place-related and goal-related activities which an individual is engaged with prior to the emergency.
 - The way in which the place is used in a normal situation.
- Thus, once action is initiated, choice of escape route is influenced by evacuees' perceptions of their environmental situation, in terms of familiarity; for example, people typically prefer to leave same way as they came in, through a normal as opposed to emergency exit (e.g., Ramachandran, 1990; Johnson & Feinberg, 1997; Benthorn & Frantzich, 1999; Pelechano & Malkawi, 2008). Therefore, they may be reluctant to evacuate via an exit usually prohibited, such as onto a football pitch, unless forced to do so (e.g., Canter et al., 1989; Donald & Canter, 1990).
- Proximity of exits is a further environmental factor which can influence choice of exit route – a good distribution of emergency exits is needed to minimise the distance to be travelled by each individual (e.g., Sime, 1983, 1985; Notake, Ebihara & Yashiro, 2001).
- Movement and behaviour are also influenced by the actions of fellow evacuees (e.g., Sime, 1983; Lo, Fang, Lin & Zhi, 2004; Alsnih & Stopher, 2006; Lo, Huang, Wang & Yuen, 2006). For example, people typically follow the movement of others during an evacuation (Yang, Zhao, Li & Fang, 2005; Zhao, Yang & Li, 2008). More specifically, family members typically exhibit kin behaviour in such situations, wherein they will gather together and wait for each other (backtracking if necessary) before exiting (Handmer, 2000; Cornwell, 2005; Yang et al., 2005). However, this makes the evacuation process less efficient.
- Studies of evacuation behaviour from aircraft (e.g., Muir, Marrison & Evans, 1989; Muir & Cobbett, 1996; Muir & Thomas, 2003, 2004) demonstrate that evacuation times can be slowed as a result of competitive behaviour, whereupon blockages and struggles occur as people fight to escape. Conversely, evacuation times can be improved when staff act assertively – both vocally and physically – to guide evacuees. This reinforces the importance of communication and leadership during the evacuation process (e.g., Aubé & Shield, 2004; Dyer et al., 2008).

- Similarly, the evacuation process can be improved by regularly practicing evacuations (Borodzicz & van Haperen, 2002; Blake et al., 2004; Drury & Cocking, 2007). For example, as a result of practicing, the emergency response time to the attack on the World Trade Centre in 2001 was much faster than it was to an earlier attack in 1993 (Fahy & Proulx, 2002).
- Drawing all these aspects together, Still (2000), based on the work of Sime (e.g., Sime & Proulx, 1991; Sime, 1992a, 1992b, 1994), proposes thirteen different factors which can impact on the rate – and ultimately success – of an emergency evacuation (see Table 4).
- For instance, as discussed previously, the timeliness, accuracy, clarity and credibility of communication – in multiple forms as opposed to a single alarm – are highly influential over initiating crowd movement in an evacuation. More complex environments will typically result in greater indecision with regards to choice of evacuation route, although this can be lessened by clearly visible emergency exit routes and signs. The physical position of an individual – i.e., whether lying, seated or standing – will also impact on reaction rate, as will the extent to which an individual feels committed to the environment.
- Finally, it is important to recognise that crowd members will want to help during an emergency and to make use of their resilience and willingness to do so (e.g., Glass & Schoch-Spana, 2002; Durodié & Wessely, 2002; Cocking & Drury, 2008; Cocking et al., in press; Drury et al., in submission).

Table 4. Factors important in the assessment of emergency egress

(Taken from Still, 2000, pp.95-97)

Factor	Description
Communication	Method of alerting the crowd to the danger, e.g., alarms, warning announcements, environmental factors (e.g., increase in temperature), movement of other people, and visual clues. Timeliness, accuracy, clarity and credibility of communication will influence the time taken for the crowd to begin to move.
Mobility	The speed at which an individual is capable of moving within a crowd. Mobility differs depending on age, disability, baggage, etc.
Social affinity	The position of an individual within an affinity cluster (i.e., within a family group) impacts on their behaviour during an emergency, e.g., a mother will instinctively put the safety of her child before her own.
Alertness	The speed with which an individual reacts will be affected by his or her state of alertness.
Role	The role of an individual will influence his or her own reaction to an emergency situation, and the reactions and behaviours of others, e.g., the role of police in relation to a crowd will influence the crowd's behaviour.
Position	The physical position of an individual, e.g., whether sitting, standing, or lying down, will affect his or her rate of reaction and movement in an emergency.
Commitment	The degree to which an individual feels committed to the environment in which the emergency occurs will influence his or her reactions, e.g., an individual may react more strongly to an emergency in the home compared with an emergency in the office.
Focal points	The visibility of focal points during an emergency evacuation, e.g., emergency exit routes and signs, will influence the speed at which evacuation occurs.
Visual access	The more visible the signage or emergency egress route, the more attractive the route will be to the individual.
Familiarity	The more familiar the individual is with the environment or building, and with the evacuation procedures, the shorter the reaction time and movement time will be.
Complexity	The more complex the environment, the more indecisive individuals will be, and the longer it will take for them to react and move.
Enclosure	Individuals instinctively want to reach safe ground in an emergency, and typically want to escape outside. However, it may sometimes be safer to evacuate a crowd inwards, or to a less obvious place of safety.
Population density	The density of the crowd will impact of how quickly they will be able to move and evacuate.

KEY LEARNING POINTS

– Emergency Evacuations –

- **Three key factors are involved with the evacuation process: 1) interpretation; 2) preparation; and 3) action. Interpretation is particularly critical.**
- **Communication and information – more rather than less – are vital to initiate movement and enhance the efficiency of an emergency evacuation.**
- **Warnings must be specific, timely, historically valid, credible and comprehensible, and must be visual and audio – sirens alone are insufficient.**
- **Delaying warnings, for fear of causing panic, merely delays emergency evacuation and, therefore, increases the risk of casualties.**
- **Individuals are predisposed to believe a situation is normal for as long as possible, and so behave as usual – according to their ingrained place scripts – thereby delaying evacuation. Clear information and specific instructions are needed for individuals to override their schema and evacuate as appropriate.**
- **Choice of escape route is influenced by familiarity – i.e., people prefer to take their usual entrance or exit, as opposed to an emergency exit – and by the actions of others – e.g., people typically follow others during an emergency, whilst family members will gather together and evacuate as a group.**
- **Additional factors which may influence evacuation rate include physical position in the environment, alertness, visibility of exit routes and emergency exit signs, density of the crowd, and complexity of the environment.**

Literature on Relevant Crowd Disasters

Literature on Relevant Crowd Disasters

- This section outlines the findings from an in-depth review of the literature concerning crowd disasters.
- More specifically, the section will: -
 - Discuss why it is important to examine crowd disasters.
 - Outline some central reasons for the occurrence of crowd disasters.
 - Discuss why lessons are not adequately learned from previous crowd disasters.
 - Analyse four particularly relevant disasters involving crowds.

The Importance of Examining Crowd Disasters

- The psychological, social and political effects of a crowd disaster – despite being relatively rare and with limited deaths – can be huge (e.g., Hills, 1998; Sime, 1999). Therefore, it is crucial to examine recent crowd disasters so that lessons for future events may be identified (e.g., Lucas, 1992).
- Table 5 displays a range of examples of crowd related disasters. Note that disasters are still occurring to the present day – i.e., lessons still need to be learned.
- Four crowd disasters will also be discussed in detail, namely: -
 - Hillsborough Stadium Disaster (1989)
 - King's Cross Fire (1987)
 - Bradford City Fire Disaster (1985)
 - Hajj Pilgrimage Disaster (2006)
- Although these disasters – with the exception of the Hajj Pilgrimage – may at first appear to not be recent enough to warrant analysis, they have been specifically chosen to highlight the major lessons identified – and still retained to the present day – in relation to successful crowd and event management. Moreover, since this analysis is based on a literature review, it seemed appropriate to consider the less recent disasters with plentiful coverage in the literature, rather than more current incidents with little mention in research.

Table 5. Examples of crowd related disasters(Information taken from www.crowddynamics.com and Lee & Hughes, 2006)

Year	Place	Event	Disaster Causes	Deaths	Injuries
1971	Glasgow, Scotland	Football match	Fans were crushed to death when barriers in the stadium collapsed near the end of a match between Celtic and Rangers. Fans leaving were met by a group trying to return upon hearing of a late Rangers equaliser.	66	140
1992	Los Angeles	Riots	Four days of civil disturbance began after four police officers involved in the Rodney King trial were acquitted.	51	2383
1993	Lan Kwai Fong, Hong Kong	Street party	Individuals attending the party were crushed to death. Poor location (narrow, steep streets), poor police planning and bad weather were all involved.	21	67
1998	Gothenburg Sweden	Disco	Party-goers died in a fire which engulfed the dance hall. The party was vastly overcrowded and only one exit, of reduced capacity, was available.	63	200+
1999	Minsk, Belarus	Daily commute	Slipping, trampling and crushing occurred as a crowd of 2500 people rushed to get out of the rain at the train station.	53	150
2003	Rhode Island	Rock concert	Massive fire engulfed the club, which had insufficient evacuation facilities.	100+	
2005	Wai, India	Religious festival	Hundreds of worshippers were crushed to death during a vastly overcrowded religious procession, when worshippers began to stampede upon hearing there was a fire.	258	200
2008	Indonesia	Rock concert	Ten young people were crushed to death when hundreds of fans tried to force their way out of the concert.	10	6
2008	Himachal Pradesh, India	Religious festival	Hindu worshippers, many of them women, children and the elderly, were crushed to death as a result of a massive crowd surge, upon hearing a landslide was imminent.	150	50

Reasons for Crowd Disasters

- During – and in the aftermath of – a disaster, the crowd themselves are often blamed, as a result of pushing, shoving, and exhibiting inexcusable behaviour (Sime, 1995), in line with early crowd behaviour theories espousing irrational behaviour and loss of control (e.g., Le Bon, 1908). However, as discussed previously, crowds are rarely irrational (e.g., Hughes, 2003; Mawson, 2005; Lee & Hughes, 2007) and often remain organised and cooperative in an emergency situation (e.g., Drury & Winter, 2004; Drury & Cocking, 2007; Cocking & Drury, 2008; Cocking et al., in press; Drury et al., in press, in submission).
- According to Dickie (1995), there are four key factors which can be found in the majority of crowd disasters: -
 1. Inadequate planning.
 2. Excited crowd.
 3. Lack of crowd management and control.
 4. A flaw or hazard in the facility.

“Disasters are characterised by poor communications prior to, during and in the aftermath of an incident, in which it is very often the victims, rather than the designers and managers of crowd settings who are blamed.”

(Sime, 1995, p.2)

“Poor venue design and crowd management as a result of inadequate research into crowd behaviour has led to many disasters resulting in wider scale loss of life and injury.”

(Langston, Masling & Asmar, 2006, p.396)

- Fruin (1985, 1993) proposes four primary factors – derived from analyses of major crowd incidents, the basic principles of traffic flow, and personal experience – which can raise the probability of crowd disasters occurring: -
 1. Increased force – i.e., the pushing forces and pressures within a crowd, such as those produced by a crowd crush. The greater the forces, the greater the likelihood of crushing occurring and, consequently, the greater the risk of disaster. Indeed, Fruin (1993) reports that crowd forces in fatal disasters have measured up to 4500N (1000 lbs).
 2. Lack of information – i.e., insufficient provision of information (e.g., communications, signs, or actions of personnel) according to which individuals in the crowd act or react, whether real or perceived, true or false.
 3. Inappropriately designed and/or inadequate space – i.e., the extent to which the layout and/or amount of space (e.g., standing and seating areas, stairs, doors, or escalators) which comprise an event location are able to accommodate safe crowd movement.
 4. Unmanaged time – i.e., lack of consideration given to how crowd flow and density can be successfully managed by controlling timings, e.g., mass crowd arrival leads to high densities as opposed to safer, staggered entry which results in gradual density increases.

“When people lose their balance and fall down, the mass tramples them, as the pushing crowd is not controllable. The injured people may turn into obstacles for others, which can produce piles of fallen people.”

(Helbing et al., 2005, p.3)

- According to Sime (1995), crowd disasters are characterised by: -
 - Poor communication before, during and after an event. For example, crowds are often given insufficient information about the potential danger or emergency situation and, therefore, have insufficient time to evacuate (Sime, 1999).
 - Poor coordination throughout an event.

- Conflict between security demands – i.e., crowd control – and safety demands – i.e., crowd management – with security seen as a higher priority.
- Excessive numbers concentrated around an entrance or exit point – where flow rate is naturally reduced – resulting in vast overcrowding and increased crowd forces, ultimately leading to trampling and crushing.
- Pauls (1984) suggests the key factors which must be addressed for safe crowd ingress are: -
 - Location and number of entrances.
 - Separation of ticketing and admission areas.
 - Risk of excessive crowd concentration.
 - Design of doors to allow maximum ingress and egress.
- Pauls (1984) also notes that people at the back of a crowd or queue are often unaware of what is occurring – most typically a crush – at the front of the crowd or queue – known as ‘front-to-back’ communication failure – and, therefore, unknowingly contribute to the forces causing that crush.

“Crowd incidents often exhibit what can be termed a failure of front-to-back communication.”

(Pauls, 1984, p.31)

Failure to Learn from Crowd Disasters

- Elliott and Smith (2006) suggest that, despite the plentiful crowd disasters which have occurred over the years, there is still an overall failure to learn the lessons identified.
- In football, for example, disasters have continued to occur, in spite of official reports detailing key lessons (Elliott & Smith, 2006).
 - For instance, the report into the Hillsborough disaster by Lord Justice Taylor in 1989 (see 'Hillsborough Football Stadium Disaster (1989)', pages 170 to 178, for further details) was the ninth official report concerning crowd control and safety at football grounds. So, why were the lessons from the previous eight reports not heeded?
- Similarly, Donald and Canter (1990) in their analysis of the King's Cross underground station fire in 1987 (see 'King's Cross Underground Fire (1987)', pages 179 to 183, for further details) argue that the disaster was predictable, given the knowledge available about human behaviours in emergency situations. So once again, we must question why lessons were not learned.
- According to Elliott and Smith (2006) and Canter (1989), this failure is partially due to the fragmented, piecemeal approach adopted in relation to crowd safety concerns, rather than consideration of the system as a whole. If lessons are to be effectively learned, there must be consistency.
- There also appears to be a technocratic emphasis on crowd safety and control. Thus, as issues regarding safety and control are conceptualised as technical considerations, the solutions sought are predominantly technical ones (Canter, 1989).

"One of the tragedies of that event is indeed that it was entirely predictable from what we knew of behaviour in emergencies."

(Donald & Canter, 1990, p.16)

"Sadly, purely technical solutions rarely take full account of the complexity of crowd-related disaster."

(Elliott & Smith, 2006, p.387)

- However, in line with socio-technical systems theory (see **Understanding Crowd Behaviours: Guidance and Lessons Identified**, 'The Need for a Systems Approach', pages 86 to 93, for further details) – which argues for the need to consider in parallel, and jointly optimise, both social and technical factors – if lessons are to be effectively learned and the occurrence of crowd disasters thereby reduced, a wide range of factors – such as culture, communication, and human behaviour – must be considered.

“A failure to search for the underlying causes of tragedy combined with a search for simple technical solutions as a panacea for ground safety problems and a complacent attitude among senior managers, inevitably leads to a certainty that football disasters are not things of the past.”

(Elliott & Smith, 2006, pp.388-398)

Hillsborough Football Stadium Disaster (1989)

Key Facts: -

- 15th April, 1989.
- Semi-final of FA Cup between Liverpool and Nottingham Forest.
- 96 deaths, over 400 injuries.
- Key reasons – severe overcrowding, poor ground design, lack of communication, and lack of crowd management and control by police.

Evolution of the Disaster¹³

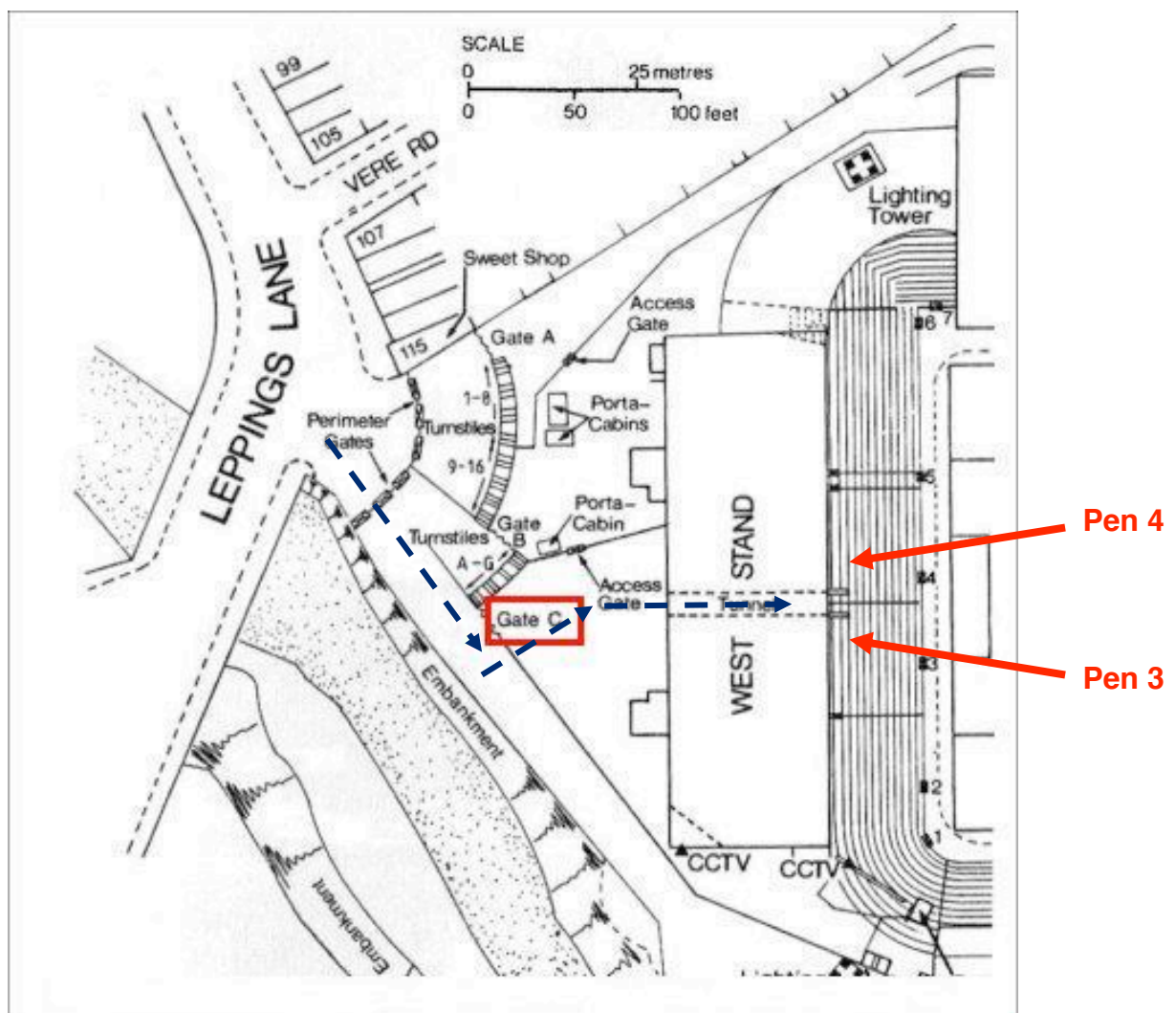
- 24 256 Liverpool fans were allocated the West Stand, the Leppings Lane terrace and the North Stand of Hillsborough football ground.
- These were all accessed via 23 turnstiles at Leppings Lane.
- Delays in their journey meant vast numbers of Liverpool supporters only arrived at the stadium 30 minutes before kick-off.
- This resulted in a considerable build-up of fans between 2.30pm and 2.40pm, with a bottleneck developing as more fans arrived than were able to enter.
- Congestion at the turnstiles overwhelmed the police, as an estimated 5000 fans tried to get through the turnstiles.

¹³ Information about this disaster taken from Taylor (1990), Nicholson and Roebuck (1995), Lea, Uttley and Vasconcelos (1998), Scraton (1999), and Elliott and Smith (2006).

- The lack of stewarding, organisation and crowd filtering meant that as more and more fans arrived and crowd pressures mounted outside the ground, a crush was inevitable.
- After some hesitation, in order to relieve the growing crush, Chief Superintendent Duckenfield decided to open an exit gate (Gate C), bypassing the turnstiles.
- This led to a rush of over 2000 supporters entering the ground through Gate C at 2.52pm, just before kick-off at 3pm.

Figure 8. The Leppings Lane end of Hillsborough

(Taken from Still, 2000, p.28)



- Entry was via a steep, narrow tunnel into two central pens (3 and 4) in the Leppings Lane terrace directly behind goal. Several side pens were half empty.
- However, there were no police or stewards at the pens to control entry and evenly distribute the fans.
- This resulted in huge back-to-front crushing in pens 3 and 4, as people at the back of the pens were unaware of fans being crushed against the perimeter fence at the front.
- Barrier 124A then collapsed under the severe crowd pressure, resulting in people falling over, being trampled and, ultimately, being crushed to death. Many simply died standing up due to the mass overcrowding.
- The police initially failed to respond, as Chief Superintendent Duckenfield – despite observing the crowd from the control box – failed to identify the seriousness of the situation, and since officers were under strict instructions to not open the perimeter gates leading onto the pitch unless specifically told to do so.
- Some fans started to climb the perimeter fence to try and escape the crush, whilst others forced open a small gate in the fencing and evacuated onto the pitch or were pulled up to safety in the West Stand by fellow supporters.
- Eventually, the police advised the referee to stop the match, and it was abandoned at 3.06pm.
- Two perimeter gates were opened and fans began to evacuate onto the pitch. Others were dragged from the pens and resuscitation attempts were made. Advertising boards were torn down by fans to act as makeshift stretchers, with fans – who were not turned back by police for fear of trouble – carrying the injured the full length of the pitch to emergency aid.

