The Bradford City Stadium fire 1985, an analysis of human behaviour

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1 Abstract

The purpose of this study is to explain the observed human behaviour in fire situations. To do so, the case of the Bradford City Stadium Fire, where 56 people died and many more got injured when a stand at a football stadium burned down during a football match is used. The Bradford City Stadium Fire showcases behaviour like reluctancy to evacuate although a fire is near, evacuation exit choice through smoke, and the absence of panic.

This, at first glance strange or abnormal behaviour is then analysed and explained with the use of the fire emergency timeline, the role-rule model, the theory on bystander apathy, risk perception, the theory of commitment, affiliation for both persons and places, the theory of affordance and different views on panic.

The projection of those accepted psychological theories on the observed behaviour at the Bradford City Stadium Fire shows that this behaviour is not strange or abnormal but can be explained and catalogued as normal human behaviour in a fire.

2 A brief description of the fire incident

On Saturday, 11 May 1985 a fire broke out at the Bradford City stadium during the football match between Bradford City and Lincoln City (Popplewell, 1985, p. 3). The Popplewell inquiry into the incident states that fire started under block G of the main stand and described the speed at which the fire spread as faster than a man could run, while the wooden structure of the stand itself caused the fire to spread (1985, p. 7).

In less than 5 minutes the entire stand was on fire (Popplewell, 1985, p. 60). The reluctance to evacuate the stand and locked escape routes led to the death of 56 people and a great number of injured (Popplewell, 1985).

The main information on the Bradford city fire was obtained from (1) the official inquiry into the fire, known as the Popplewell Inquiry, and (2) the Yorkshire television footage as it can be found on YouTube.

3 The Crowd at Bradford City Stadium

To analyse the human behaviour of individuals in a group of football spectators, it is important to understand the nature of the group itself. The main stand of the Bradford City stadium, at that time, could hold about 5,000 people. On the day of the event, it was mainly occupied with long-time fans and family members (Klem, 1986). The individuals present in the stand all shared the same goal, the goal of seeing their team play, and preferably win. Therefore, the crowd can be catalogued not just as a physical crowd but also as a psychological crowd as a result of their shared social identity (Reicher, 2011). This, however, does not imply that individuals lose their individual identity and become an irrational crowd (Le Bon, 1895). There

is no loss of control or self-interest, but behaviour and interest are based on the collective self (Drury & Reicher, 1999).

4   Behaviour sequences – The fire emergency timeline

The Society of Fire Protection Engineers (SFPE) considers three major phases in the fire evacuation timeline, (1) Detection and warning, (2) Pre-evacuation, and (3) Movement (SFPE, 2018). A similar system with the slightly different wording of 'pre-movement processes' and movement (or travel) processes' is presented by the British Standards Institution and the International Organisation for Standardisation (Purser & Bensilum, 2001).

The Pre-evacuation period starts after the ignition of the fire, from the moment the first cues are received by an individual or individuals (SFPE, 2018). The Pre-evacuation period covers (1) the Perception phase (Kuligowski, 2008), (2) the Interpretation Phase, and (3) the Preparation phase (Canter, et al., 1990) (Cepolina, 2005), where each of the phases is influenced by both human-based or cue-based factors (Kuligowski, 2009).

The Movement period contains the actual 'Action' phase (Kuligowski, 2008) of the emergency timeline, where the possible actions can be summarised as (1) evacuate, (2) wait, (3) fight, and warn (Canter, et al., 1990). The equivalent of the 'Run, Hide, Tell' or 'Run, Hide, Fight' strategy in case of an active shooter.

5   Visual representation

This report focusses on human behaviour in both the Pre-evacuation and the Movement period. A summary of the main actions during the incident, as presented in the Popplewell Inquiry and as seen on the TV footage, is given in the table below. A distinction is made between (1) Mr Bennet, who was one of the first to notice the fire, (2) Mr Brownlie, who was seated next to Mr Bennett, (3) Police Constable (PC) Lyles and (4) Thompson, who were in the back of the stand, (5) the general public in the stand, and (6) Police Command.