“Pens like cattle pens, fences to the side and at the front; and no way back.”

(Scratton, 1999, p.282)

“The screams of the dying were drowned by the thunderous roar of the crowd as the match kicked off.”

(Scratton, 1999, p.282)

Reasons for the Disaster

- Lack of communication.
 - Poor communication between police and stewards inside and outside the ground, particularly during the last minute rush of fans into the ground. Thus, those inside the ground had no time to prepare for the influx of fans.
 - Lack of communication with fans outside the ground to provide information about ingress problems. Had fans been aware of the problems ahead, they may have been less agitated and more patient.
 - Poor communication between police/stewards and the crowd, meaning fans were not warned about the overcrowding and excessive congestion ahead. This resulted in a front-to-back communication failure (Pauls, 1984), with those entering the pens unaware of the crush at the front.
 - Lack of communication and coordination between the different agencies involved – i.e., lack of agreement between police, stewards and event administrators about overall control of the situation and specific roles and responsibilities of each party.

- Lack of crowd management and control.
 - Failure of police control was cited as the main reason for the disaster in the official inquiry (Taylor, 1990).
 - Little control was exerted over the growing crowds outside the stadium.
 - Poor crowd management by stewards and police inside the ground, resulting in an uneven distribution of people in the terraces, and ultimately leading to the overcrowding in pens 3 and 4 (Sime, 1995).
 - Chief Superintendent Duckenfield failed to exert any control over the ingress of fans once the decision had been made to open Gate C. A contingency plan should have been in place, outlining the procedures to follow should it be necessary to open Gate C.
 - Overall, the police were very slow to recognise and understand what was occurring.

- Severe overcrowding.
 - Cited as the main cause in the official inquiry (Taylor, 1990).

- Prior expectations about crowd behaviours.
 - At the time of the disaster, hooliganism was rife in football and, therefore, disorder was expected. This influenced policing and crowd management for the event.

 - Segregating the Liverpool and Nottingham Forest fans, to prevent disorder, was of primary concern (Lea et al., 1998). Even whilst the disaster was unfolding, police were deployed to form a cordon across the pitch to prevent opposing fans – despite wanting to help injured supporters – coming into contact.

“...insufficient concern and vigilance for the safety and well-being of spectators... compounded by a preoccupation with measures to control hooliganism.”

(Taylor, 1990, p.4)

 - The focus was on crowd control rather than safety, again influenced by the expectations of violence and football hooliganism (e.g., Scraton, 1999).

 - Cries for help – indicative of the disaster unfolding – were ignored by police, due to their prior assumptions that fans would behave in an anti-social manner.

 - When fans were seen climbing the perimeter fences, a pitch invasion was assumed and so perimeter gates were not opened.

- Failure to learn lessons from previous incidents (Elliott & Smith, 2006).
 - Crushing was reported during the 1988 FA Cup semi-final at Hillsborough, also between Nottingham Forest and Liverpool.

 - In addition, overcrowding of pens 3 and 4 had been so severe in 1988 that police had blocked off the tunnel leading to the pens.

 - However, no official record was made of the actions taken during the match debrief, nor were they taken into account when preparing for the match in 1989.

- The major incident plan was not operationalised (Scruton, 1999).
 - It may have been more appropriate to delay the start of the match, to allow fans time to enter safely.
 - Consideration was not given to the safe evacuation of fans.

The following three diagrams demonstrate the varying perspectives of the police, the event administrators and the supporters, in relation to the unfolding incidents at Hillsborough.

Figure 9. Perspective of the police at Hillsborough
(Taken from Lea, Uttley & Vasconcelos, 1998, p.349)

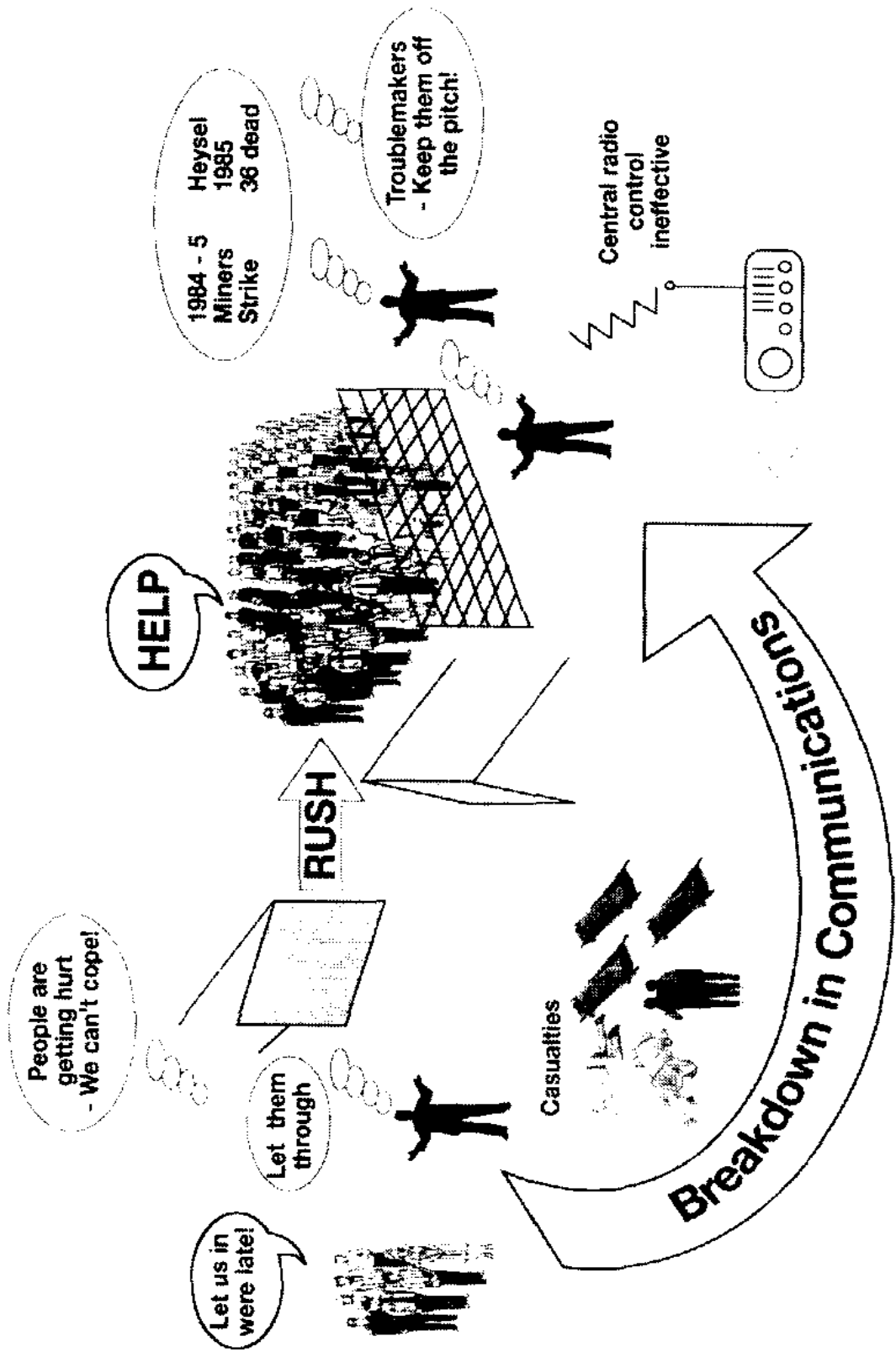


Figure 10. Perspective of event administrators at Hillsborough
 (Taken from Lea et al., 1998, p.350)

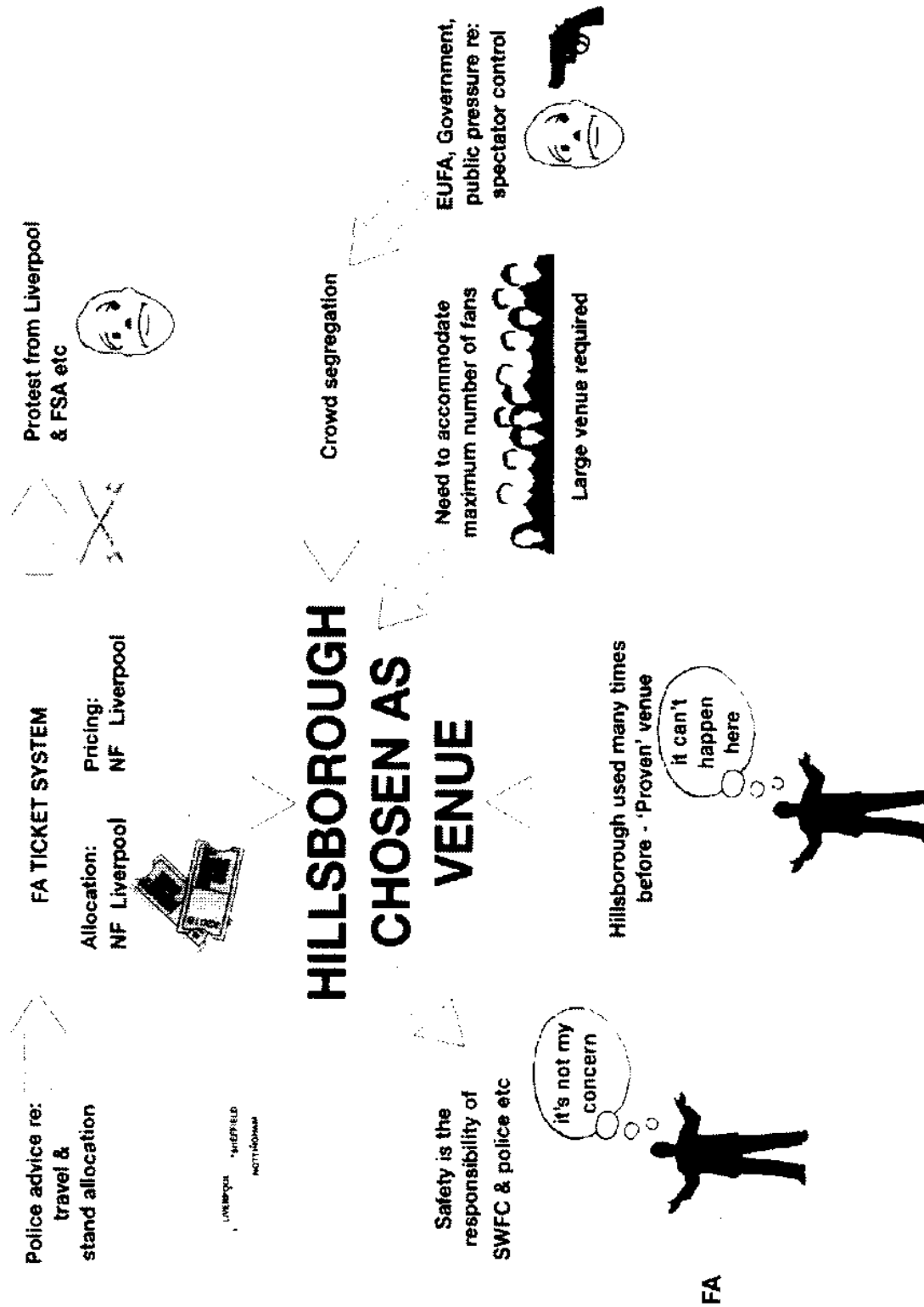
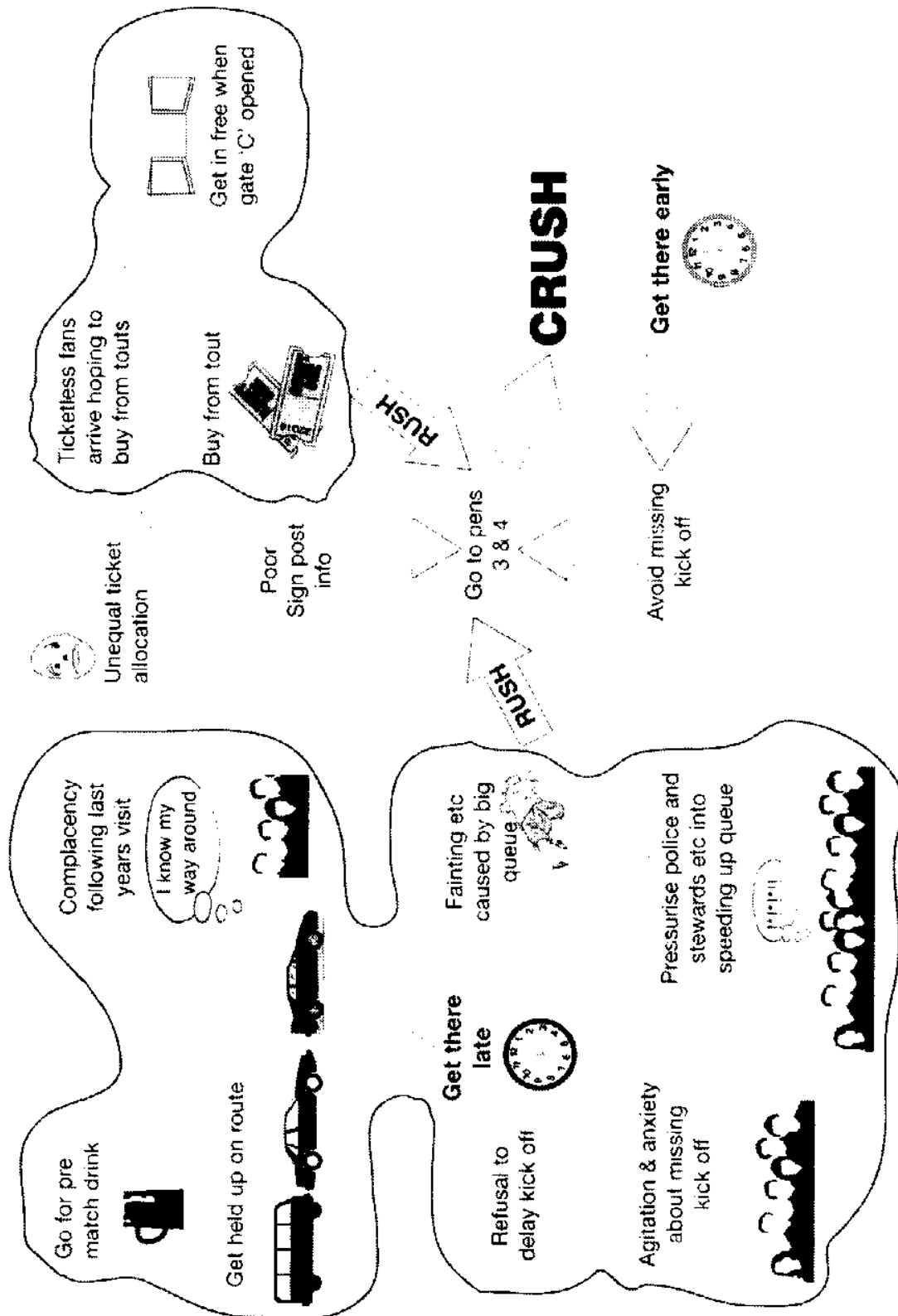


Figure 11. Perspective of supporters at Hillsborough
 (Taken from Lea et al., 1998, p.351)



King's Cross Underground Fire (1987)

Key Facts: -

- 18th November, 1987.
- 31 deaths, over 60 injuries.
- Key reasons – poor communication and crowd management, lack of evacuation training and poor building design.

Evolution of the Disaster¹⁴

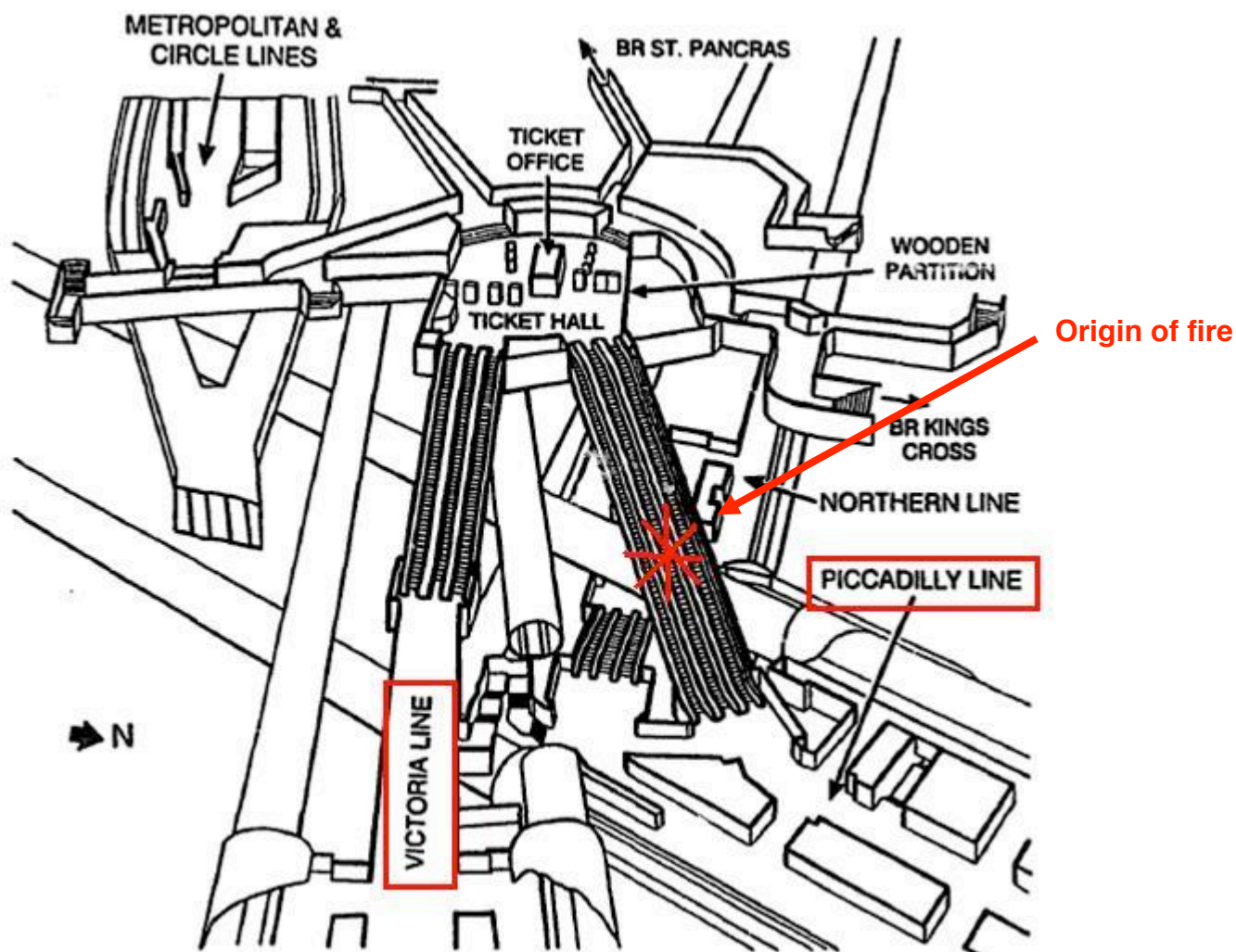
- The fire is thought to have started at around 7.25pm on an escalator leading up from the Piccadilly line into the booking hall at King's Cross underground station.
- At approximately 7.30pm, a passenger informed a member of staff about the fire. In accordance with the rules, the member of staff went to investigate, but did not inform either the station manager or the line controller.
- Approximately one minute later, another passenger pressed the emergency stop button on the escalator.
- Two British Transport Police went to investigate the situation and saw a small fire on the escalator. They then called the fire brigade at about 7.34pm.
- Passengers were steered away from the Piccadilly line escalators and directed instead towards the Victoria line escalators.
- Passengers were also evacuated from the underground platforms, via the Victoria line escalators, into ticket hall, towards the Metropolitan line concourse and finally out onto the street.

¹⁴ Information about this disaster taken from Fennell (1988), Donald and Canter (1990, 1992), Crossland (1992), Moodie (1992), and Moodie and Jagger (1992).

- The fire brigade arrived at approximately 7.43pm. Some firemen prepared the hoses and breathing apparatus, whilst others went into the station to assist with the evacuation.

Figure 12. Diagram of King's Cross Underground

(Taken from Moodie, 1992, p.15)



- Trains continued to arrive and passengers to be evacuated.
- At approximately 7.45pm, a flashover – as a result of a massive and sudden increase in temperature – occurred in the main ticket hall, filling it with poisonous black smoke and balls of fire.

- The flashover spread into the passages leading to the main ticket hall and into the Victoria line escalators, via which passengers had originally been evacuated.
- Passengers were then evacuated onto the trains and the fire was eventually extinguished.

Reasons for the Disaster

“The King’s Cross fire was a large, complex, interrelated set of incidents involving hundreds of people, each of whom in different ways, can be seen to go through a number of stages in relation to the development of the fire and the actions of other people around them.”

(Donald & Canter, 1990, p.19).

- Poor communication.
 - No alarms sounded and warning messages were not co-ordinated.

“Good communications are at the heart of a modern system of mass transportation...The control room at any Underground station must be the nerve centre of communication and it was a material deficiency on the night of the disaster that there was no member of London Underground in the room and much of the equipment was out of order. Neither was the public address system used at any time.”

(Fennell, 1988, p.19)

- Therefore, passengers were largely unaware of the situation unfolding and, consequently, of the most appropriate course of action to take. For instance, in accordance with the theory of place schema described previously (Donald & Canter, 1992), passengers tried to carry on as normal – following their usual routes and intended courses of action – for as long as possible (e.g., Yoshida, 1996; Proulx & Reid, 2006). Only when they were interrupted by their route being blocked by the fire, or by the public announcements, did they abandon their schema and adopt more appropriate behaviours.
- However, this delay in evacuating may have endangered passengers' lives (Mawson, 2005) – had communication been sufficient, providing clear information and specific instructions, passengers may have been able to override their schema and break with their familiar behaviours more quickly (e.g., Donald & Canter, 1990, 1992).
- Poor situation management.
 - The member of staff who initially went to investigate the situation was not based at King's Cross and had received no fire training. Therefore, he was unsure of how to proceed.
 - There was no evacuation plan for London Underground.
 - There was confusion over the exact location of the fire, again preventing a fast response.
 - Station staff failed to accept, and respond efficiently to, notifications of the fire from passengers (Borodzicz, 2005). Had their reactions been more timely, a local solution to the fire may have been possible – i.e., using fire extinguishers.
 - The police assumed responsibility for the movement of passengers, choosing to evacuate people via the Victoria line escalators and into the main ticket hall, which resulted in a high concentration of people, vulnerable to the fire (e.g., Borodzicz, 2005). Their decision was, apparently, made without consulting staff or management at the station, despite being unfamiliar with the geography of the station and, consequently, of the most appropriate evacuation route (Fennell, 1988).

“...contrast between the extraordinary amount of apparent activity and the total lack of effective response which resulted from it.”

(Borodzicz, 2005, p.188)

- Lack of training and familiarity.
 - There was no system in place to train staff in fire drills or evacuation procedures. Therefore, the correct procedures to follow in an emergency situation were unknown. For example, the most appropriate evacuation route for the location of the fire was unknown, which had disastrous consequences.
 - Many personnel involved were unfamiliar with the station layout and the evacuation procedures (Fennell, 1988).

- Poor coordination.
 - Each party involved in the emergency – i.e., police, fire service, station staff, and senior management – was unaware of their own roles and responsibilities (Fennell, 1988).
 - No one party assumed overall control of the situation or overall responsibility for the safety of passengers.

“The response of the staff was uncoordinated, haphazard and untrained.”

(Fennell, 1988, p.19)

Bradford Football Stadium Fire (1985)

Key Facts: -

- 11th May, 1985.
- Match between Bradford City and Lincoln City.
- 56 deaths, over 450 injuries.
- Key reasons – poor communication, failure to react and respond quickly.

Evolution of the Disaster¹⁵

- The fire is thought to have started when a fan disposed of cigarette. It is thought to have fallen through a damaged space beneath the seats in Block G of the 77 year old wooden stand, and into a pile of rubbish which had gathered over a period of 20 years.
- Approximately five minutes before half time, white smoke was seen rising from the stand.
- Police began to move fans from the rear of block G, and fire-fighting equipment was requested.
- Three minutes later, flames emerged from beneath the stand.
- The referee stopped the match, which was later declared a 0-0 draw.
- Fans then began to evacuate onto the pitch.
- Only 90 seconds later, the fire rapidly took hold and a flashover engulfed Block G, with the entire main stand in flames within two minutes.

¹⁵ Information about this disaster taken from Popplewell (1986), Kneale (1988), and Elliott and Smith (2006).

- Those fans seated at the rear of the stand were then trapped in a narrow corridor at the back of the stand.
- The turnstile entrances and exit doors at rear, which opened inwards, were both locked to prevent unauthorised access.

Reasons for the Disaster

- Inadequate communication advising fans of the escalating problem and the immediate need to evacuate. Evacuation could have been improved by communication with the crowd – both audio and visual.
- Inefficient communication systems and equipment available for police officers.
- Underestimation by stadium officials of the speed at which the fire would escalate. Therefore, they did not begin an emergency evacuation as soon as was possible (e.g., Canter et al., 1989).
- Underestimation by crowd members regarding the escalation speed of the fire, meaning they were slow to begin evacuating. However, had communication been sufficient, the crowd should have been prompted into action.
- Poorly constructed, old main stand, e.g., over 70 years old, made of wood, and with gaps in the flooring underneath which rubbish (fire hazard) could accumulate.
- Lack of prior consideration for safe egress routes and emergency evacuation procedures.
- Overall lack of concern for crowd safety and very little compliance with the Guide to Safety at Sport Grounds.

Hajj Pilgrimage Disaster (2006)

Key Facts: -

- 12th January 2006.
- Hajj pilgrimage to Mecca.
- 363 deaths, over 298 injuries.
- Key reasons – severe overcrowding, massive crowd surges, progressive crowd collapse.

The Hajj Pilgrimage¹⁶

- The Hajj is the Muslim pilgrimage to the city of Mecca in Saudi Arabia.
- One of the ritual acts which must be performed during the Hajj is the ‘Stoning of the Devil’ (or ‘Stoning of the Jamarat’), when pilgrims throw pebbles at three walls – known as Jamarah – in the city of Mina, east of Mecca. These walls can be accessed on two levels, via the two-tier Jamarat Bridge.
- This ritual is thought to be the most dangerous part of the pilgrimage, due to the huge crowds it attracts.
- Unfortunately, the Hajj has a long history of large scale crowd disasters, predominantly as a result of severe overcrowding and enormous crowd pressures, leading to progressive crowd collapse and, ultimately, to trampling and crushing. The history of crowd disasters during the Hajj is shown in Table 6.

¹⁶ Information about this disaster taken from <http://www.crowddynamics.com/technical/>

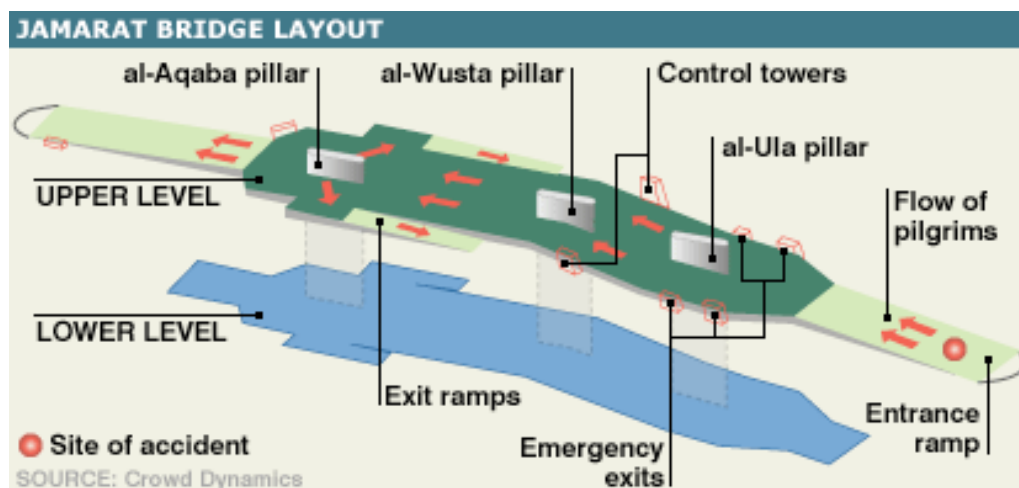
Table 6. History of the Hajj disaster(Information taken from <http://www.crowddynamics.com/technical/>)

Year	Disaster Causes	Deaths/ Injuries
2006	Crushed and trampled to death following progressive crowd collapse, as a result of the sheer force of crowd pressure	363 / 298+
2004	Trampled to death as a result of a massive crowd surge and progressive crowd collapse	251 / 244
2003	Crushed to death by a bus	14
2001	Crushed to death during a huge crowd surge	35 / 179
1998	Crushed to death as a result of progressive crowd collapse, caused by the excessive numbers of pilgrims	118 / 434
1997	Fire swept through a tent city in Mina	340 / 1500
1994	Crushed to death during a progressive crowd collapse, caused by the vast number of pilgrims	266 / 98
1990	Trampled to death or suffocated during a frantic attempt to escape from an overcrowded tunnel leading to the holy sites	1426
1987	Anti-US demonstration by Iranian pilgrims broken up by security forces	402

- Until 2004, the three Jamarah were tall pillars. However, following a disaster during the 2004 Hajj – when 251 pilgrims were trampled and 244 injured during a massive crowd surge as a result of severe overcrowding around the pillars – these were replaced, on expert advice, by three elliptical shaped walls, each 26 metres in length. This improved crowd flow and enabled more people to perform the stoning ritual at one time.

Figure 13. Layout of the Jamarat Bridge

(Taken from <http://www.crowddynamics.com/technical/>)



Evolution of the Disaster

- The 2006 disaster occurred at 12:30pm shortly after the noon call to prayers.
- An estimated 750 000 pilgrims had gathered near the Eastern Entrance to the Jamarat Bridge, resulting in crowds of very high density.
- The geometry at the Eastern Entrance is dangerous for high density crowds, as the corner of the entrance has a converging series of routes and a 180 degree turn.
- There is also a help point at the corner of the Eastern Entrance where some pilgrims stopped, increasing the density at that location.
- No amount of resistance could hold back the 750 000 pilgrims pushing forward to reach the Jamarah and perform their stoning ritual.
- The massive pressures of such high density crowds created a progressive crowd collapse – i.e., such was the extent of the overcrowding, that people were unable to control their individual movements and became carried along with the crowd.
- Thus, the crush was not as a result of panic or a stampede, but simply due to the sheer forces of two opposing crowd dynamics in such a large, dense, crowd gathering.

Figure 14. Severe overcrowding during the Hajj
(Taken from <http://www.crowddynamics.com/technical/>)



Reasons for the Disaster

- Severe overcrowding and enormous crowd pressures.
- Lack of understanding of crowd management.
- Over-excitable crowd, pushing forwards to perform the stoning ritual.
- Mismatched ingress flow to stoning capacity.
- Expert advice, highlighting the entrance to the bridge as a high risk area for a disaster, was ignored by authorities.

KEY LEARNING POINTS

– Relevant Crowd Disasters –

- **Communication with the crowd is vital.**
- **Provision of specific information and clear instructions are crucial to start people evacuating.**
- **Using experienced personnel is critical.**
- **Prior expectations about behaviour can be very dangerous.**
- **Crowd management and monitoring should be continuous.**
- **Means of controlling crowd flow and density is crucial.**
- **Stewarding and directing of the crowd is vital to avoid overcrowding.**
- **Response to the signs of an imminent emergency should be immediate.**
- **Never underestimate the seriousness of the situation.**
- **A multi-agency approach, with all parties consulted, should be adopted.**
- **Evacuation training is important.**
- **Crowd management training is important.**

Literature on Simulating Crowd Behaviours

Literature on Simulating Crowd Behaviours

- This section reviews two key approaches to modelling and simulating crowd behaviours, namely: -
 - Macroscopic approaches, including: -
 - Regression models
 - Fluid dynamic models
 - Microscopic approaches, including: -
 - Rule-based models
 - Social forces models
 - Cellular automata models
 - Agent-based models
- Evacuations models will also be considered, including: -
 - EXODUS
 - SIMULEX

Crowd Models and Simulations

Main Ideas

- Models and simulations of crowd behaviours are used for many different purposes, including: -
 - Studies of artificial life (e.g., Blue & Adler, 2000).
 - Training in crowd management and control, for example, in the police and military (e.g., Ulicny & Thalmann, 2001; Sung, Gleicher & Cheney, 2004).
 - Architecture and urban planning, for example, to determine the levels of comfort, safety and security for crowds in large public spaces (e.g., Lovas, 1993; Farenc, Musse, Schweiss, Kallmann, Aune, Boulic & Thalmann, 2000; Schreckenberg & Sharma, 2001; Musse, Jung, Jacques Jr & Braun, 2007).
 - Evacuation preparation, training and practice (e.g., Pidd, de Silva & Eglese, 1996; Farahmand, 1997; de Silva & Eglese, 2000; Musse & Thalmann, 2001; Mitchell & Radwan, 2006).
- Simulations of crowd behaviours generally focus on visual animations to represent how crowds are likely to move and behave (e.g., Ahn, Kim, Kwak & Han, 2005). They are particularly effective for studying crowd behaviours because, unlike the relatively static methods social scientists often use to collect and analyse data, the models are dynamic, thereby permitting unpredictable behaviours to emerge (e.g., Bonabeau & Meyer, 2001; Bonabeau, 2002; Pan, Han, Dauber & Law, 2007).
- However, there are often conflicting goals when carrying out a simulation – simple agents are easier to evaluate but less realistic, whereas complex agents are more realistic but more difficult to devise and evaluate (e.g., Sung, et al., 2004).

“The goal of the simulation is to reproduce realistic scenarios of such situations evolving in real-time involving a large number of virtual human agents.”

(Ulicny & Thalmann, 2001, p.163)

Types of Crowd Simulation Model

- Models for simulating pedestrian and crowd movement can typically be classified into macroscopic level and microscopic level models (e.g., Yamori, 1998; Leggett, 2004; Pan, Han & Law, 2005; Pan, Han, Dauber & Law, 2006; Pan et al., 2007; Courty & Corpetti, 2007; Yu & Johansson, 2007; ZARBOUTIS & MARMARAS, 2007; Pelechano & Malkawi, 2008).
- Macroscopic level models focus on the whole model system and concern collective observable behaviours which emerge from the crowd, e.g., the behaviour of the crowd as a whole.
- Microscopic level models focus on the individual level and concern the behaviour, actions and decisions of individuals within the crowd and their interactions with others. They are state of the art for computer simulations (Seyfried, Steffen & Lippert, 2006).
- Research (e.g., Yamori, 1998; Tecchia, Loscos & Chrysanthou, 2002; ZARBOUTIS & MARMARAS, 2007) suggests that using a combination of both macro and micro levels is most beneficial, since it enables valuable knowledge about the patterns of individuals' behaviours to be examined, which subsequently leads to the emergence of particular phenomena in the overall system. In other words, modelling how individual agents move and behave should help uncover how the crowd moves as a whole.

“Real-time crowd simulation is difficult because large groups of people exhibit behavior of enormous complexity and subtlety. A crowd model must not only include individual human motion and environmental constraints such as boundaries, but also address a bewildering array of dynamic interactions between people. Further, the model must reflect intelligent path planning through this changing environment. Humans constantly adjust their paths to reflect congestion and other dynamic factors. Even dense crowds are characterized by surprisingly few collisions or sudden changes in individual motion. It has proven difficult to capture these effects in simulation, especially for large crowds in real-time.”

(Treuille, Cooper & Popovic, 2006, p.1160).

Macroscopic Models

Macroscopic models of crowd behaviours include: -

- **Regression models**
 - These predict pedestrian flow under specific circumstances, dependent on the infrastructure (e.g., stairs, corridors), from statistically established relations between flow variables (e.g., Milazzo, Roupail, Hummer & Allen, 1998).
 - For example, simple spreadsheet models are an incredibly useful means of measuring and predicting flow variables, such as ingress and egress rates, flow rate, speed of movement, and density. This information can then be used to assist preparations for a crowd event.
- **Route choice models**
 - These describe pedestrian way-finding, based on the premise that pedestrians chose their route in order to maximise utility, in terms of travel time, effort, comfort, etc (e.g., Hoogendoorn & Bovy, 2003).
- **Gas-kinetics or fluid dynamics models**
 - These describe the movement of individuals within a crowd as being continuous and fluid-like – analogous with fluid or gas dynamics – with changes in density and velocity over time (e.g., Henderson, 1971; Takimoto & Nagatnai, 2003).

Fluid Dynamics Models

- Fluid dynamics models (e.g., Helbing, 1992; Smith, 1995; Cusack, 2002; Hughes, 2000, 2002, 2003) are based on the idea that collective movement – i.e., crowd movement – can be likened to the flow of a fluid.
- This notion comes from the observation that under certain circumstances, the trajectories of individuals within a group qualitatively resemble streamlines in a fluid (Cusack, 2002), with individual molecules moving relatively independently of one another, with different velocities and directions (Davies, Yin & Velastin, 1995). For instance, individual movement is often prevented when people are closely packed together, but individuals may be carried along by the crowd, with their movements determined by the movements of the crowd as a whole (e.g., Fruin, 1971, 1993; Thompson & Marchant, 1995a, 1995b). Hence, crowd movement is described as fluid in nature.
- More precisely, Hughes (e.g., 2000, 2002, 2003) likens the flow of a crowd to that of a fluid, but with the addition that crowd members have the ability to think rationally, and to behave in a rational and goal-directed manner (e.g., Lee & Hughes, 2007).
- According to Hughes (2003), the following assumptions about crowd behaviours can be made: -
 - The speed at which individuals walk is determined by the ground on which they walk, the density of surrounding individuals and the behavioral characteristics of those individuals (e.g., Fruin, 1971; Pushkarev & Zupan, 1975; Daly, McGrath & Annesley, 1991).
 - Individuals have a common sense of the task – termed ‘potential’ – which they face in order to reach their common destination, such that any two individuals with the same potential but at different locations would see no advantage to exchanging places.
 - Individuals seek to minimise their estimated travel time towards a particular goal, whilst simultaneously attempting to avoid extreme crowd densities.

Limitations of Macroscopic Models

- A drawback of macroscopic models is that no individual features – such as physical abilities, direction of movement, and individual positioning – can be considered (Wong & Luo, 2005; Lerner, Chrysanthou & Lischinski, 2007).
- Fluid analogies of crowds are weak – people do not behave according to laws of physics.

“The laws of crowd dynamics have to include the fact that people do not follow the laws of physics, they have a choice in their direction, have no conservation of momentum and can stop and start at will. They cannot be reduced to equations which are appropriate for the movement of ball bearings through viscous fluids.”

(Still, 2000, p.16)

- Fluid dynamics models are also unable to account for observed crowd behaviours, such as herding, multi-directional flow, and uneven density distribution (Still, 2000; Pan et al., 2005). For instance, the fluid analogy would predict equal usage of exits during an emergency evacuation (Pan et al., 2005), yet in reality, phenomena such as herding – when one exit becomes clogged whilst the other is highly underused, as the majority of the crowd use the exit they know (e.g., Low, 2000) – are observed.

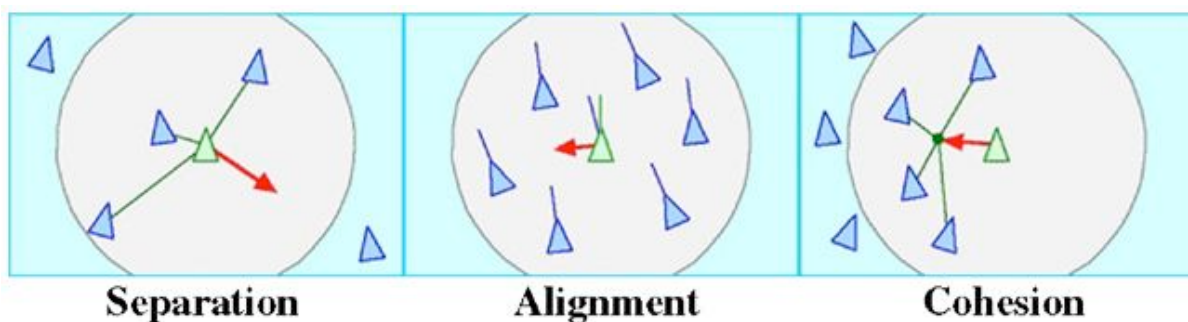
Microscopic Models

- The focus of microscopic level models concerns the behaviour, actions and decisions of crowd members at the individual level (e.g., Pan et al., 2005; Pan et al., 2006, 2007), and include: -
 - Rule-based models
 - Social forces models
 - Cellular automata models
 - Agent-based models

Rule-Based Models

- Rule-based models (e.g., Reynolds, 1987, 1999) have been widely used to simulate flocks of animals and human crowds (Pelechano & Malkawi, 2008).
- The most well known of the rule-based models is the ‘boids’ model proposed by Reynolds (1987), which likens crowd behaviours to the movement of herds of animals. In particular, the flocking behaviour of birds – wherein, when flying, each bird keeps as near to its neighbours as possible without colliding either with them or with obstacles, with its direction guided by a homing instinct – is viewed as being similar to the way in which a crowd typically moves (Reynolds, 1987, 1999).
- More precisely, the model uses a ‘flocking algorithm’ to describe animal and crowd movement (Reynolds, 1987, 1999; Saiwaki, Komatsu & Nishida, 1999), comprising the elements of: -
 - Separation – i.e., keeping a minimum distance between individuals in the given environment.
 - Alignment – i.e., consistency in the direction and movement speed of an individual in relation to others.
 - Cohesion – i.e., gathering members into a unique crowd.
 - Avoidance – i.e., preventing each individual colliding with others.

Figure 15. Reynolds’ (1987) ‘boids’ model
(Taken from Pelechano & Malkawi, 2008, p.378)



- More recently, Reynolds (1999) has added the additional factors of seek, pursue and evade to the flocking rule.

Limitations of Rule-Based Models

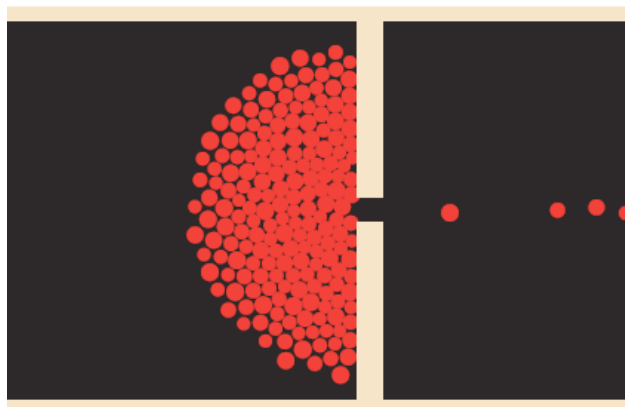
- Rule-based models have been criticised for lacking realism, through likening human behaviour to that of flocking birds. By primarily determining an individual's choice of movement according to the speed, direction and proximity of other individuals, other important factors which may influence crowd behaviours are overlooked (e.g., Pelechano & Malkawi, 2008).