The relation of their actions to the fire emergency timeline is shown in the figure below in combination with the further explained human behaviour characteristics.

| Nr.	Mr Bennet	Mr Brownlie	PC Lyles	PC Thompson	General Public	Police command
0	Watch Football	Watch Football	On duty in the main stand	On duty in the main stand	Watch Football	On duty
1	Notice Warmth					
2	Look down					
3	Interpret as not significant	Alarmed by Mr. Bennet				
4	Go get fire extinguisher					
5	Alarm Police officer	Poor cup of coffee to extinguish	Alarmed by Mr. Bennet		Watch Football	
6			Asked to get fire extinguisher			
7			Go to investigate			
8			Request assistance	Got order		
9				Radioed for Fire Brigade		Request for assistance
10			Ask people to move		Asked to move	
11					Interpret cue for action	
12					Reluctant to move	
13					Start to Move	
14					Movement	

Table 1 - List of actions
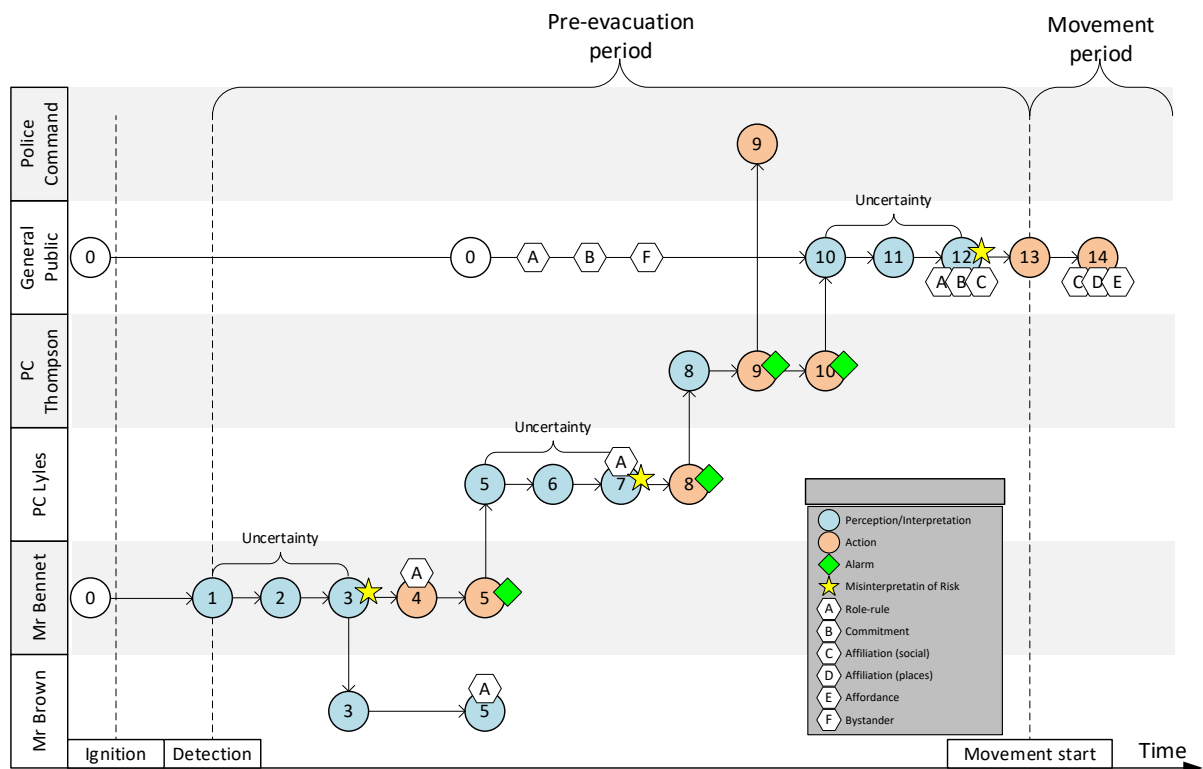
Figure 1 - Fire Emergency Timeline with Behaviour Analysis

6   First Perception and Interpretation

In the Bradford City Stadium Fire case, the Pre-movement period starts when the occupant of Row I, seat 142, Mr Bennett, experienced unusual heath at his feet and noticed the fire under the stand (Popplewell, 1985). The physical cue of the experienced heat triggered to look down and notice the fire. This moment of perception can be defined as the detection of the fire and the start of the pre-evacuation period (SFPE, 2018).

It is in this process of perception and interpretation that people try to understand the severity of the situation and the risk to themselves (Kuligowski, 2009), action will be taken when the situation is catalogued as risky (Fridolf & Nilsson, 2011).

Mr Bennett interpreted the fire as not of a particular significance and initially decided not to alarm or evacuate the stand but opted to go and get a fire extinguisher (Popplewell, 1985). This is a reasonable action as the male role in fire emergencies often is characterised by rescue or firefighting (Wood, 1980) (Canter, et al., 1990). The growth of the fire, and thus the risks involved, tend to be evaluated wrong (Fridolf & Nilsson, 2011) (Francisco, 2017) or underestimated (Canter, et al., 1990) as Mr Bennett did.

Not being able to find a fire extinguisher, Mr Bennett approached three police officers, standing in the back of the stand and asked them for a fire extinguisher. In approaching Police Constable (PC) Lyles, Frankland and Thomson (Popplewell, 1985), in line with the role-rule model (Canter, et al., 1990), Mr. Bennett fulfilled his role as a male, a patron, and as a citizen, and furthermore acknowledged the policemen in their role as authority in safety.

As a result of the ambiguous notion of fire, PC Lyles found himself in a state of uncertainty, uncertainty on the risk involved, just as experiencing heat at his feet had done with Mr Bennet. This prevailing feeling of uncertainty is common in the stages of a fire (Tong & Canter, 1985).

And thus, the individual process of interpretation started over again. PC Lyles and PC Frankland, both, went down to have a look at the stand. (Popplewell, 1985), another role-rule based behaviour as it is the role of a policeman to investigate and help. Again, the fire and the risks involved were labelled as a minor incident (Popplewell, 1985).

At this point, however, PC Lyles asked other policemen to get a fire extinguisher, because of the noise they misinterpreted this question and radioed for the fire brigade with the additional question to clear the stand (Popplewell, 1985). The requested assistance of the fire brigade and the question to clear the stand was logged in the police records at 1541.18 seconds. The request to clear the stand, however, was not received and acted upon (Popplewell, 1985).

7 Reluctancy to move

7.1 General perception and interpretation

Both the Popplewell Inquiry and the available video footage show that the people near the fire were reluctant to move even when asked to do so by the police. The events and the human behaviour can be explained with the use of (1) the Role-rule model, (2) Risk Perception, (3) the Theory of Commitment, (4) the Theory of Affiliation, (5) help in emergencies, and (6) Social influence.

It is to be noted that the effect of this behaviour, a prolonged pre-evacuation time needs to be considered when calculating evacuation times or simulating evacuation scenario's (Purser & Bensilum, 2001).

7.2 The Role-rule model

The Role-rule model argues that everyone has a certain role and that every role is defined by a set of rules and responsibilities (Tong & Canter, 1985). As already demonstrated in the case of Mr Bennett, human behaviour in fires is related to these pre-existing role definitions (Tong & Canter, 1985) (Canter, et al., 1990) (Sime, 1991).

The reluctance of the crowd in the stands to move can be explained by the fact that the individuals in the stands have adopted their role as a patron and waited for an active cue to start to move, or better multiple cues or stimuli (Kimura & Sime, 1988) (Proulx & Sime, 1991). Despite there was a public address system available in the stand no announcement or another form of alarm was given (Popplewell, 1985).

7.3 Risk Perception

Kinateder, et al. defined Risk Perception in the context of fire evacuation behaviour as a psychological process comprising the subjective evaluation of the probability to be affected by an imminent threat and an assessment of one's own perceived vulnerability and coping resources (2015).