Social Forces Model

- The social forces model – a behavioural force model of individual pedestrian dynamics, typically used in panic simulations – was proposed by Helbing and colleagues (e.g., Helbing, 1991, 1996, 1997; Helbing & Molnár, 1995, 1997; Molnár, 1996; Helbing & Vicsek, 1999; Helbing et al., 2000a; Helbing, Farkas & Vicsek, 2000b; Helbing, Molnár, Farkas & Bolay, 2001; Helbing, Farkas, Molnár & Vicsek, 2002; Helbing, Buzna, Johansson & Werner, 2005).
- This model describes collective panic behaviour using a self-driven, many-particle system framework (e.g., Helbing et al., 2000a), wherein each self-driven particle has a target and is prepared to move at a given velocity to reach that target (Parisi & Dorso, 2007). In other words, pedestrians – with a certain bodily mass – like to move in a certain direction at a certain speed, adapting their velocity within a certain time period, whilst keeping their distance from other individuals and obstacles.

Figure 16. Snapshot of social forces model simulation, showing crowd members moving towards a narrow exit

(Taken from Helbing et al., 2000a, p.488)



- The motion of each crowd member is expressed as a result of combined socio-psychological and physical forces which attract or repel individuals (e.g., Helbing & Molnár, 1995; Helbing et al., 2000a, 2000b).
 - The social forces reflect individuals' intentions to not collide with other people or obstacles, and to move in a specific direction at a specific speed (Helbing et al., 2002).

- The physical forces – i.e., pushing and shoving, characteristic of crowd movement under certain circumstances (e.g., Henein & White, 2007) – influence crowd behaviours when crowd density becomes so high that individuals are forced to collide, such as during an emergency evacuation (Helbing et al., 2000b; Helbing et al., 2002).
- More precisely, Helbing and Molnár (1998) describe these forces as: -
 - Acceleration – i.e., the velocity of each individual varies over time, as he or she attempts to reach optimum speed, whilst avoiding obstacles.
 - Repulsion – i.e., there is a repulsive force from other individuals and from obstacles and edges.
 - Attraction – i.e., individuals are sometimes attracted by other people (e.g., friends or street artists) or other objects (e.g., window displays).
- The simulation space is treated as continuous, thus individuals are able to move continuously in a two-dimensional environment. This enables realistic crowd phenomena – such as herding behaviour and mass queuing (see ‘Self-Organisation Phenomena’ below, pages 205 to 214) – to be generated.
- The social forces model has also been modified to consider individualities (Braun & Musse, 2003) and the presence of toxic gases (Courty & Musse, 2005).
- In line with the social forces model, Henein and White (2005, 2007) argue that force effects should be a basic element in models of crowd behaviours, since forces – such as pushing, or the ‘domino effect’ of people leaning on one another – can have a direct effect on the way in which crowd members move and, ultimately, may result in injuries or death.

“Force effects are particularly important in modelling crowd behaviours. Although people generally try to move toward goals, force effects can cause them to be pushed away from their desired trajectories and accurate models must reflect this. Also, the presence of crowd members injured by excessive force can significantly affect the ability of others to move freely. In an evacuation situation, increased desired walking speed leads to increased forces, and these forces tend to cause additional delays to those trying to exit. Models that do not represent pushing forces therefore cannot directly account for all these additional delays.”

(Henein & White, 2005, p.173-174)

- Moreover, individuals utilise information about forces to better understand the situation they are in and, subsequently, to make decisions about their actions.
- However, when considering crowd forces and the impact they have on crowd movement, it is important to remember that: -
 - Crowd forces are not random but occur for a reason (Henein & White, 2005, 2007). For instance, people who want to move in a particular direction but are prevented from doing so may push in the desired direction. Alternatively, people may push in order to try to retain their personal space.
 - Forces are directed, applied by one crowd member to another in a particular direction (Henein & White, 2005).
 - Forces propagate through a crowd – often moving like a shockwave (Fruin, 1993). This means that a force is not instantly felt by all crowd members and, therefore, the factor of time must be considered – i.e., how long it takes for a force to travel through the crowd.

“Force applied at the rear of a crowd is not immediately felt at the front; instead it travels from person to person, and is experienced by all people as it is transmitted.”

(Henein & White, 2007, p.696)
 - Forces, once exerted, are outside an individual’s control and, therefore, carry dangerous consequences (Henein & White, 2007). For example, an individual who is subject to a force – i.e., to pushing – may become unable to move in the direction he or she desires, thereby losing control over his or her own actions, or, more seriously, may become injured (Henein & White, 2005).
 - Forces – as a result of being both propagated and additive in the direction in which they are exerted – are location specific (Henein & White, 2005, 2007). Thus, most injuries occur at either the front of a crowd – where the forces are most concentrated – or in the centre of a crowd, where forces from individuals pushing off a wall from the front combine with forces from individuals pushing from the back (Fruin, 1993).
- According to Fruin (1993), in densely packed crowds, individual control over movement is lost and individuals – as a result of immense forces propagating through the crowd – can be lifted off their feet and carried distances of three metres or more. For instance, bent steel railings after several fatal crowd incidents provided evidence of forces greater than 4500N (1000 lbs).

Limitations of the Social Forces Model

- Models of social forces have been criticised for failing to fully capture the range and subtleties of individual behaviours (e.g., Lerner et al., 2007).
- Moreover, through advocating that individuals' movements are determined by forces, the vital influence of individual decision making is overlooked (e.g., Lakoba, Kaup & Finkelstein, 2005).

“Simple things such as walking in pairs, stopping to talk to someone, changing one’s mind and heading off in a different direction or aimlessly wandering about, are just a few examples which are difficult to capture.”

(Lerner, et al., 2007, p.656)

Self-Organisation Phenomena

- Crowd behaviour models, such as the social forces model described above, are very useful for demonstrating self-organisation phenomena, an emergent property of observed crowd behaviours (e.g., Yamori, 1998; Helbing et al., 2001; Kirchner & Schadschneider, 2002; Helbing et al., 2005; Lakoba et al., 2005; Varas, Cornejo, Mainemer, Toledo, Rogan, Muñoz & Valdivia, 2007).

“Self-organization means that these patterns are not externally planned, prescribed, or organized, e.g., by traffic signs, laws, or behavioral conventions. Instead, the spatiotemporal patterns emerge due to the nonlinear interactions of pedestrians. These interactions are more reactive and subconscious than based on strategical considerations or communication.”

(Helbing et al., 2005, p.4)

- These phenomena arise because crowds typically behave according to the ‘principle of least effort’ (Zipf, 1949). This principle proposes that, when considering all available options (e.g., changing direction, changing speed, or remaining constant) an individual will typically opt for the one which requires least effort or that will yield the smallest disutility (Sud, Anderson, Curtis & Lin, 2008). An individual will try to adapt to his or her environment or, if it requires less effort, will try to change the environment to better suit his or her needs (Sud et al., 2008) and, hence, the self-organisation of collective behavioural patterns can be observed (e.g., Reynolds, 1987; Vicsek, Czirók, Ben-Jacob, Cohen & Schochet, 1995). Optimal self-organisation occurs when individual walking speed is maximised (Helbing & Vicsek, 1999).

“...individuals will usually not take complicated decisions between various possible alternative behaviors, but apply an optimized behavioral strategy, which has been learned over time by trial and error. Hence a pedestrian will react to obstacles, other pedestrians, etc, in a somewhat automatic way.”

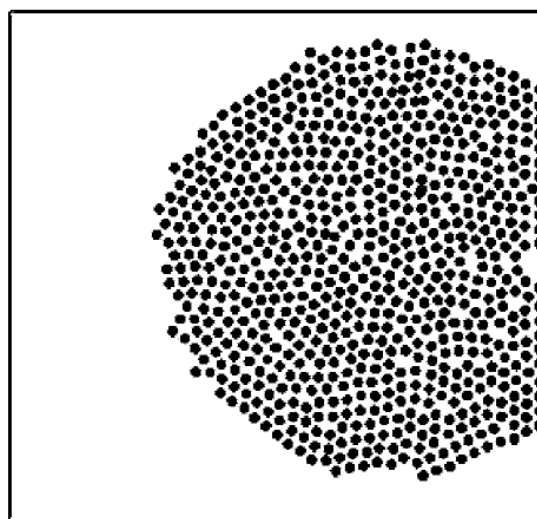
(Helbing et al., 2001, p.364)

Self-organisation phenomena include: -

- 'Faster is slower' effect.
 - When passing through a bottleneck, the faster people wish to move – due to impatience – the more densely packed they become and the slower they can actually move and evacuate (e.g., Helbing et al., 2000a; Parisi & Dorso, 2005, 2006, 2007).
- Crowd jams.
 - These build up when densely packed crowds attempt to move (e.g., Helbing et al., 2000a, 2001; Takimoto & Nagatnai, 2003; Georgoudas, Sirakoulis & Andreadis, 2006; Helbing, Johansson & Al-Abideen, 2007).
- Clogging and arching.
 - As large, dense crowds push forward towards a narrow exit, clogging and arching are observed – i.e., the exit becomes clogged and the crowd forms an arch-shape, radiating outwards from the exit (e.g., Helbing et al., 2000a, 2005; Yu, Chen, Dong & Dai, 2005).

Figure 17. Arching effect observed at a narrow exit

(Taken from Yu et al., 2005, p.3)



- Lane formation.
 - When people are moving in opposite directions, they can self-organise to create distinct lanes – one for each direction of movement (e.g., Helbing & Molnár, 1995; Helbing et al., 2001; Couzin & Franks, 2003; Helbing et al., 2005). This helps to reduce collisions and increase speed and, therefore, is considered a form of optimal self-organisation.
 - Lane formation may begin as small channels of people moving in opposite directions, but these channels then merge to create larger lanes (Helbing et al., 2005).

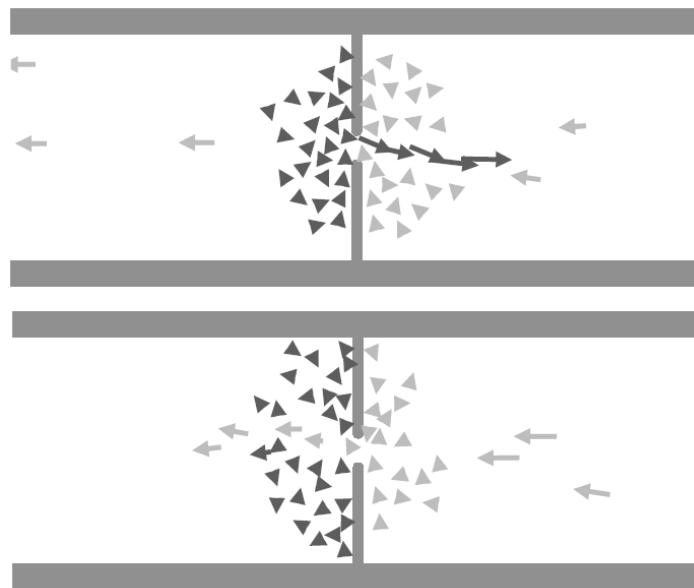


Figure 18. Lane formation

(Taken from Helbing et al., 2001, p.364)

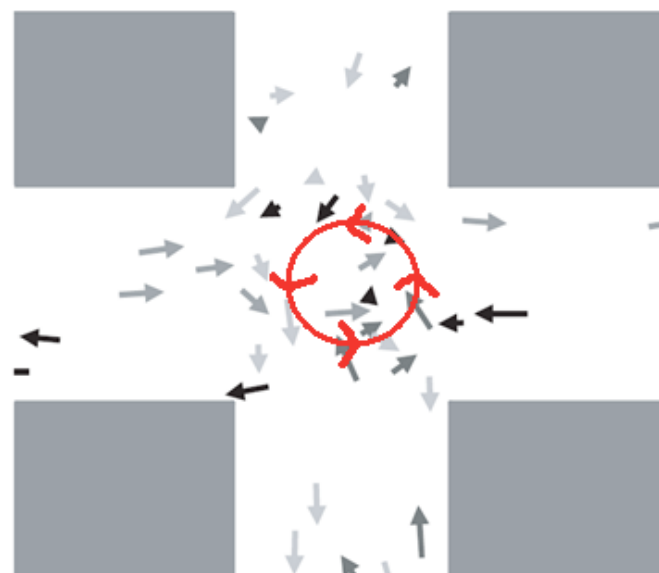
- ‘Freezing by heating’ effect.
 - In high density crowds, nervous crowds or large disturbances, lanes formed may break down due to continuous overtaking manoeuvres (e.g., Helbing et al., 2000b).
- Oscillations – or variations in the direction of movement – at bottlenecks in counter-flow.
 - Due to the narrowness of the opening, crowd members are only able to pass through a bottleneck in one direction at a time. When a crowd is in counter-flow – and, thereby, is approaching the opening from opposing sides – the direction of movement through the bottleneck alternates between right-to-left and left-to-right (e.g., Helbing & Molnár, 1995; Kretz, Grünebohm & Schreckenberg, 2006a; Kretz, Grünebohm, Kaufman, Mazur and Schreckenberg, 2006b; Kretz, Wolki & Schreckenberg, 2006c).
 - This oscillation is due to the movement of the crowd from one side of the bottleneck – e.g., moving right-to-left – being continually halted by mounting pressure from the crowd wanting to move in the opposite direction – e.g., moving left-to-right. Thus, the opposing crowd flows take turns to pass through the bottleneck, resulting in oscillating crowd movements.

Figure 19. Oscillations in crowd movement at a bottleneck in counter-flow
(Taken from Helbing et al., 2001, p.370)



- Patterns at intersections.
 - Crowd movement is eased by the emergence of flow patterns, such as short-term roundabouts (e.g., Helbing, 2001; Helbing et al., 2001; Helbing et al., 2005).

Figure 20. Roundabout flow pattern observed at an intersection
(Taken from Helbing et al., 2001, p.371)



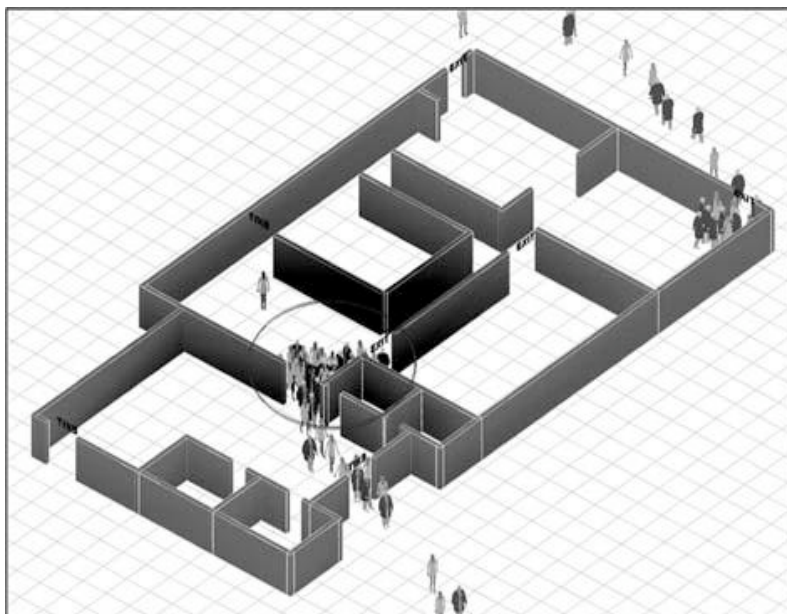
- 'Corner hugging'.
 - As crowd members turn corners, they tend to slow down and move further into them, becoming more densely packed and appearing to 'hug' the corner (Still, 2000; Aubé & Shield, 2004).



Figure 21. Corner hugging
(Taken from Still, 2000, p.56)

- Competitive behaviour (e.g., Pan et al., 2005; Pan et al., 2006, 2007).
 - When individuals compete with other crowd members to evacuate through a particular exit, inefficient evacuation or non-adaptive behaviours often result.

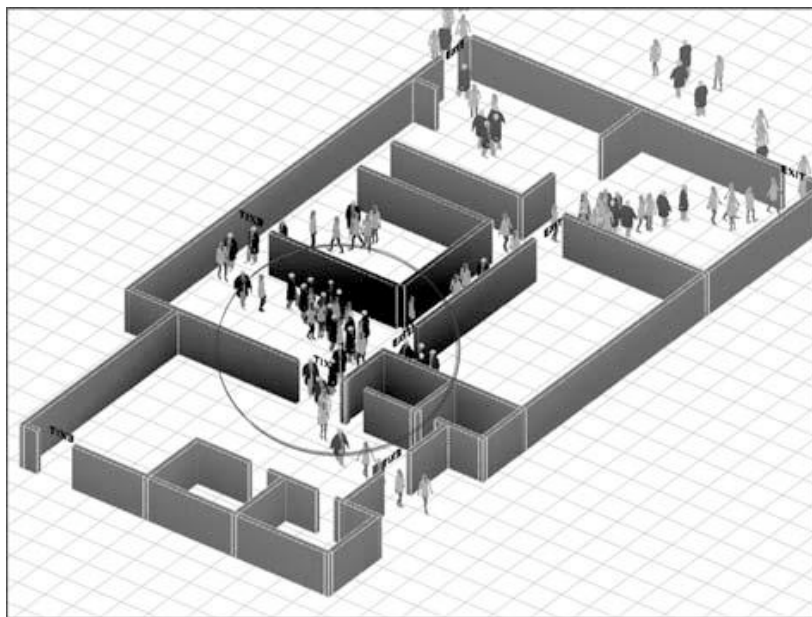
Figure 22. Competitive crowd behaviour
(Taken from Pan et al., 2007, p.127)



- Queuing behaviour (e.g., Pan et al., 2005; Pan et al., 2006, 2007).
 - Upon seeing their evacuation route is obstructed by other crowd members, individuals may initiate a queue or join an existing queue. Thus, a more effective evacuation is often achieved, as a result of crowd members leaving in an orderly and single-file manner rather than exhibiting competitive behaviour.

Figure 23. Queuing behaviour

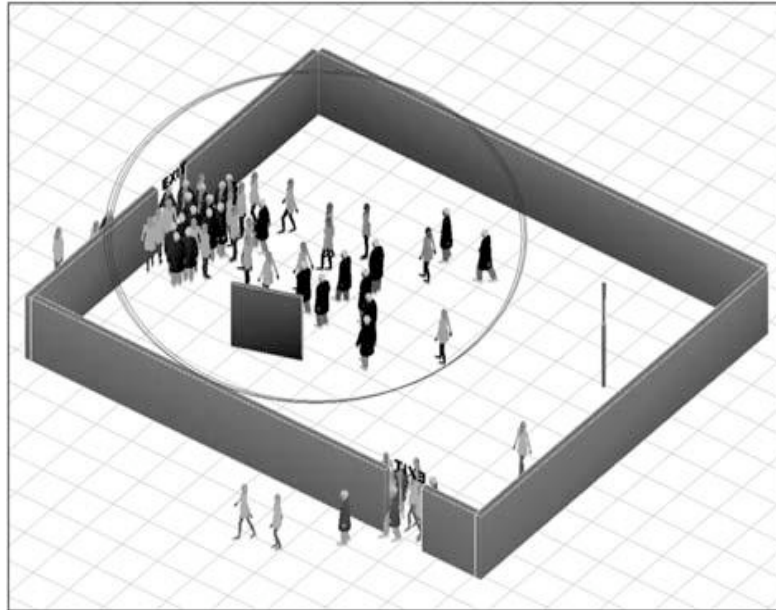
(Taken from Pan et al., 2007, p.128)



- Herding behaviour (e.g., Pan et al., 2005; Pan et al., 2006, 2007).
 - During an evacuation, one exit may become clogged whilst another exit is highly underused, as the crowd prefer to use the exit with which they are familiar (e.g., Low, 2000).

Figure 24. Herding behaviour

(Taken from Pan et al., 2007, p.128)

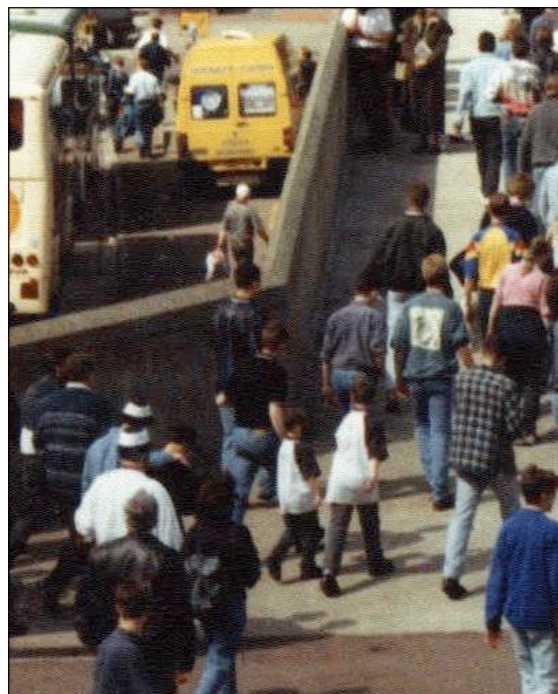


- Ring structures.
 - When a crowd is observing a particular event or gathers around a particular point of interest – such as a street artist – ring structures result, emanating outwards from the point of interest (e.g., Milgram & Toch, 1969).