Both Mr Bennett and the policemen, who were involved in the detection process, had a flawed perception of the speed at which the fire grew and thus the risks involved in the starting fire. This misinterpretation (Fridolf & Nilsson, 2011) (Francisco, 2017) and underestimation of risk are common (Canter, 1980) (Canter, et al., 1990).

In addition to the underestimation of the risks, a normalcy bias and optimism bias, where individuals have the pre-set idea that the situation at hand is normal and that nothing will happen to them (SFPE, 2018), may have been at play as argued by Kinateder et al. (2015).

7.4 Theory of Commitment

Another possibility that could have contributed to the reluctance to evacuate the stand is the fact that patrons were determined to finish their activity of watching the football game, as it was almost halftime. This commitment to finish a course of action is the core Sime's Theory of Commitment (1995).

7.5 The Bystander Effect

Although it might be considered normal to intervene or help in case of an emergency, the thought of intervention or help can be accompanied by the fear, rational or irrational, of "…physical harm, public embarrassment, involvement with police procedures, lost workdays and jobs, and other unknown dangers". (Darley & Latane, 1968, p. 377).

During the first moments of the Bradford fire, patrons were standing next to the fire without taking any action (Popplewell, 1985). This could be explained by possible fear of the consequences of an intervention, as stated above.

On the other hand, individuals are influenced by other non-responsive bystanders (Latané & Darley, 1968) leading to an underestimation of the risk. In addition, Darley and Latané stated that in cases with multiple bystanders, both the responsibility for helping and the potential blame are diffused (Darley & Latane, 1968) leading to the behaviour of non-intervention.

8 Evacuation

8.1 Exit choice

When patrons started to move, a great number tried to evacuate through the entries via the corridor in the back of the stand, despite the dense, thick smoke in that area (Popplewell, 1985), rather than evacuate in the direction of the pitch. Entry to the stand was through turnstiles at either end of the back corridor, a great number of people tried to evacuate through this familiar entry route.

8.2 Theory of affiliation

This choice of exit route is in line with the Sime's affiliative model (1983), that states that "…in a situation of potential entrapment people would move toward familiar persons and places." (1985b, p. 697), and the findings of Kinateder et al. (2018).

This, in contradiction with the physical science tradition, where exit choice is based on availability and proximity (Sime, 1985b). Crowd dynamics cannot be equated with ball bearings (Still, 2000) without attention for behaviour, while control is removed (Sime, 1985a).

8.3   Ignoring Emergency exits in the main corridor

It is possible that the emergency exit signs were ignored as a result of familiarity with such signs and the unconsciously filter out this information (SFPE, 2018).

Alternatively, sensory and functional affordances (Hartson, 2003) can be the basis for this behaviour. The exits and signs might not be seen as they were located along the corridor, perpendicular to the movement direction, sensory. As a functional affordance, the fact that exits and doors are likely to be closed, bolted or not in use (Popplewell, 1985) can be identified.

8.4   Movement through Smoke

The FSPE recognises four acute physiological fire hazards that affect escape capability (1) impaired vision from smoke obscuration, (2) impaired vision, pain, breathing difficulties from effects of smoke, (3) asphyxiation, and (4) pain and burns from heat (SFPE, 2018).

Despite these hazards and the fact that movement through smoke is less fast (Frantzich & Nilsson, 2004) (Fridolf, et al., 2014) people do evacuate through smoke-filled areas (Proulx & Fahy, 2008) (Fridolf, et al., 2014).

So happened in the Bradford City Stadium Case, despite the heavy smoke on the familiar entry route people tried to evacuate through the back of the stand, as mentioned before affiliation could have been at play as well.

9   Panic vs Resilience

Panic is often defined as the causality or at least a contributing factor of casualties and catastrophes. Over time, however, the way panic is perceived has changed (Fahy, et al., 2009). The word 'panic' is not only used in the field of human behaviour, but in many fields of study and daily life, therefore it is hard to define of the term panic (Smelser, 1970). Furthermore, the terms panic and fear are often used in the same way (Rogsch, et al., 2010).

9.1   On the concept of collective Panic

The idea of collective panic has emerged from Le Bon's Theory of Contagion (1895) and the Emergent Norm Theory (Park, 1967) characterised by irrationality, suggestibility and the unconditional passage of emotion.