- In addition to self-organisation phenomena, observations of human behaviour, which can be realistically simulated by models such as the social forces model (e.g., Helbing et al., 2000a; Helbing et al., 2001; Helbing et al., 2005), include: -
 - Individuals prefer not to take detours or to move in the opposing direction to the main crowd flow, even if the direct route they subsequently choose is crowded (Helbing et al., 2001). They typically move according to the principle of ‘least effort’ (e.g., Still, 2000).
 - Thus, people typically prefer to choose the fastest route (e.g., Ganem, 1998; Kurose, Borgers & Timmermans, 2001).

- If alternative routes are of the same length, individuals prefer to take the one which offers the straightest route – with the least changes in direction – for as long as possible (e.g., Nishinari, Sugawara, Kazama, Schadschneider & Chowdhury, 2006), provided that the alternatives are not more attractive (e.g., in terms of being better lit, less noisy or a more attractive environment). Goffman (1971) terms this the ‘law of minimal change’.
- People – provided there is sufficient time to reach their destination – prefer to walk at an individually desired speed, corresponding to their most comfortable – i.e., least energy-consuming – walking speed.
- In order to avoid collisions, people try to keep a certain distance from other people and from environmental borders, such as walls or obstacles. This distance decreases if the individual is in a hurry or if crowd density increases, for instance, around a particularly attractive place, such as a food outlet.
- People will often turn sideways when trying to move quickly through a crowd, as reducing the leading surface area of their body trying to navigate through the crowd helps to lessen congestion (e.g., Fukamachi & Nagatani, 2007).
- Crowds do not fill a space evenly, but rather cluster, exploit short-cuts and exhibit herding behaviour (e.g., Still, 2000).

Figure 25. Crowd members do not evenly fill available space
(Taken from Still, 2000, p.55)



- When congestion occurs, people typically follow the person in front of them, thereby creating flow patterns (Loscos, Marchal & Meyer, 2003).

Figure 26. Flow patterns in a densely packed crowd

(Taken from Still, 2000, p.15)



- Individuals act more or less automatically and typically do not reflect on their behavioural strategy in each new situation, rather they learn optimal behaviours over time by trial and error. For example, people who commute regularly often get onto the train in 'autopilot', although this can cause problems if other people are still trying to get off.
- Family groups and groups of friends prefer to move together as a unit. For example, people who arrive at an event together prefer to move around the event together and to leave together (e.g., Pan et al., 2006).
- If group members become separated, they are likely to try to reform their group before exiting. However, this may produce movements contrary to the main flow of the crowd which can hinder the flow as a whole (e.g., Pan et al., 2006).
- Hierarchically organised groups – e.g., parents with children – are likely to behave differently to group who are not organised according to a hierarchy – e.g., groups of friends (Pan et al., 2006).

- Based on these observations, the following techniques can be implemented in order to improve crowd flow: -
 - Strategically placed obstacles, such as railings, trees or columns – all of which are flexible but have the same psychological effect as a wall – can be used as wave breakers, preventing large crowd pressure building up, and encouraging lane formation (Helbing et al., 2005).

Figure 27. Appropriately placed columns to encourage lane formation

(Taken from Helbing et al., 2005, p.14)



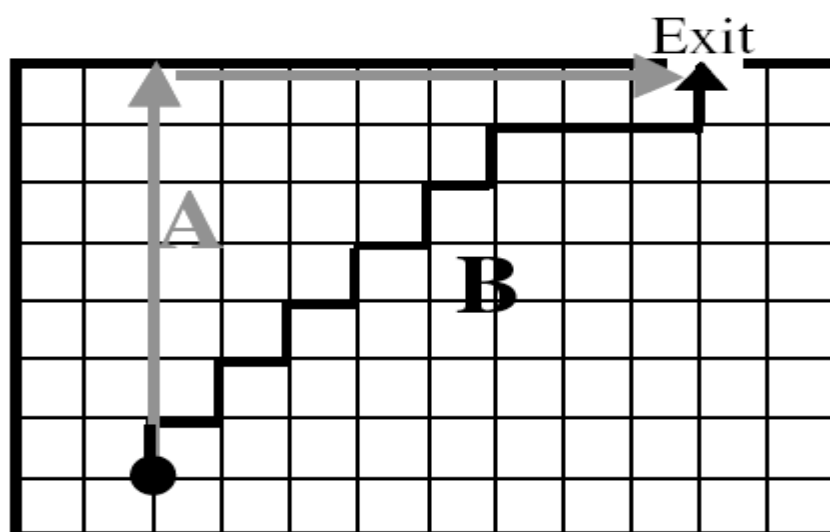
- A separate door for entry and exit should be used to separate opposing crowd flows (e.g., Helbing et al., 2001; Helbing & Molnár, 1997).
- Exits should be wide enough to accommodate groups of people, so as to prevent the group having to disperse upon exiting and, subsequently, having to wait for all group members before leaving (Pan et al., 2006).
- Corners in corridors should be rounded, rather than angular, and obstacles smoothly contoured (e.g., Davies et al., 1995).
- Line-of sight paths should be made as long as possible, allowing individuals to see their destination and, thereby, more likely to choose the most direct route and to move quickly (e.g., Hillier, Penn, Hanson, Grajewski & Xu, 1993; Davies et al., 1995; Notake et al., 2001).
- Pushing and shoving from the rear of a crowd – where people are unaware of what is happening at the front of the crowd – should be prevented by ensuring communication is adequate, with information visible to all crowd members and not just those at the front (Pan et al., 2006).

Cellular Automata Models

- Cellular automata models – or matrix-based systems – treat the environment as discrete, dividing the space into a uniform grid of discrete cells used to represent free areas of floor, obstacles, or areas occupied by individuals or groups, for example (e.g., Wolfgram, 1983; Ferber, 1999; Blue & Adler, 2000; Dijkstra, Jessurun & Timmermans, 2001; Narimatsu, Shiraishi & Morishita, 2004; Gudowski & Waş, 2006; Waş, 2005; Yang et al., 2005; Dudek-Dyduch & Waş, 2006; Georgoudas, 2006; Georgoudas, Sirakoulis & Andreadis, 2006; Yamamoto, et al., 2006, 2007; Zhao, Yang & Li, 2006; Weifeng & Kang Hai, 2007).

Figure 28. Cellular automata grid showing two alternative paths to the exit (A and B)

(Taken from Yamamoto et al., 2006, p.729)



- Each agent (individual) occupies a particular cell or position on the grid, and moves from cell to cell according to a set of occupancy rules, i.e., an agent will only move to a neighbouring cell if it is unoccupied (e.g., Weifeng & Kang Hai, 2007). The model evolves in a series of discrete time steps, with the value of a variable at one cell affected by the value of a variable at an adjoining cell. Variables at each cell are updated simultaneously, according to a local set of rules.
- Cellular automata models are well suited to large scale simulations (e.g., Kirchner, Klüpfel, Nishinari, Schadschneider & Schreckenberg, 2003, 2004).

- Work by Bandini and colleagues (e.g., Bandini, Manzoni, Vizzari, 2004; Bandini, Federici, Manzoni & Vizzari, 2006; Bandini & Manzoni, 2006; Vizzari, Pizzi & Federici, 2006; Bandini, Federici & Vizzari, 2007) introduces the modelling framework of ‘Situating cellular agents’, which provides extensions to more traditional cellular automata models.
- The situated cellular agents model takes into account agents’ state and heterogeneity, and explicitly represents the spatial structure of the environment. Agents are viewed as reactive – i.e., their internal state or position on the environment can change, as a result of altered environmental perceptions or interactions with other agents.
- Based on their model, Bandini and colleagues suggest the following assumptions can be made about crowd behaviours in an underground station.

The crowd is viewed as a “system of autonomous situated agents that act and interact in a spatially structured environment.”

(Bandini & Manzoni, 2004, p.686)

“Passengers that do not have to get off at a train stop tend to remain still, if they do not constitute obstacle to the passengers that are descending. Passengers will move only to give way to descending passenger, to reach some seat that has become available, or to reach a better position like places at the side of the doors or close to the handles. On the other hand, in very crowded situations it often happens that people that do not have to get off can constitute an obstacle to the descent of other passengers, and they “are forced to” get off and wait for the moment to get on the wagon again. Passengers that have to get off have a tendency to go around still agents to find their route towards the exit, if it is possible. Once the train is almost stopped the waiting passengers on the platform identify the entrance that is closer to them, and try to move towards it. If they perceive some passengers bound to get off, they first let them get off and then get on the wagon.”

(Bandini et al., 2007, pp.742-743)

Limitations of Cellular Automata Models

- Cellular automata models are criticised for lacking realism (e.g., Still, 2000; Pelechano, Allbeck & Badler, 2007; Pelechano & Malkawi, 2008), for instance, by restricting individuals' behaviours to grid-based movement, since agents are only able to occupy discrete cells in a grid. Moreover, the assumption that individuals move within a static environment, dependent on the availability of space, negates the reality of a dynamic environment and individuals' abilities to make independent decisions (Pelechano & Malkawi, 2008).

Agent-Based Models

- Agent-based models – in which a system (i.e., environment) is modelled as a collection of intelligent, autonomous, decision-making entities known as ‘agents’ (e.g., Bonabeau, 2002) – are the most complex and realistic of the crowd simulation tools. As such, they are more suitable for simulating situations which involve dynamic and heterogeneous agents and environments (e.g., Epstein & Axtell, 1996; Johnson, 2001; Sanchez & Lucas, 2002; Bandini et al., 2006; Wong & Luo, 2005).
- Each agent can be assigned individual attributes – such as gender, age, mobility, body size and walking speed – and is capable of perceptive and cognitive functions, whilst also being able to adapt its behaviour according to environmental circumstances (e.g., Goldenstein, Karavelas, Metaxas, Guibas, Aaron & Goswami, 2001; Hacklay, O’Sullivan, Thurstain-Goodwin & Schelhorn, 2001; Musse & Thalmann, 2001; Villamil, Musse & Luna de Oliveira, 2003; Sung et al., 2004; Sakuma, Mukai & Kuriyama, 2005; Shao & Terzopoulos, 2005, 2007; Paris, Donikian & Bonvalet, 2006; Pelechano et al., 2007; Durupinar, Allbeck, Pelechano & Badler, 2008).

“...a simulation made up of agents, objects or entities that behave autonomously. These agents are aware of (and interact with) their local environment through simple internal rules for decision-making, movement and action.”

(Sanchez & Lucas, 2002, p.116)

- Moreover, these intelligent, autonomous agents are – in accordance with varying sets of underlying simulation rules – typically capable of perceiving and assessing their environment, generating intentions, making independent decisions, and managing and performing rational and – most importantly – realistic behaviours, such as avoidance of obstructions, overtaking, and taking the most direct route (e.g., Epstein & Axtell, 1996; Fraser-Mitchell, 1999; Musse & Thalmann, 2001; Bonabeau, 2002; Feng & Liang, 2003; Treuille et al., 2006; Durupinar et al., 2008).
- Just as in reality, this enables agent-based models to capture the unique situation of each individual within the given environment and, in combination with the assignment of differing attributes and characteristics, to more realistically represent the heterogeneous nature of crowds (Treuille et al., 2006; Durupinar et al., 2008).

- For example, movement of an individual within a crowd – in particular, speed and direction – may be influenced by the geography of the environment, position within the environment, obstacles, proximity and speed of surrounding individuals, personality, state of mind, and cognitions (e.g., Fang, Lo & Lu, 2003; Lerner et al., 2007; Lin, Lo, Yuen, Huang & Liang, 2007).
- Agent-based models also demonstrate – as observed in real crowd behaviours – that an increased density leads to increased interactions between crowd members, which reduce individual walking speed (Marconi & Chopard, 2002; Fang et al., 2003; Zhang, Liu, Wu & Zhao, 2007).
- The flow of individuals also becomes unstable when density, and consequently interactions, increase (e.g., Fruin, 1993; Helbing et al., 2007; Yu & Johansson, 2007), with an increased risk of pushing, falling, crushing and trampling (Lee & Hughes, 2005, 2007; Zhang et al., 2007).

Simulations must be able to treat “each person individually, with individual characteristics (including age, disability and eagerness to escape) that can cope with infinite geometrical possibilities, whilst automatically assessing the entire escape route for each person, and reassessing the route (both locally and globally) at each time step of motion. There is also a need for overtaking, queuing, and other behaviour modelling. Each position should be precise and the crowd should continuously be displayed on the computer screen.”

(Thompson & Marchant, 1995a, p.283)

- Hence, agent-based models should – by definition – outperform the other types of model discussed above (e.g., Berrou, Beecham, Quaglia, Kagarlis & Gerodimos, 2005) by their abilities, for instance, to:
 - Predict crowd flow and travel time in bottlenecks.
 - Form more realistic estimates of size and shape of queues at congestion points.
 - Simulate crowd flows merging together during evacuation scenarios.

- Simulate cross-flows and counter-flows in crowd movements.
- Understand the distribution of individual travel times, as opposed to the mean (i.e., average).
- Map accurately space utilisation, density and speed as a function of time.
- According to Bonabeau (2002), the benefits of agent-based modelling over other modelling approaches are its abilities to: -
 - Capture emergent phenomena – i.e., events or actions which arise from the interactions of individual agents, such as crowd congestion when crowd members try to move in opposing directions.
 - Provide a natural description of the system – i.e., a more realistic representation of the environment.
 - Be flexible – i.e., altering the underlying rules to test out varying situations *in silico*, such as altering agents' behaviours to examine differing evacuation scenarios.
- Bonabeau (2002) also states that agent-based modelling is particularly beneficial in situations involving: -
 - Heterogeneous populations, i.e., when all individuals within that population (potentially) differ.
 - Complex human behaviours, such as learning or adaptation.
 - Complex, non-linear, discontinuous or discrete interactions between agents, e.g., when the actions of one agent have a dramatic impact on the actions of another agent, such as when part of a crowd.
 - Pre-determined environmental space and non-fixed agent positions, such as evacuation from a building.
- Sung et al. (2004) propose a situation-based approach to agent-based modelling. This is based on the principle that a given individual can never be present in more than a few situations at the same time, which limits the set of behaviours required at a given moment – i.e., when watching a football match, an agent needs to know how to sit and watch the match and how to react, but does not need to remember how to use the bathroom or how it bought its ticket.

- In other words, the situation-based approach takes into account that different behaviours are necessary at different stages within a situation, with core behaviours adaptable to any environment (Sung et al., 2004).
- Alternatively, some studies (e.g., Bonabeau, Dorigo & Theraulaz, 1999; Kennedy, Eberhart & Shui, 2001; Batty, Desyllas & Duxbury, 2003a, 2003b) describe agent movement according to an algorithm based on ‘swarm intelligence’. This mirrors the process in which insects seek out food by foraging away from their nests; agents move randomly from origins to destinations searching for the best route, and when they find it, they move back towards their origin and tell others (or others learn from observation) about the best routes to take. In other words, the swarm intelligence algorithm generates hierarchies of the shortest paths between event locations and points of entry (Batty et al., 2003b).
- Thalmann and colleagues (e.g., Musse & Thalmann, 1997; Musse, Babski, Capin & Thalmann, 1998; Musse, Garat & Thalmann, 1999; Musse & Thalmann, 2001; Ulicny & Thalmann, 2001, 2002; Magnenat-Thalmann & Thalmann, 2005; Musse et al., 2007) present the ‘ViCrowd’ model as a means of simulating real time crowd behaviours.
- The model utilises a behaviour based multi-level framework to simulate crowd behaviours specifically based on different groups within the crowd, rather than on individuals (Musse & Thalmann, 2001; Magnenat-Thalmann & Thalmann, 2005). ‘ViCrowd’ is able to simulate many observed group behaviours, including flocking, following, goal changing, attraction, repulsion, group splitting, space adaptability, and safe wandering (e.g., Musse & Thalmann, 2001).
- Similarly, Pelechano and colleagues (e.g., Pelechano et al., 2007; Durupinar et al., 2008) describe their ‘HiDAC’ (High Density Autonomous Crowds) simulation system, wherein the behaviours of autonomous agents are governed by both geometric – e.g., distances, angles, influential locations – and psychological – e.g., leadership, impatience, panic – rules, in a dynamically changing environment.

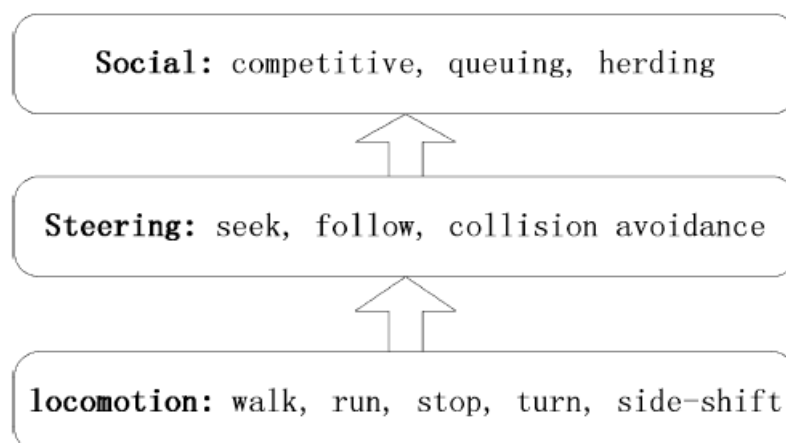
“In our system, a crowd is modeled as collection of individuals, which react to the environment, other agents and real human participants of the simulation and can have very different behaviors both for one agent in different situations and for many agents in the same situation.”

(Magnenat-Thalmann & Thalmann, 2005, p1006)

- Recently, Durupinar et al. (2008) have also incorporated personality variables into the 'HiDAC' simulation system, to examine the effects of personality differences on crowd behaviours. Their simulations revealed the following behavioural tendencies: -
 - Individuals with more extravert tendencies typically move faster and are more likely to push past those in their way, than individuals with more introvert tendencies.
 - Individuals with greater leadership qualities – as determined by levels of extraversion, conscientiousness, disagreeableness and stability – are more likely to have increased confidence in their own capabilities and are, therefore, more likely to help others navigate through a building.
 - Those who have low levels of conscientiousness and agreeableness are more likely to cause congestion, as they are more impatient, more likely to push fellow crowd members, and less willing to let others move past them.
 - Individuals who have higher levels of neuroticism, and are more prone to anxiety, appear to be more likely to push past other individuals in order to force their way to an exit.
- Pan and colleagues (e.g., Pan et al., 2005; Pan et al., 2006, 2007) utilise the following hierarchy of agent behaviour, incorporating both individual and social behaviours.

Figure 29. Hierarchy of agent behaviour

(Taken from Pan et al., 2007, p.125)



- Pan et al. (2006, 2007) also suggest that, when being modelled, human behaviours should be categorised at three levels: -
 - The individual.
 - Crowds are comprised of individuals and, therefore, it is important to consider individuals' behaviours. Behaviours are the result of decision-making, which can be: based on following instinct (e.g., Quarantelli, 1954); based on following experience according to, for example, schema developed for particular environments and situations (e.g., Donald & Canter, 1992); or bounded by rationality, wherein a decision is made by evaluating alternative options in terms of consequences for preferences (e.g., March, 1994).
 - Interactions between individuals.
 - When part of a crowd, individuals interact socially with others, exhibiting social behaviours. Therefore, it is also important for models to consider how these interactions and social behaviours may be influenced. For instance, crowd behaviours are determined by perceptions of social identity, as discussed previously, (e.g., Reicher, 1996a; Drury & Reicher, 1999, 2000; Stott & Drury, 1999). In addition, social interactions are affected by the amount of personal space each individual requires to feel comfortable and safe (e.g., Ashcraft & Schefflen, 1976; Bryan, 1997), and the notion of social proof (e.g., Cialdini, 1993), such that an individual is likely to follow the actions of others in an unfamiliar situation, as a means of determining appropriate behaviour.
 - The group.
 - Viewing the crowd as a mass group or whole entity enables many significant factors, which may influence crowd behaviours, to be identified. It is, therefore, important for models to consider the group level of behaviour. Such influential factors may include: crowd density, with increased density related to decreased comfort and control over individual behaviours (e.g., Bryan, 1997; Chertkoff & Kushigian, 1999); environmental constraints, such as narrowed or obstructed passageways, poor lighting or an insufficient number of exits; and perceived emotions and tension, with higher levels of emotional arousal – i.e., perceptions of negative consequences if evacuation is not immediate – likely to result in more anti-social behaviours (e.g., Sime, 1983, 1999; Johnson, 1998).

Limitations of Agent-Based Models

- Despite their clear advantages over the other forms of modelling discussed above, agent-based models are still thought to be lacking in psychological and physiological elements to make them more realistic, and enable more human-like decision making (Santos & Aguirre, 2004; Silverman, 2004; Pelechano & Malkawi, 2008).
- Bruzzone, Briano, Bocca and Massei (2007) argue that simulation tools have difficulties modelling aspects of human behaviour – for example, rational decision making – because it is difficult to reproduce the intelligence needed to make human-like decisions. Similarly, Treuille et al. (2006) propose that a drawback to agent-based models is the difficulty of developing behavioural rules which are capable of consistently producing realistic crowd movement.
- Human behaviours are complex emergent phenomena, which are difficult for computers to capture as mathematical equations (Pan et al., 2007).

Examples of Agent-Based Simulation Rules

Figure 30. Simulation rules for exiting a venue

(Taken from Sanchez & Lucas, 2002, p.117)

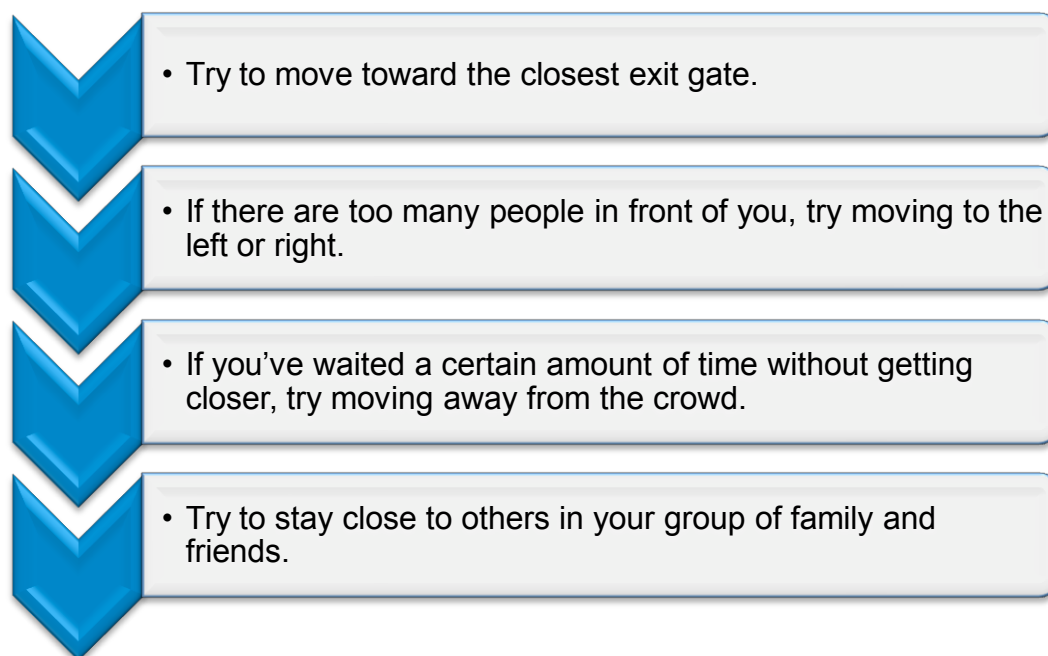


Figure 31. Simulation rules demonstrating herding behaviour

(Taken from Pan et al., 2007, p.129)

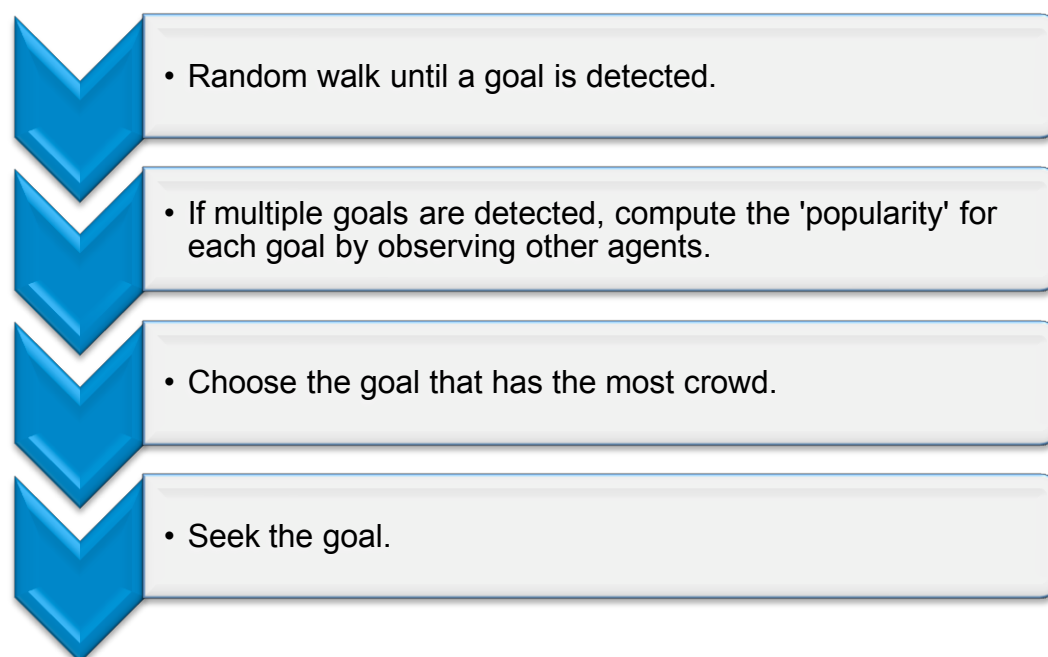
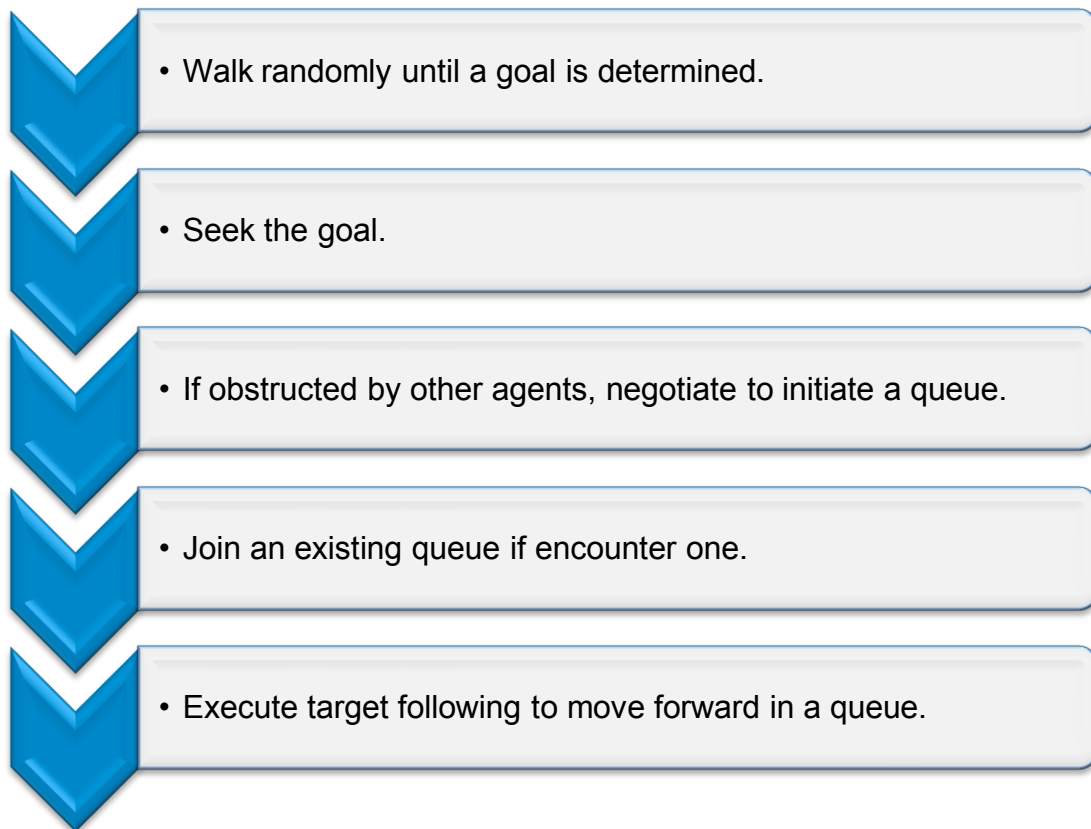


Figure 32. Simulation rules demonstrating queuing behaviour

(Taken from Pan et al., 2007, p.128)

**Figure 33. Simulation rules demonstrating flocking behaviour**

(Taken from Musse & Thalmann, 2001, p.156)

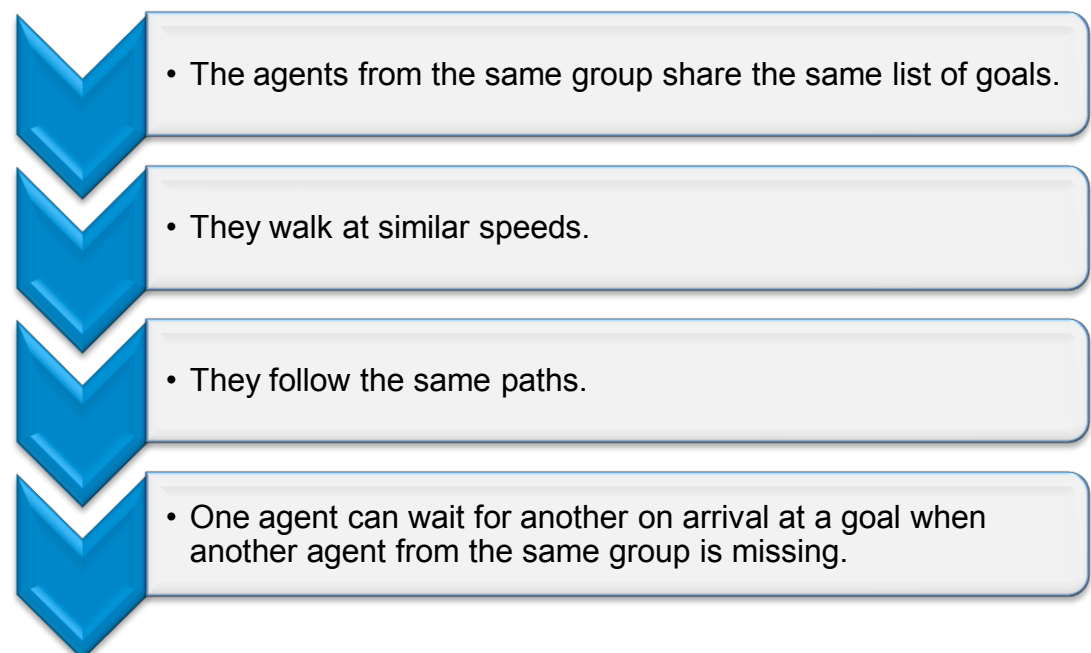
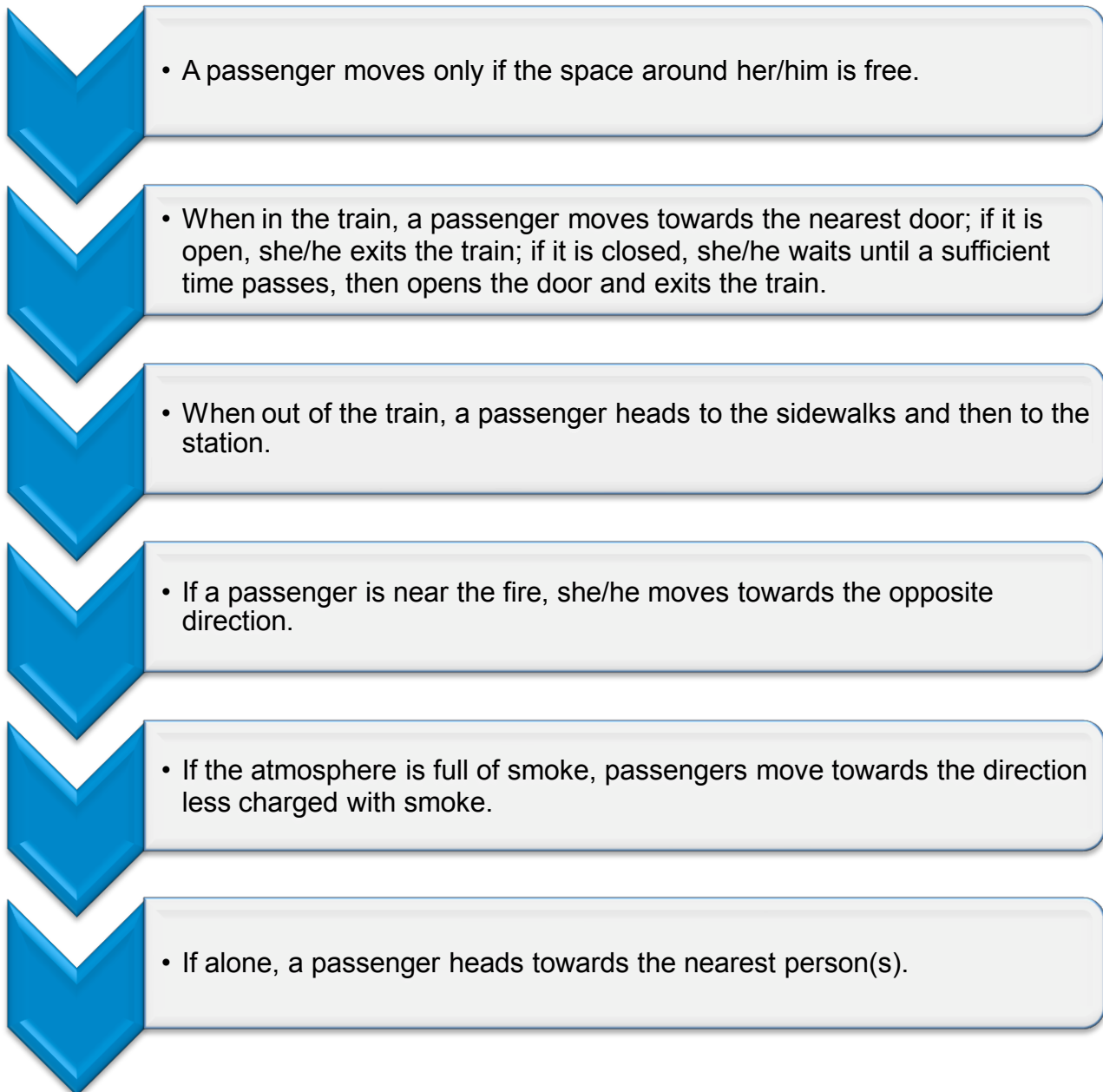


Figure 34. Simulation rules for a fire on a train

(Taken from Zarboutis & Marmaras, 2007, p.931)



Evacuation Models

- There are numerous models concerned with evacuation behaviour¹⁷, for example: -
 - Evacuation from aircraft (e.g., Muir et al., 1989; Muir & Cobbett, 1996).
 - Evacuation from train wrecks (e.g., Galea & Gwynne, 2000).
 - Evacuation from fires (e.g., Feinberg & Johnson, 1995; Haque & Balasubramanian, 2004; Pires, 2005; Kang, 2007).
 - Evacuation from transport terminals (e.g., Kang, 2006; Chow & Ng, 2008).
 - Evacuation from buildings (e.g., Yoshida, 1995, 1996; Zhang, Xiao & Chen, 2000; See, Michel, Xiong, Luh & Chang, 2006; Haque & Balasubramanian, 2007; Maestas, Smith & Young, 2007; Xiong, Luh, Chang, Michel & See, 2007).
 - Evacuation from natural disasters (e.g., Lui, Zou & Chang, 2005; Simonovic & Ahmad, 2005; Zou, Yeh, Chang, Marquess & Zezeski, 2005; Chen, Meaker & Zhan, 2006; Lui, Zhang, Zhang & Li, 2007).
- Indeed, Gwynne, Galea, Owen, Lawrence and Filippidis (1999), in their review of methodologies used to simulate evacuation from the built environment, identified 22 different evacuation models. Similarly, Kuligowski (2004) more recently identified 28 models of egress behaviour.
- Evacuation models typically use complex mathematics and equations (e.g., Shen, 2005, 2006; Han, Yuan, Chin & Hwang, 2006; Zhang & Han, 2006; Chien & Korikanthimath, 2007; Geordiadou, Papazoglou, Kiranoudis & Markatos, 2007; Yuan & Wang, 2007; Chiu & Mirchandani, 2008).
- They can also be categorised according to the differing modelling approaches described previously, namely: -
 - Social forces models (e.g., Helbing et al., 2000a; Parisi & Dorso, 2005, 2006, 2007; Lin, Ji & Gong, 2006).

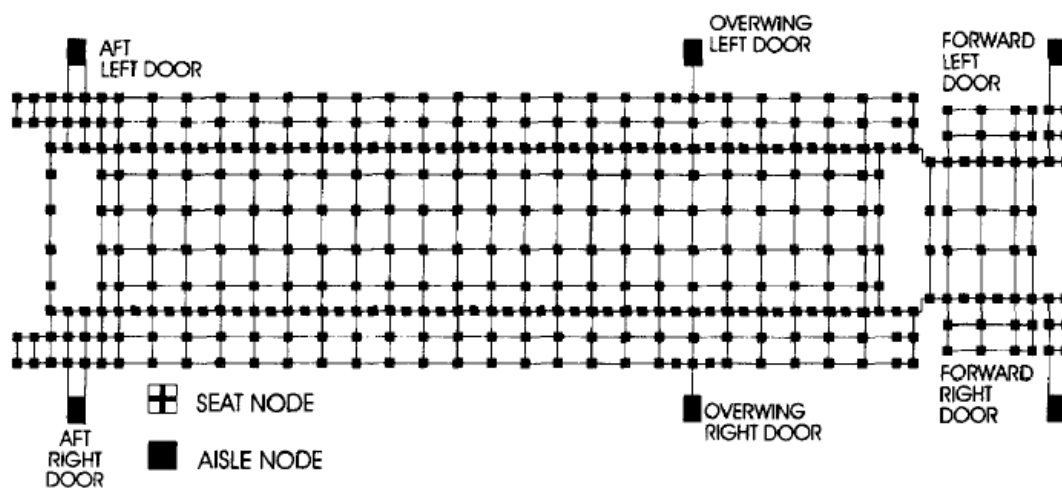
¹⁷ The literature review also revealed many computer-based models concerned with simulating traffic movements during emergency evacuations. However, because this research is primarily interested in human behaviours during emergency evacuations, these traffic related models have not been included.

- Cellular automata models (e.g., Lo & Fang, 2000; Gupta & Yadav, 2004; Lo et al., 2004; Yang et al., 2005; Nishinari et al., 2006; Zhao, Yang & Li, 2006; Zhao, Yang & Li, 2008; Chiu & Zheng, 2007; Varas et al., 2007; Weifeng & Kang Hai, 2007).
- Agent-based models (e.g., Wong & Luo, 2005; Bo, Cheng, Hua & Lijun, 2007; Pan et al., 2007; Zarboutis & Marmaras, 2007; Zhang et al., 2007).
- Two key evacuation models are: -
 - EXODUS
 - SIMULEX

EXODUS

- Exodus¹⁸ is a suite of software tools which enables evacuation simulation for large numbers of people from within an enclosure, for example in mass transportation, such as aircraft, trains, or ships (e.g., Galea & Perez Galparsoro, 1994; Galea, Owen & Lawrence, 1996; Galea, 1998; Filippidis, Gwynne, Galea & Lawrence, 2003).
- The basic, cellular automata model tracks the trajectory of individuals either as they escape from an enclosure, or as they are overcome by fire or toxic gases. Each individual moves from one cell/node to the next, dependent on whether a node is occupied or empty.
- EXODUS includes multiple social psychological attributes and characteristics which can be assigned to individual agents, such as age, name, sex, breathing rate, agility, mobility, running speed, response time and drive (Galea & Perez Galparsoro, 1994; Galea et al., 1996).
- It features an 'itinerary list', which enables each individual to perform certain tasks before evacuating, such as searching for a child, or returning to a location to collect a bag, along with a feature that enables the use of signage and communication between individuals to be modelled (Filippidis et al., 2003).

Figure 35. An EXODUS grid used to represent a wide-bodied aircraft
(Taken from Galea et al., 1996, p.66)



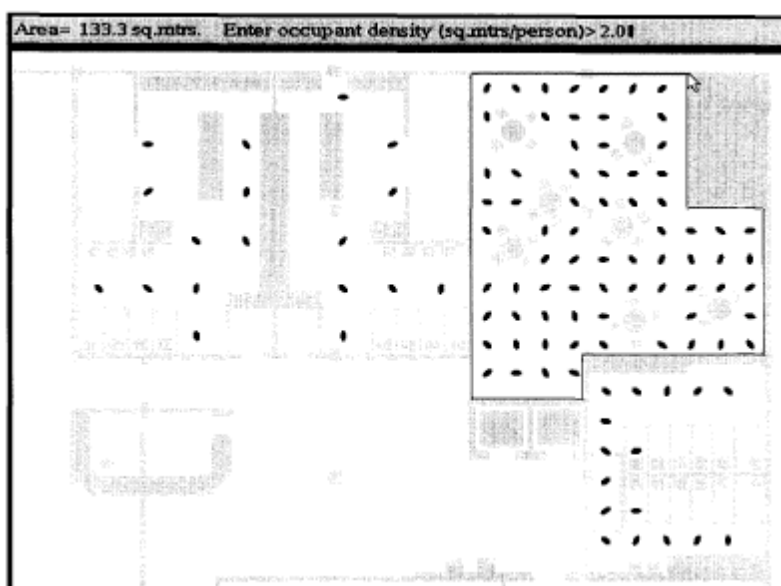
¹⁸ For further details see <http://fseg.gre.ac.uk/exodus/index.html>

SIMULEX

- SIMULEX is an agent-based model, concerned with evacuation from complex buildings (e.g., Thompson & Marchant, 1994, 1995a, 1995b, 1995c). It enables more realistic human behaviours to be modelled, since multiple factors are taken into account, including physical motions and gestures (e.g., swaying and twisting), proximity of other evacuees, shape of building structure, and influence of gender and age.
- Additionally, walking speed and the direction of each individual are assessed independently of group density, meaning that each individual is allowed to decide on his or her own direction and speed, depending on environmental logistics, proximity of other people and obstacles. Thus, for example, an individual is able to slow down if obstacles are encountered (Thompson & Marchant, 1995b).
- However, a weakness of SIMULEX is that it relies on inter-person distances to specify individuals' walking speeds and directions, yet in reality, people are not equally spaced (Santos & Aguirre, 2004).