9.1.1   Theory of Contagion

Le Bon stated (1) that a crowd is driven to achieve a purpose that is common to every member of the group, and (2) that crowds are emotional, irrational, and suggestible (1895). This (1) characteristic of suggestibility in combination with (2) the anonymity in a crowd, where an individual loses his sense of obligation, and (3) the idea that one individual's state of mind can spread to another's without a conscious effort, form the basis for the process of Circular Reactions (Park & Burgess, 1921) in a crowd that defines the Theory of Contagion (Le Bon, 1895). Irrationality and suggestibility in combination with the Theory of Contagion are the foundation of the myth of collective panic in the crowd (Schweingruber & Wohlstein, 2005).

9.1.2 Emergent Norm Theory

The Emergent-norm theory states that in the case of less stable crowds, such as expressive crowds (McPhail, 1989), norms may be vague and changing (Park, 1967). New norms emerge instantly when individuals are in a vague, confusing or ambiguous situation and follow those new emergent norms, which may not be in line with normal behaviour.

9.2 Definitions of Panic

The behaviour as described in the Contagion Theory seems in contradiction with the behaviour in panic, as "men in a state of panic… although equally under the influence of the mass excitement, act not corporately but individually, each individual wildly seeking to save his own skin" (Park & Burgess, 1921, p. 34). Based on this Park and Burgess produce a first definition of panic, they state that "panic is the crowd in dissolution" (1921).

Quarentelli (1954) and all five definitions of panic from the field of sociology and psychology described by Fahy et al. (2009), define that the concept of panic embeds an acute and uncontrollable fear causing irrational and non-social behaviour that dominates reason. Often a correlation between panic and the fight or flight reaction is made. The reaction of flight, however, can be a very rational and appropriate decision. (Fahy, et al., 2009).

9.3 Collective Resilience

Drury and Cocking found that in very dramatic and dangerous circumstances, such as the 9/11 attack on the World Trade Center in New York or the terrorist attacks on Brussels Airport and the Maelbeek Metro Station (Belgium), people in accordance with the fight or flight response fled from danger but panic was not a collective response (Drury, 2016) nor is there any evidence of pushing, trampling or any other panic related actions (Cocking, 2016). The same applies to fire-related incidents as described by Fahy et al. who state "that studies specifically looking at fires have consistently shown that non-adaptive and irrational behaviours are actually a rare occurrence" (2009, p. 388).

In emergency situations crowd behaviour remains structured and organised, cooperation and helping behaviour is more common (The Cabinet Office Emergency Planning College, 2009) indicating that the model of "collective resilience," described by Drury and Cocking (Cocking, 2016) (Drury, et al., 2009), explains crowd behaviour in emergency situations more accurate than the old commonly accepted model of crowd irrationality and mass panic (Le Bon, 1895).

9.4 Keeping the Myth alive

To create attractive headlines on fire or crowd disasters or incidents, popular media tend to use emotive language. Wording such as "panic", however, places the cause of such incidents within the crowd itself (Still, 2018) and minimises the role of building design or management as a possible causality (Fahy, et al., 2009). In the meantime, the myth is kept alive (Fahy, et al., 2009).

Next to this, regulations, standards and official risk analysis' often misuse the word 'panic' as well.

9.5 Observations of panic at the Bradford City Fire

In observing the video footage on the Bradford City fire, we can see that people try to flee from danger and that once the seriousness of the situation has sunk help is being offered, not only by police officers but also by members of the public.

A collective response in line with the idea of collective resilience and the fact that panic is not a collective nor common response in fire emergencies.

10 Conclusions

Although the behaviour in the Bradford City fire where (1) patrons are watching a football match next to a fire and are reluctant to evacuate the burning stand, (2) evacuate through thick smoke through areas well affected by the fire seem odd, they can all be explained considering the available knowledge on human behaviour in emergencies and fire.

The TV footage and eye witness accounts also provide a view on behaviour without the 'popular' notion or presence of panic. On the contrary, once the seriousness of the situation is clear evacuees are helped by not only police but also by members of the public.

The analysis and explanation of this kind of behaviour is one thing, more important are the lessons that are to be learned.

In this case, much time was lost before patrons started to move, suggesting that parameters involved in detection, but more important interpretation of risk needed to be improved, in combination with clear means of communication to stop the game and alarm patrons and ask them to leave the respective area.

A second major point is one of infrastructure, in the mean time structures with those materials are no longer approved, but the location and condition of exits needs attention as well. Keeping the theory of affordance in mind signage leading to exits needs attention as well.

11 References

Canter, D., 1980. Fires and Human Behaviour: Emerging Issues. *Fire Safety Journal,* Volume 3, pp. 41-46.

Canter, D., Breaux, J. & Sime, J., 1990. Domestic, multiple occupancy and hospital fires. In: D. Canter, ed. *Fires and Human Behaviour, 2nd Edition.* London: David Fulton Publishers, pp. 117-136.

Cepolina, E. M., 2005. A methodology for defining building evacuation routes. *Civil Engineering and Environmental Systems,* 22(1), pp. 29-47.

Cocking, C., 2016. *Brussels terror attack victims show how humans help each other in times of crisis.* [Online] Available at: http://theconversation.com/brussels-terror-attack-victims-show-how-humans-help-each-other-in-times-of-crisis-56707 [Accessed 12 November 2016].

Darley, J. M. & Latane, B., 1968. Bystander intervention in emergencies: Diffusion of Responsibility. *Journal of Personality and Social Psychology,* 8(4), pp. 377 - 383.

Drury, J., 2016. *The crowd: What do the events of 9-11 tell us.* [Online] Available at: http://drury-sussex-the-crowd.blogspot.be/2011/09/what-do-events-of-9-11-tell-us.html [Accessed 12 november 2016].

Drury, J., Cocking , C. & Reicher, S., 2009. The Nature of Collective Resilience: Survivor Reactions to the 2005 London Bombings. *International Journal of Mass Emergencies and disasters. ,* 27(1), pp. 66-95.

Drury, J. & Reicher, S. D., 1999. The intergroup dynamics of collective empowerment: Substantiating the social identity model of crowd behaviour. *Group Processes & Intergroup Relations,* 2(4), pp. 381-402.

Fahy, R. F., Proulx, G. & Aiman, L., 2009. *'Panic' and human behaviour in fire.* Camebridge, s.n.

Francisco, D. R., 2017. *Assessment of People's Perception of Fire Growth: A Virtual Reality Study (Unpublished master's thesis).* Lund: Lund University.

Frantzich, H. & Nilsson, D., 2004. *Evacuation Experiments in a smoke filled tunnel.* Belfast, Interscience Communications.

Fridolf, K., Andrée, K., Nilsson, D. & Frantzich, H., 2014. The impact of smoke on walking speed. *Fire and Materials,* Volume 38, pp. 744-759.

Fridolf, K. & Nilsson, D., 2011. People's Subjective Estimation of Fire Growth: An Experimental Study of Young Adults. *Fire Safety Science*, pp. 161-172.

Hartson, R. H., 2003. Cognitive, physical, sensory, and functional affordances in interaction design.. *Behaviour & Information Technology ,* 22(5), pp. 315-338.

Kimura, M. & Sime, J. D., 1988. *Exit choice behavior during the evacuation of two lecture halls.* Tokyo, International Association of Fire Safety Science.

Kinateder, M., Comunale, B. & Warren, W. H., 2018. Exit choice in an emergency evacuation scenario is influenced by exit. *Safety Science,* Volume 106, pp. 170-175.

Kinateder, M. T., Kuligowski, E. D., Reneke, P. A. & Peacock, R. D., 2015. Risk perception in fire evacuation behavior revisited: definitions, related concepts, and empirical evidence. *Fire Science Reviews,* 4(1).

Klem, T. J., 1986. Investigation Report: 56 die in English Stadium Fire. *Fire Journal,* pp. 128-147.