Figure 36. SIMULEX screen display showing a populated area

(Taken from Thompson & Marchant, 1995b, p.139)



Future Simulation Models

- Few models include psychological aspects of human behaviour which can affect decision making, such as memory, personality, values, stress and emotions (e.g., Pelechano, O'Brien, Silverman & Badler, 2005; Silverman, Bharathy, O'Brien & Cornwell, 2006a; Silverman, Johns, Cornwell & O'Brien, 2006b; Sakuma et al., 2005; Shao & Terzopoulos, 2007; Durupinar et al., 2008). Consequently, future simulation tools should aim to take psychological factors into account (e.g., Santos & Aguirre, 2004; Silverman, 2004; Pires, 2005; Pelechano & Malkawi, 2008).

"It is necessary thus to incorporate psychological and physiological elements that can affect agents' behaviors in ways similar to behaviors observed in real people (i.e. altruism, fatigue, route selection...)." (Pelechano & Malkawi, 2008, p.383)
- Silverman and colleagues (e.g., Silverman, 2004; Silverman et al., 2006a; Silverman et al., 2000b) suggest that the challenges for increasing the realism of human behaviour simulations include modelling higher level cognitive functioning, having sufficient behavioural knowledge input into the design process, bridging the gap between behavioural and cognitive research and actual implementation of the simulations, and design of simulation software.
- Visual characteristics and aesthetics of simulations tools have made considerable progress over recent years, for instance, the realistic appearance of individuals and the way in which they move (Magnenat-Thalmann & Thalmann, 2005) – primarily due to customer demands. However, the realism and accuracy of actual human behaviours – i.e., the fundamental purpose of simulation models – do not appear to have evolved in a similar manner (e.g., O'Sullivan, Cassell, Vilhjalmsson, Dingliana, Dobbyn, McNamee, Peters & Giang, 2002; Tecchia et al., 2002). Thus, future models should try to redress this balance, emphasising fundamental human behaviours, such as perceptions, emotions, decisions, autonomy, reactivity, personality, interactions and social skills (e.g., Durupinar et al., 2008).
- Models which consider the notion of body-to-body contact, leading to consequences such as pushing and falling over, should ideally be included in future simulation tools (e.g., Pelechano & Malkawi, 2008).

"...effects such as falling, injury, incapacitation, and others walking over the fallen agent that can appear during an emergency evacuation with agents in panic are also ignored." (Pelechano & Malkawi, 2008, p.383)

- Future models should also aim to realistically simulate how communication and, similarly, interactions between crowds and other groups, such as the police during crowd control, alters the behaviour of crowd members (e.g., Pelechano et al., 2005; Silverman et al., 2006a; Silverman et al., 2006b; Bruzzone et al., 2007).

“...it is essential to integrate agent-based approaches that endow the agents with physiological and psychological elements that can describe the virtual humans' mental state at any given time and drive their decision making, orientation skills and possible roles within the crowd. Communication between agents is another crucial element to integrate in realistic models to achieve more accurate evacuation results.”

(Pelechano & Malkawi, 2008, p.384)

- In particular, crowd members have both the ability to communicate with one another in order to exchange information, and the ability to enter a situation with limited knowledge but to then gain further knowledge from exploring the environment or from communicating with others (e.g., Pelechano & Badler, 2006). Unrealistically however, simulations typically fail to consider communication between agents, in addition to assuming that agents have complete information about their environment and are able to access the entire internal structure of their environment (Pelechano & Malkawi, 2008). Therefore, future simulations should attempt to take into account that individuals have these communication and exploration abilities, for example, by providing agents with the ability to explore a new environment.
- Simulations should also attempt to model the interaction between individuals (either alone or in a crowd) and traffic (e.g., Kwon & Pitt, 2005).
- Approximately half of all individuals in a particular environment move around as part of a group, of varying size (Loscos et al., 2003). Therefore, the inclusion of group behaviour in crowd simulations – an aspect which is currently lacking – is a key area for future models to consider. Typically, individuals in the same group walk at the same speed, follow the same goals and will wait for one another if a group member is missing (Musse et al., 1998).

- Simulations should also incorporate the psychological role of being part of a group, with a strong sense of shared social identity – a concept known as “*psychological ‘groupness’*” (Drury & Cocking, 2007, p.34) – and the impact which this has on crowd behaviours (e.g., Smith, James, Jones, Langston, Lester & Drury, 2009).
- Additionally, future models should consider non-navigational, more personally motivated behaviours, which often occur during a journey from A to B, such as stopping to talk to another person, looking in a shop window, taking a rest on an available seat, observing a street performance or queuing for a ticket machine or bus (Leggett, 2004; Shao & Terzopoulos, 2007).

KEY LEARNING POINTS

– Simulating Crowd Behaviours –

- There are two types of model for simulating crowd movement: 1) macroscopic, which concern the behaviour of the crowd as a whole; and 2) microscopic, which concern the behaviour, decisions and interactions of individuals within the crowd.
- Macroscopic models include: regression models, which use simple equations to calculate flow variables; and fluid dynamics models, which liken the movement of a crowd to the flow of a fluid.
- Microscopic models include: rule-based models, e.g., Reynolds' (1987, 1999) 'boids' model which likens crowd behaviour to the movement of flocking birds; social forces models, where each individual is represented by a self-driven particle subject to social and physical forces; cellular automata models, which divide the environment into a uniform grid of discrete cells, with agents able to move between unoccupied neighbouring cells; and agent-based models.
- Agent-based models are the most complex and realistic of the simulation models. They are populated by intelligent, autonomous agents capable of perceiving their environment, generating intentions, making independent decisions and performing rational, realistic behaviours, according to various sets of underlying simulation rules. Individual attributes, such as age, gender, mobility, size and walking speed can be assigned randomly to agents.
- Crowd behaviour should be modelled at three levels – 1) the individual, 2) interactions between individuals, and 3) the group – to mirror the behaviours of a crowd in reality.

- **Physical forces within a crowd have a direct impact on movement and behaviour. These forces occur for a reason, are directed and location specific, propagate through the crowd like a shockwave, and, once exerted, are typically out of an individual's control, thereby carrying dangerous consequences.**
- **Self-organisation phenomena, which emerge because a crowd typically behaves according to the principle of least effort, can be accurately simulated with crowd behaviour models. These include the 'faster is slower' effect, lane formation, herding and queuing, and 'corner hugging'.**
- **Additional observed crowd behaviours which can be realistically modelled include: -**
 - **Individuals prefer not to take detours or move in opposition to the main crowd flow, instead taking the fastest route or, if routes are of equal length, the route with the least changes in direction.**
 - **Individuals try to maintain a distance from others and from obstacles, in order to avoid collisions.**
 - **Group or family members prefer to move as a unit and will wait for one another if they become separated. Behaviour in hierarchical groups (e.g., families) is likely to differ from behaviour in groups of friends.**
- **Initiatives which can be implemented to improve crowd flow, based on these observations, include: -**
 - **Columns to encourage lane formation.**
 - **Separate entry and exit doors.**
 - **Long line-of sight paths.**
 - **Rounded rather than angular corners.**
 - **Communication systems.**

- **There are numerous models used to simulate evacuations, two key ones being EXODUS and SIMULEX.**
- **Future crowd behaviour models should ideally aim to: -**
 - **Include more psychological aspects of human behaviour, such as memory, emotions and stress.**
 - **Include higher level cognitive functioning.**
 - **Improve the realism and accuracy of crowd behaviour and movement, in addition to improving visual aesthetics.**
 - **Consider the impact of contact between crowd members, such as pushing or falling over.**
 - **Realistically simulate communication between crowd members and the impact this has on crowd behaviour.**
 - **Design simulations which acknowledge that crowd members are unlikely to have complete information about, or a complete understanding of, their environment and, therefore, may choose to explore.**
 - **Consider interactions between crowds and other groups, such as the police or stewards.**
 - **Simulate how groups, e.g., families or groups of friends, behave in a given environment .**
 - **Include behaviours with an alternative purpose, driven by personal motivation, such as stopping to look in a shop window or taking a rest.**

Gaps in Current Research Literature

Gaps in Current Research Literature

- Based on the extensive literature reviews conducted in relation to crowds, their behaviours, theories used to explain their behaviours, and the ways in which they can be modelled, the following areas appear to be lacking from research: -
 - Types of crowds.
 - Stewarding of crowds.
 - Non-ticketed event crowds – i.e., people who are not attending an event but wish to be involved.

Types of Crowds

- There appears to be very little research into crowd typologies. Only two relevant papers were found in the review of the literature: -
 - Momboisse (1967), who categorises crowds into four main types.
 - Berlonghi (1995), who identifies eleven types of crowd.
- There is a real need to conduct further research in this area, in order to identify different types of crowds, along with the characteristics and behaviours they are likely to exhibit.
- This should assist event planners and managers with their preparation for and management of particular crowd events, with particular types of crowd.

Stewarding of Crowds

- The extensive literature reviews uncovered no research concerned with stewards. Whilst there was plentiful research concerned with police – specifically regarding their interactions with crowds and the impact of their actions towards crowds on crowd behaviours (e.g., Adang, 2003; Stott & Adang, 2003, 2004; Drury et al., 2003a; Adang & Stott, 2004; Stott et al., 2007) – there was no equivalent investigation of stewards.
- Given that stewards are often the initial point of contact for crowd members, and that their behaviours towards, and interactions with, a crowd is highly likely to influence how the crowd behaves, it is essential that research be carried out in this area.
- It would also be interesting to examine the interactions between stewards and police.

Non-Ticketed Event Crowds

- The issue of individuals, who wish to be part of an event but do not have tickets to attend the event itself, also appears to be relatively unexplored.
- How these individuals are likely to behave, and the impact their behaviour may have on preparation for and management of the event, is an area worthy of further investigation.
- For instance, on Wednesday 14th May 2008, over 100 000 Glasgow Rangers football fans descended on Manchester for the UEFA Cup Final against Zenit St Petersburg. This was substantially more people than could be accommodated in the venue itself – the City of Manchester Stadium – which had a match capacity of 44 000. Moreover, only 13 000 seats had been allocated to fans of Glasgow Rangers (UEFA, 2008). Consequently, the vast majority of Glasgow Rangers fans did not have tickets, but still wanted to be involved in the event without attending the match itself. To accommodate such non-ticketed crowds, the Manchester officials provided three giant screens in the city centre on which the match would be shown.
- However, due to a technical fault with one of the big screens prior to the match kicking off, the transmission failed. Tensions then mounted as fans were unable to watch the game and, subsequently, riots resulted. In combination with violent rampages outside the stadium after Rangers lost the match, a total of 52 assaults were recorded and 42 Rangers fans arrested (see www.timesonline.co.uk¹⁹).
- Thus, despite not attending the match itself, the behaviour of this non-ticketed event crowd caused mass disorder and created huge problems for the authorities tasked with controlling the event (BBC, 2008).
- This incident highlights the need for event preparation and management strategies to include careful consideration of how individuals – who do not have tickets, but wish to be part of an event – are likely to behave, and how their behaviour, along with any potential problems which may arise, should best be managed.

¹⁹ Article retrieved from <http://www.timesonline.co.uk/tol/news/uk/crime/article3936458.ece>

PART 4

Expert Interview Findings

Part 4 – Expert Interview Findings

This part of the report contains: -

- A description of the expert interviewees.
- A summary of the key findings from the interviews, specifically in relation to crowds, their behaviours and the most appropriate ways of preparing for, and managing, crowd events.

The Expert Interviewees

The Expert Interviewees

- Twenty-seven semi-structured interviews were conducted with both academics and police/practitioners considered to be experts in the field of crowd behaviours.
- The interviewees (see below for further details) were specifically chosen for their wealth of experience of crowds and crowd events, ranging from a few years to over 30 years, with the majority having over ten years' experience in the field.
- They had a range of roles and responsibilities, including event management, overseeing public order at major events, emergency planning, operational planning and safety management.
- Experience of crowd events included: -
 - Notting Hill Carnival.
 - The Matthew Street Festival, Liverpool.
 - Glastonbury.
 - Hogmanay.
 - Liverpool Capital of Culture events 2008.
 - The Tall Ships Festival.
 - New Year's Eve in London.
 - Large scale marches in London (such as Stop the City, Stop the War, May Day protests).
 - Events at Wembley Stadium.

Experienced Police Officers

- Temporary Assistant Commissioner Chris Allison – Metropolitan Police.
- Superintendent Roger Gomm – Metropolitan Police.
- Superintendent Roger Evans – Metropolitan Police.
- Sergeant Kerry O'Connor – Metropolitan Police.
- Superintendent Phil O'Kane – Lothian and Borders Police.
- Chief Inspector Peter McGrath – Lothian and Borders Police.
- Chief Inspector Peter Mills – Sussex Police.

In addition, visits were made to:

- New Scotland Yard.
- Metropolitan Police Public Order Training Centre, Gravesend.
- Lothian and Borders Police, for a day out on duty during a visit from the Queen.

Key Practitioners

- Simon Ancliffe – Founder of Movement Strategies.
- Professor Keith Still – Founder of Crowd Dynamics.
- Sue Storey – Emergency Planning Manager, Nottinghamshire County Council.
- Ian Rowe – Arup.
- Andrew Jenkins – Arup.
- Clara Yeung – Arup.
- Erin Morrow – Arup.
- John Parry – Emergency Planning Officer, Liverpool City Council.

- Susan Lees – Senior Events Manager, Liverpool Culture Company, Liverpool City Council.
- Susan McAdam – Senior Events Manager, Liverpool Culture Company, Liverpool City Council.
- Alastair Stott – Senior Events Manager, Liverpool Culture Company, Liverpool City Council.
- Andrew McNicholl – Senior Events Manager, Liverpool Culture Company, Liverpool City Council.
- Gerrard Gibbons – Acting Chief Executive, Liverpool City Central Improvement District.
- Edward Grant – Senior Lecturer in Events Management, University of Derby.
- Mike Richmond – Managing Director of Richmond Event Management Ltd; Managing Director of The Event Safety Shop Ltd.

Leading Academics

- Professor Edward Borodzicz – University of Portsmouth.
- Professor Stephen Reicher – University of St Andrews.
- Dr John Drury – University of Sussex.
- Krisen Moodley – University of Leeds.
- Glyn Lawson – Human Factors Research Group, University of Nottingham.

Key Interview Findings

Key Interview Findings

- The following section reports the key findings from the 27 semi-structured interviews. Consequently, the information detailed is based on knowledgeable, informed opinion, as a result of many years' experience in the field of crowd behaviours and crowd events.

- More specifically, the findings concern: -
 - Types of crowd.
 - Key lessons and good practice advice for crowd events.
 - Key risks involved with crowd events.
 - Debriefing.

Types of Crowd

- The interviewees agreed that there is no one, typical crowd, but a whole range of crowd types and crowd behaviours, depending on numerous factors, including the event type, its location, the time of day, the act profile, whether the event is free or ticketed, and the weather.
- Therefore, it is vital that each event be considered and profiled according to its specific conditions, drawing on the knowledge and experience from previous events, concerning the likely crowd composition, their expectations and their probable behaviours.
- There is a whole range of crowd types, from passive and compliant crowds who are simply there to observe an event, to compliant protesters who are passionate about their cause but well behaved and law abiding, to crowds who will commit disorder if incited by other members of the crowd, to volatile crowds who set out with the intention of causing disorder. The majority of crowd members, however, are usually completely compliant and manageable.
- Within one particular event, there will be many different types of crowd, each with its own profile. For instance, some people will just want to be there for the atmosphere, some will want to be actively involved in the event, some will want to simply observe the event, and some will be going about their daily business in the event vicinity.
- This diversity makes event management difficult and, therefore, a flexible framework must be developed in order to accommodate the different crowd types.
- There also appears to be something about being part of a crowd which serves to empower individuals to behave contrary to their normal civil and moral restraints and, instead, commit disorder. When individuals come together as a crowd, a sense of group solidarity or ‘mob mentality’ is often created, whereupon members of the crowd feel empowered, under the ‘cover of the crowd’ to commit disorder and to incite disorder in others. Thus, normally law-abiding crowd members seem to be caught up in this ‘mob mentality’ and the emotion of the crowd, and subsequently break the law. Once disorder has been committed, the crowd typically maintain this sense of power and feel legitimate in continuing with their unlawful behaviour.

“Something happens to make these people empowered and emboldened.”

Temporary Assistant
Commissioner
Chris Allison
Metropolitan Police

“People use the cover of the crowd to do stuff that they would never have the bottle to do as an individual, but when they were in that crowd they felt they had the power to do it, they had the mentality, they were willing to take a step further.”

Temporary Assistant Commissioner
Chris Allison
Metropolitan Police

The following are examples of the types of crowd identified by the experts: -

Crowds at Marches and Demonstrations

- A complete spectrum of crowd member types can be observed during marches and protests. For example: -
 - The majority of crowd members will be totally compliant protesters, who are passionate but do not cause trouble.
 - There will be slightly more difficult protesters, who will not cause disorder but may commit civil disobedience, such as suddenly sitting down.
 - There will be protesters who are willing to commit disorder if they become caught up with the emotion and are pushed by other members of the crowd.
 - There will be professional/subversive protesters who are intent on causing and provoking disorder.
 - There could be “rent-a-mob” individuals who are not genuine protesters, but will use a protest as a cover to commit disorder.

Crowds at Sports Events

- Football crowds are typically male dominated, passionate and loyal fans, who are compliant in the main and return to the ground regularly to support their team. This makes their behaviour slightly more predictable, for instance, they tend to arrive late and leave early (particularly if their team is losing), to use the same entrances and exits, and to visit the same amenities. However, some fans have a territorial, tribal mentality which can influence their behaviour both inside and outside the ground; there is a risk of hooliganism from those who believe they have a legitimate right to fight and defend their territory against opposing fans.
- Rugby crowds are typically less problematic than football crowds, often with a family based profile.
- Historically, cricket crowds typically comprised older gentleman, who were calm, quiet and compliant. However, there has been a trend over recent years for younger, binge drinking groups, often in fancy dress, to attend international cricket fixtures at English cricket venues. This has led to an increase in crowd disorder at cricket matches.
- Crowds at the Olympic Games are typically compliant and of mixed composition, comprising family groups, couples, sports fans and tourists, both young and old. However, tension is likely if, for example, they have to queue for longer than expected or cannot get to the event they want to see, and therefore, it is vital that their expectations are managed and that they are kept informed when appropriate.

Crowds at Concerts

- Crowds at concerts are usually of variable composition, primarily determined by the profile of the act, for instance, a pop concert may have a larger proportion of teenagers and family groups, whilst an operatic concert may have a larger proportion of couples and older individuals. The profile of both the crowd and the act will then have a subsequent impact on the amount of management needed. Concert crowds are typically compliant, providing they get to see what they wanted to see, but can become irate and tense if there are long queues or delays, particularly if there is no information or communication provided.

Crowds at Celebrations, e.g., New Year's Eve

- Crowds at celebrations such as New Year's Eve are predominantly well-behaved party goers aged between 20 and 30 years old, although alcohol initiated violence is typically expected. There are generally few families or elderly due to the nature of the event. A small percentage of the crowd will typically arrive early and congregate at the best view points, followed by a late surge just before the event begins.

Crowds at Train Stations

- Crowds at train stations are typically comprised of commuters, who are usually in a rush but know where they are going and so rarely stop to observe signs, and leisure travellers, who are more relaxed and less rushed, but are more unsure of their journey and so stop and start more frequently.

Key Lessons and Good Practice Advice for Crowd Events

- This section details the key factors which the expert interviewees believed to be central to successfully planning and managing crowd events. These factors can be grouped broadly into the following categories: -
 - Planning and preparation.
 - Communication and information.
 - Understanding the crowd.
 - Experienced personnel.
 - Command and control.
 - Observing and monitoring.

Planning and Preparation

- Thorough planning and preparation for a crowd event is essential. This should include careful consideration of: -
 - Event type.
 - Profile of the act.
 - Location of the event.
 - Timing of the event.
 - Whether the event is free or paid entry.
 - Event publicity and promotion.
 - The likely crowd composition.
 - Which agencies need to be involved.
 - What the aims and objectives of the event are.
 - What a successful event should look like.
 - What resources will be needed to achieve this success.
 - What problems could potentially arise.
 - What contingencies need to be implemented to deal with those problems if they occur.

***“Preparation!
Preparation!
Preparation!”***

Professor Keith Still
Crowd Dynamics

“A big part of crowd management is about knowing your crowd and that comes by pre-planning and...doing that research on the crowd, seeing what happens and going to other venues to see how the crowd reacts.”

Sue Storey
Emergency Planning Manager,
Nottinghamshire County Council

- Police intelligence surrounding the event and the likely crowds it will attract, should be drawn on throughout the planning and preparation stages.
- However, it is important not to rely too heavily on preconceptions about how a crowd will behave or what will go wrong at an event – e.g., to focus on terrorism or hooliganism. Each event should be assessed on its own merits, and the atmosphere and crowd profile on the day of the event taken into account.
- Complacency is an issue to be aware of during event preparation – plans should be context and location specific.
 - Successful execution of an annual event in previous years does not negate the need to thoroughly plan and prepare for the forthcoming event.
 - Similarly, just because an event has been successful in one location, it should not be assumed that it will be successful with the same preparation and control measures in another location. For example, an event taking place in London will have different requirements to the same event taking place in Leeds.
- It is important to strike a balance between operational practicalities and creativity. Often, a large proportion of the budget is allocated to artistic elements, to make the event look impressive. However, the operational element – i.e., making the event run effectively – is of equal importance.
- An event should be considered from a ‘system-wide’ perspective – i.e., taking not only the event itself into account, but also factors in the surrounding area – in order to fully understand the wider implications of the event being organised.
 - For instance, it is important to consider whether other events are happening at the same time in the same area or close by, as this will alter the profile of the event and the likely crowds expected. It is beneficial to avoid a clash of events wherever possible.
 - Adopting this approach necessitates interaction with other agencies from other geographical areas, e.g., councils, transport authorities.