Kuligowski, E. D., 2008. *Modeling human behavior in building fires,* s.l.: National Institue of Standards and Techhnology.

Kuligowski, E. D., 2009. *The proces of human behavior in fires,* s.l.: National Institue of Standards and Technology.

Latané, B. & Darley, J. M., 1968. Group inhibition of bystander intervention in emergencies. *Journal of Personality and Social Psychology,* 10(3), pp. 215-221.

Le Bon, G., 1895. *Psychologie des Foules.* Paris: Alcan.

McPhail, C., 1989. Blumer's Theory of Collective Behavior: The Development of a Non-Symbolic Interaction Explanation. *THe Sociological Quarterly,* 30(3), pp. 401-423.

Nilsson, D. & Johansson, A., 2009. Social influence during the initial phase of a fire evacuation - Analysis of evacuation experiments in a cinema theatre. *Fire Safety Journal*, pp. 71-79.

Park, R. E., 1967. *On Social Control and Collective Behavior: Selected Papers.* Chicago: University of Chicago Press.

Park, R. E. & Burgess, E. W., 1921. *Introduction to the science of sociology.* Chicago: The University of Chicago Press.

Popplewell, O., 1985. *Interim report of the inquiry into crowd safety and control at sports grounds,* London: Her Majesty's Stationary Office.

Proulx, G. & Fahy, R., 2008. Human Behavior and Evacuation Movement in Smoke. *ASHRAE Transactions,* 114(2), pp. 159-165.

Proulx, G. & Sime, J. D., 1991. *To Prevent 'Panic' in an Underground Emergency: Why Not Tell People the Truth?.* London, ELsevier Applied Sience.

Purser, D. A. & Bensilum, M., 2001. Quantification of behaviour for engineering design standards and escape time calculations. *Safety Science*, pp. 157-182.

Quarentelli, E., 1954. The nature and conditions of Panic. *The American journal of sociology,* pp. 267-275.

Reicher, S., 2011. Mass action and mundane reality: an argument for putting crowd analysis at the centre of the social sciences. *Contemporary Social Science,* 6(3), pp. 433-449.

Rogsch, C. et al., 2010. *Was it Panic? An Overview about Mass-Emergencies and their Origin all over the World for Recent Years.* Wuppertal, University of Wuppertall.

Schweingruber, D. & Wohlstein, R. T., 2005. The Madding Crowd Goes to School: Myths about Crowds in Introductory Sociology Textbooks. *Teaching Sociology,* pp. 136-153.

SFPE, 2018. *SFPE Guide to Human Behavior in Fire.* 2 ed. Cham: Springer.

Sime, J. D., 1983. Affiliative behaviour during escape to building exits. *Journal of Environmental Psychology,* Volume 3, pp. 21-41.

Sime, J. D., 1985a. Designing for people or ball bearings. *Design Studies,* 3(6), pp. 163-168.

Sime, J. D., 1985b. Movement toward the familiar: Person and place affiliation in a fire entrapment setting.. *Environment and Behavior,* Issue 17, pp. 697-724.

Sime, J. D., 1991. *Human behaviour in fires.* London: Home office.

Sime, J. D., 1995. Crowd psychology and engineering. *Safety Science,* Issue 21, pp. 1-14.

Smelser, N. J., 1970. *Theory of Collective Behavior..* London: Routledge and Kegan.

Still, G. K., 2000. *Crowd Dynamics.* Warwick: University of Warwick.

Still, G. K., 2018. *Crowd Disasters.* [Online] Available at: http://gkstill.com/ExpertWitness/CrowdDisasters.html [Accessed 28 December 2018].

The Cabinet Office Emergency Planning College, 2009. *Understanding Crowd Behaviours.* York: The Cabinet Office.

Tong, D. & Canter, D., 1985. The Decision to Evacuate: a Study of the Motivations which Contribute to Evacuation in the Event of Fire. *Fire Safety Journal,* pp. 257-265.

Wood, P. G., 1980. A Survey of Behaviour in Fires. In: D. Canter, ed. *Fires and Human Behaviour.* s.l.:John Wlley & Sons Ltd, pp. 83-90.