“People obsess about bells and whistles when they should be looking after the nuts and bolts.”

Mike Richmond
MD, Richmond Event Management Ltd;
MD, The Event Safety Shop Ltd.

- “What if...?” scenarios – i.e., table top planning exercises – are incredibly useful during preparation for a crowd event.
 - They provide an opportunity to test out the suitability and sufficiency of the plans in place, to think about potential problems from multiple perspectives, to share information from differing agencies, and to develop adequate contingency plans to manage and control these problems should they arise.
 - Such exercises should be carried out throughout the planning stage – not just at the end – and should be done in real time whenever possible, building incrementally from a relatively small incident.
 - For example, all parties could consider what their most vulnerable area is, and scenarios could be developed around those.
 - It is important to think about obscure incidents, such as a burst water main or an explosion, but there is little added value of considering highly unlikely events, such as a plane falling out of the sky.
- When conducting practice events, it is beneficial to have few crowd control measures in place and to observe how individuals move. The nature and location of potential problems can then be better anticipated, enabling more appropriate control measures to be implemented.
- The event site should be visited prior to the event and again on the day of the event, to thoroughly assess the geography of the location and its capacities, and to determine where potential hazards and areas of trouble, such as crowd congestion and reduced rates of flow, could be. It is important to work with the geography of the location and make use of physical street furniture wherever possible.
- The crowd will typically judge the success of an event based on minor details, such as the length of the queues or the toilet facilities available, rather than on the act itself. Therefore, careful consideration should be given to where crowd facilities/attractions should be located, in order to make the crowd’s experience as enjoyable as possible.

***“Information is
actually one of the
greatest assets.”***

Edward Grant
Senior Lecturer in
Events Management
University of Derby

- For instance, in relation to where queues are going to form – particularly when entering the event itself – it is important to think about what facilities the crowd have access to – i.e., Have they got toilets? Have they got shelter? Have they got stands to buy food and drinks from? Access to facilities such as these whilst queuing, may help to alleviate the crowd's discomfort.

“You’re only ever as good as your last event...if one part of your event goes wrong, it mars the overall success.”

Susan Lees
Senior Events Manager
Liverpool Culture Company

- Careful consideration should also be given to the location of barriers, to ensure that they assist event personnel – i.e., the authorities and stewards – with crowd management and control, rather than acting as hazards or obstructions.
- The way in which event promoters publicise – or wish to publicise – an event and the hype generated by spin doctors must be acknowledged when preparing for an event.
 - Event organisers often experience difficulties with event promoters, since the way in which an event is advertised influences the crowd profile it attracts. If promoters are looking to draw as many people as possible, they may, for instance, publicise the event in more varied and widespread ways, or offer incentives. These techniques will alter the type of crowd attracted, thereby making preparation and planning much more complex.
 - Spin doctors, in wanting to build hype for an event, may greatly exaggerate the crowd numbers expected, advertising highly unrealistic figures. However, this then has a detrimental effect on the event industry as a whole, as events appear to be vastly undersold when the true – and safe – attendance is calculated.

Multi-Agency Teamwork

- A multi-agency approach, drawing on the expertise of police, fire and ambulance services, local authorities and event organisers, for example, should be promoted and adopted. In addition, a hierarchical model, comprising chief executives, senior officers, a safety advisory group, and a team of event planners should be utilised.
 - This will enable the event to be considered from multiple perspectives which should increase the likelihood of all potential problems being covered.

“If you haven’t got the right people involved at the right time, no amount of money is going to rescue you.”

Edward Grant
Senior Lecturer in Events Management
University of Derby

- Included as part of the multi-agency event team should be disabled individuals – e.g., people in wheelchairs – since they are best placed to advise what disabled access and facilities will be most appropriate for a crowd event. Reliance on able-bodied advisors is much less satisfactory.
- All agencies to be involved should be introduced on site as early in the process as possible. This should help to build a sense of team solidarity, enable all individuals to learn from each other and create a common body of knowledge, and allow the various strengths and weaknesses of different parties to be assessed.
- If an event is to be successful, it is important that the multi-agency event team continues to work together as united team throughout whole event, from the early planning and table top exercises through to event delivery. This should enable a bond to develop between all involved increasing levels of trust.

“The longevity of the team is actually key.”

Edward Grant
Senior Lecturer in
Events Management
University of Derby

- It is critical to identify early in the process the key personnel, and assign their individual roles and responsibilities.
- All parties should be aware of their own roles and responsibilities, and of the roles and responsibilities of others, to ensure successful integration of all agencies.
- It is important to be aware of the weaknesses of different members of the event team – e.g., who is more risk averse, who is more likely to take bigger risks, who will need more support. This awareness should develop over time as the team work together, and should enable the team to know, for instance, when people will need additional support, when more consideration needs to be given to taking certain risks, and when information received may be more cautious.
- If a multi-agency approach such as this is to be successful, all parties must be prepared to work alongside one another and compromise when necessary.
- Similarly, it is important to trust the judgements and opinions of fellow team members in their specific areas of expertise. Other parties may have concerns about certain issues, but providing those concerns are addressed during event preparation and contingencies are in place to manage incidents should they arise, this should be sufficient.

“I think having a real wealth of experience round the planning table is probably the greatest qualification you could bring to an event.”

Gerrard Gibbons
Liverpool City Central Improvement District

- A crucial area of joint-agency collaboration which currently appears to be lacking is that between architects/designers and event organisers/managers.
 - Crowd event personnel are rarely involved in the design stage and, therefore, venues are often constructed against the best practices of crowd management and, instead, are designed to look aesthetically appealing.

“Make it fit for purpose.”

Susan Lees
Senior Events Manager
Liverpool Culture Company

- To avoid this, those commissioned to design venues for crowd events should communicate with – and listen to the expert advice of – event organisers in the very initial stages. This should better enable architects and designers to create crowd-friendly venues.
- All meetings should be structured and documented, with actions noted and followed up as appropriate.
- Consistency of terminology between all agencies involved in a particular crowd event – and within the crowd event industry more generally – is a key issue for the smooth running of an event. At present, however, terminology used is not consistent.
 - For example, there is inconsistency in official guidelines, such as The Green Guide and The Purple Guide, regarding safe crowd densities and capacities for different venues.
 - The concept of ‘a crowd’ differs considerably between individuals and, therefore, it is difficult to ensure all parties are working from the same baseline.
 - Fundamental crowd event terms – such as ‘major incident’, ‘stampede’, ‘crush’ – which are highly emotive and carry serious consequences, are often perceived differently by distinct agencies. Therefore, what one party believes to be a major incident, another more experienced party may not, and this can have subsequent effects on the level of action taken.
 - Different local authorities often have different approaches to crowd event management. This can be particularly problematic when one event spans several authority regions, as there is then inconsistency within the same event.

***“Consistency of terminology is vital
in crowd management.”***

Mike Richmond
MD, Richmond Event Management Ltd;
MD, The Event Safety Shop Ltd.

Communication and Information

- Communicating with, and providing information to, the crowd is vital for a successful event.
- Information communicated to – or withheld from – the crowd can influence their behaviour. Hence, communicating with the crowd is essential in maintaining order and managing behaviour.
- Prospective event crowds should be provided with information prior to the event, so that they are aware of what to expect. This information can be communicated via media advertising and announcements, literature and programmes distributed with event tickets, or a website, for instance. It should inform crowd members: -
 - How they can arrive at the event – e.g., directions, public transport available.
 - Where they are going to go when they get to the venue – e.g., parking facilities, park and ride facilities, directions to the event entrance.
 - What they will want to do when they get inside the event – e.g., toilets, concessions stands, souvenir shops.
 - What they will not be allowed to take into the event – e.g., potential hazards such as glass bottles, umbrellas, picnic chairs.

“Communication – it’s such an important thing but it’s so easily forgotten.”

Superintendent Roger Evans
Metropolitan Police

“You need to give people as much information as you can before they get to the event.”

Susan Lees
Senior Events Manager
Liverpool Culture Company

- Be aware that English will not be the first language for all crowd members, particularly at very large, international events.
 - Therefore, try to provide signs in multiple languages or make use of pictograms, as a universal language, e.g., ticks and crosses next to pictures to indicate what behaviours are and are not allowed.
- During an event, the whole crowd – not just those at the front of the event or in closest proximity – should be provided with accurate, comprehensive and timely information, both audio and visual.
 - Again, it is important to provide this information in multiple languages and/or in a format which is likely to be understood by people from a range of cultures with a range of languages, e.g., picture representations.
- Communication from stewards is often the most effective and most well received, as crowd members perceive stewards to be most similar to themselves, as opposed to police or other authority figures (i.e., “us” versus “them” mindset).
- Managing the crowd’s expectations is important in terms of managing their behaviour more effectively. This can be achieved by: -
 - Providing the crowd with information about, for example, the reasons why they are having to queue or are being asked to act in a certain way.
 - Communicating with the whole crowd when appropriate.
 - Listening to the crowd and trying to facilitate their needs and solve any problems wherever possible.
- Bear in mind that expectations are likely to be higher if the event is paid entry, since crowd members attend with certain expectations about what they want to see in return for their money.
- Try to manage information proactively rather than reactively – i.e., if footfall counts indicate that more individuals than expected are arriving at the event early, act accordingly to prevent problems before they arise.
- Make use of information available from the multiple agencies involved in organising the event. For instance, use knowledge regarding the departure and arrival times of park and ride buses to give an indication of when more people are likely to arrive at, and leave, the event.

Understanding the Crowd

- Being able to read and understand the crowd, and drawing on the knowledge, skills and experience of those individuals who are able to do so, is imperative.

“Every crowd is different, but if you understand it you’re more able to manage it and cope with it in a more effective way.”

Temporary Assistant Commissioner
Chris Allison
Metropolitan Police

- For each specific event, this must involve consideration of:-
 - Who the crowd are, i.e., their likely composition and profile, based on previous events.
 - Their purpose for attending the event, i.e., their aims and objectives in attending the event.
 - How they are likely to move around the event.
 - The most appropriate form of intervention if needed, dependent on these previous factors.

“Just because a crowd is larger, doesn’t necessarily mean it is more dangerous – it’s the way they move and behave that is key.”

Edward Grant
Senior Lecturer in Events Management
University of Derby

- It should be recognised that crowds, in general, do not distribute evenly, but tend to cluster in particular areas, such as areas with a good view or near to concessions stands. Therefore, whilst the average density over the whole event area might be acceptable, it is crucial to be aware that particular areas will be very dense whilst others will be relatively unused. Action may be needed to redistribute density more evenly.
- It is important to remember that by and large people are creatures of habit, who generally prefer to follow what they know, for example, following the same routes or going out the same way they came in. Therefore, the behaviours of regular crowds, such as those who attend football matches, tend to be more predictable.
 - Nevertheless, sometimes people will act in an unexpected way – e.g., not rushing to be at the front of the event or the front of stage.
- In unfamiliar surroundings or unfamiliar circumstances, people will behave differently, for instance, stopping and starting more frequently, moving more slowly, and relying heavily on signage and stewarding.
- Remembering that the crowd is not homogenous, but is comprised of a wide range of diverse individuals, with different wants, needs and expectations, is crucial for successful crowd management. The crowd should not be treated as one mass, but as a collection of smaller groups, with authorities taking action appropriate to the composition and likely behaviours of each group.
 - For example, rather than considering all crowd members to be troublesome and acting accordingly – running the risk of alienating the whole crowd – authorities should differentiate, and target, only those groups known (or thought likely) to be unruly.
- It is important to recognise that the way in which authorities – chiefly the police – behave towards the crowd will influence the way the crowd themselves behave.
 - For instance, the legitimacy with which police interventions are perceived by the crowd will impact on their behaviour; if the crowd perceive the intervention to be legitimate they are more likely to accept the police action and comply, whereas if the crowd perceive illegitimate interference they are more likely to react, often resulting in disorder.
- Action taken when problems are imminent, or have already arisen, should be appropriate for the crowd profile. Thus, a more gentle, human approach is often more effective at changing crowd behaviours than more aggressive, heavy-handed actions.

- Careful consideration should be given to the level of visible security at an event, and to the uniforms they are wearing. Both must be appropriate for the event and crowd profile, in order to appease crowd members as much as possible.
 - Hence, it is less suitable to have heavy duty security teams or tactical teams visible at an event, as this gives the crowd the impression that disorder is expected. It is more acceptable to make use of stewards and police officers in a public relations role, and engage the stronger security measures only when needed.
 - Similarly, if the crowd is expected to be predominantly compliant, it is more appropriate for security personnel to be dressed in their day-to-day uniforms, rather than kitted out in full riot gear.
- Rethinking the way in which crowds are generally perceived, to view them as a positive occurrence and an opportunity to form and transform social relationships – such as the typically strained relations between crowds and the police – as opposed to troublesome, problematic, and in need of control, should enhance the success of a crowd event. If the crowd feels fairly treated and trusted by the authorities, they should begin to self-manage and self-police.

“People will manage themselves and only look for help when they need it.”

Mike Richmond
MD, Richmond Event Management Ltd;
MD, The Event Safety Shop Ltd.

Experienced Personnel

- Utilising personnel who have plentiful experience in planning for and managing crowd events is a must.
- Knowledge of crowds and their likely behaviours, and of varying types of crowds and their likely compositions, develops from years of experience of dealing with crowds and managing crowd events on a regular basis.

“It’s one of those industries where experience matters.”

Simon Ancliffe
Movement Strategies

“You only develop competency by being in crowd environments.”

Mike Richmond
MD, Richmond Event Management Ltd;
MD, The Event Safety Shop Ltd.

- Judging how a crowd is likely to react to intervention from authority and, subsequently, knowing when it is appropriate to intervene and when to take a step back, also develops from experience of dealing with crowds first hand.

“I think as much as you learn from attending presentation or courses, nothing can compare to actually being on the ground and seeing crowds at first hand, because they’re not like a textbook, they don’t behave like a textbook either, and it’s only seeing them first hand that you do get the experience and knowledge.”

Andrew McNicholl
Senior Events Manager
Liverpool Culture Company

Command and Control

- A solid command and control structure, following a logical strategy, should be in place for each crowd event, with a central control point responsible for the overall event management across multiple locations.
- Command and control of an event should be given to key, operational personnel with plentiful experience of crowd events, and not to an individual who is high in authority but has no experience of actually being out in the field.
- All parties should be thoroughly briefed, so as: -
 - To understand, and be confident in, their own roles and responsibilities.
 - To be aware of the roles and responsibilities of others.
 - To understand how actions by one party can impact on actions by another party.
 - To be aware of event safety.
 - To be aware of who is in command of the operation overall.
 - To be aware of the boundaries of operational control – i.e., when control of the event could shift from the event organisers to the police.
- The commander should be supportive and intrusive in the appropriate measure.
- Stewards should also have good knowledge of the local area, in order to efficiently divert traffic, give directions, or suggest the best areas from which to observe the event.
- Flexibility – in terms of being able to deviate from the original plan and following contingency plans in the event of problems – is key to safely managing a crowd event.
- Often, a judgement call regarding how to react to an incident will need to be made by the individual in charge. This should involve an assessment of the benefits and drawbacks of implementing a specific contingency plan, in order to execute the event safely whilst also meeting the expectations of the crowd.

- For example, would cancelling an event half way through to alleviate overcrowding cause more problems – in terms of the crowd being disappointed – than permitting the event to continue, with the possibility that a few crowd members may be injured, in order to allow the crowd to see the event they expected to see?

“You can actually create more difficulties and more disorder by overreacting to a situation that’s not there, or is very unlikely to happen.”

Andrew McNicholl
Senior Events Manager
Liverpool Culture Company

- It is also important to consider the context of the event when deciding how problematic an issue is and, consequently, what control measures need to be taken.
 - For example, at a rock/pop concert with a predominantly young audience, a reasonable amount of ‘crowd surfing’ is expected and, therefore, providing the appropriate safety measures are in place to cope with these individuals, it should not be considered a high risk.
 - However, at a concert with a predominantly old audience, crowd surfing would not be anticipated and, therefore, if a few individuals engaged in the behaviour, it could be indicative of a problem.

Observing and Monitoring

- It is vital to continually observe and monitor the crowd, to look for any signs of potential problems or trouble, or any indications that disorder is imminent.
- Crowd dynamics – particularly violence – can be seen to evolve in the build up to an event, with typical indications of trouble including build up at turnstiles, rising crowd pressures, pushing and shoving, and chanting.
- There should very rarely be a need to intervene at the last minute; if observations and monitoring are sufficient and efficient, early intervention should be possible.
- It is essential to use multiple forms of crowd monitoring during an event, in order to assess the crowd and their behaviour from multiple perspectives. These include: -
 - Officers on the ground, to listen and feel how the crowd is acting.
 - Undercover officers in the crowd.
 - Stewards.
 - CCTV.
 - Helicopters, to give an overall view of the event.
 - Commanders overseeing from the command centre.
- However, it is important to be aware that some monitoring tools, such as CCTV, may portray a false image. For instance, CCTV pictures may show an area to be very densely populated area, whereas in reality, the density is fine. Therefore, a range of measures should be used in parallel, to assess issues such as density. For example, in addition to CCTV, observations of how freely people are able to move through a crowd can be used to indicate density.
- The build up of a crowd tends to be gradual, with people congregating in key areas, for example, near concession stands or in areas with the best view. There is also typically a significant increase in people arriving just before the start of the event.

Key Risks Involved with Crowd Events

The expert interviewees believed the following factors to be the key risks involved with crowd events: -

- Insufficient pre-planning, resulting in a lack of awareness and thorough consideration of what can go wrong and how it can be managed.
- Insufficient control system overseeing the whole event, with parties unaware of who is in charge.
- Lack of experienced personnel and lack of familiarity with the event environment.
- External risks, such as terrorism and severe weather conditions.
- Crowd collapse, crushing and serious injury.
- Panic – when a large number of people in a small space sense something is wrong it can lead to crushing, pushing, and crowd collapse.

Debriefing

A debrief session takes place after every event, although the size and scale of the event determines the type of debrief: -

- There is always some form of 'hot debrief' at the end of an event to discuss any problems or issues which arose during the event, for example, the use and positioning of barriers.
- For an event taking place over several consecutive days, a debrief should be conducted every evening, so that improvements can be made for the following day.
- Each team of police officers deployed at an event is asked to complete an operational record that includes any debrief points. Where appropriate, a short report detailing the debrief is then kept on file with the planning team and used when planning future events.
- For larger or more unusual events, a more formal, multi agency debrief usually takes place to examine, for instance, what went wrong, what was successful, and what can be changed for future events. This typically includes communication issues, control structure, tactics, positioning and use of barriers, and stewarding issues.
- All actions, decisions and lessons identified should be written down, and kept on file with the planning team or transferred into policy, to be used when planning future events. Everything should be clearly recorded and fully explained, to enable future event organisers to easily understand the resulting policies.
- Lessons identified, such as new techniques, new tactics, or new training methods, should also be disseminated to those involved in planning and managing crowd events. It is vital to learn year-on-year and to continually improve on less successful aspects from previous events.

KEY LEARNING POINTS

– Expert Interviews –

- There is no one typical crowd, but a continuum of crowd types and crowd behaviours. Therefore, each event must be profiled according to its specific conditions, to ascertain the likely composition and behaviour of the crowd.
- Within one event, there will be many different types of crowd, each with its own profile. A flexible framework for event management should be developed in order to cope with this diversity.
- When individuals come together as a crowd, a sense of ‘mob mentality’ is often created, whereby under the ‘cover of the crowd’, crowd members feel empowered to commit disorder or incite disorder in others.
- Thorough planning and preparation is essential, and should consider issues such as event type, location, likely crowd profile, resources needed and contingencies.
- Police intelligence should be drawn upon during the process, although prior expectations should not overshadow event management on the day.
- Beware of complacency as a result of past event success.
- “What if...?” scenarios should be used throughout the preparation stage, to consider management strategies and contingency plans to deal with potential problems.
- A system-wide approach, considering the event in relation to its wider surroundings, is beneficial.
- Careful consideration should be given to the location of crowd facilities and amenities, to make them as accessible as possible.

- **Be aware of the hype generated by spin doctors promoting an event and the subsequent impact which this may have on the types of crowds attracted.**
- **A multi-agency approach, drawing on the expertise and perspectives of a wide range of individuals, should be used.**
- **All parties must be prepared to work together as a united team, and be aware of their own roles and responsibilities, and those of the other agencies.**
- **The agency members who will comprise the event team should meet as early as possible in the event preparations, to enable team-working throughout the process and to build a sense of team solidarity.**
- **Consistency of crowd event terminology between all agencies is key.**
- **Accurate, timely and comprehensive communication with the whole crowd, both audio and visual, is vital and should help manage the crowd's expectations.**
- **As much information as possible should be provided to prospective crowd members prior to the event, to influence their behaviour on arrival.**
- **Information should be provided in multiple languages and/or simple pictures should be used to convey meaning.**
- **It is important to remember that the crowd is not a homogenous mass, but a collection of smaller crowds and individuals with their own needs, wants and expectations, which need to be managed.**
- **The way in which authorities, such as the police, react towards and treat a crowd will impact on how the crowd behaves. Distinct groups within the crowd should be differentiated and treated appropriately.**

APPENDIX

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