This item was submitted to Loughborough University as an MPhil thesis by the author and is made available in the Institutional Repository (https://dspace.lboro.ac.uk/) under the following Creative Commons Licence conditions.

For the full text of this licence, please go to:
http://creativecommons.org/licenses/by-nc-nd/2.5/

The Relationship between Fire Damage and Fire Safety Management

Jim Baker B.Sc (Hons)

Student No. B028460

Master's Thesis

Submitted in partial fulfillment of the requirements for the award of

Master of Philosophy of Loughborough University

27 May 2013

Loughborough University

School of Civil and Building Engineering

"As almost all fires arise from inattention in one shape or another, it is of the utmost importance that every master of a house or other establishment should persevere in rigidly enjoining and enforcing on those under him, the necessity of observing the utmost possible care in preventing such calamities, which, in nineteen cases out of twenty, are the result of remissness or inattention. Indeed, if any one will for a moment consider the fearful risk of life and property, which is often incurred from a very slight inattention, the necessity of vigilance and care will at once be apparent. Immense hazard is frequently incurred for the most trifling indulgences, and much property is annually destroyed, and valuable lives often lost, because a few thoughtless individuals cannot deny themselves the gratification of reading in bed with a candle beside them."

'Fire Prevention including Fire-proof Structures' (1866), written by James Braidwood (1800-1861) (James Braidwood was founder of Edinburgh Fire Brigade in 1824, the world's first municipal fire service and, in 1833, went on to become Superintendent of the London Fire Engine Establshment. He is referred to as the 'Father of the British Fire Service'.)

"To myself I am only a child playing on the beach, while vast oceans of truth lie undiscovered before me."

Isaac Newton (1642-1727)

"If you want something new, you have to stop doing something old"

Peter F. Drucker (1909-2005) (referred to as the Father of modern management)

Contents

Acknowledgments

For their assistance in the creation of this thesis, I would like to acknowledge the following:

    Deborah Roberts for her patience, enthusiasm, motivation and support.

    Professor Stephen Emmitt for his supervision, support and encouragement.

    Rod Harrison for his generocity, his interest and his support.

    Dave Webb, Paul Botteril and Karen Klein of Leicestershire Fire and Rescue Service for their generous offer of data and for their support.

List of Figures

List of Tables

Abstract

The problem at the heart of this research is the lack of objective information about what actually causes the property fires commonly seen on the television and experienced vicariously. Most people are unlikely to suffer a fire and are unable to imagine the consequences of a fire in their home, in their village hall or at their place of work. This means that an average manager in a company or organisation is ill-equipped to formulate and manage a fire safety plan tailored to that company or organisation. Those that do are hampered because there are no obvious ways of measuring the standard of management needed to manage the plan successfully. Most people are left to their own devices to decide how an ignition occurs, how quickly a fire can consume a property, what contingencies should have been considered and so on. This study investigates the relationship between fire damage and fire safety management and hypothesises that most fire damage is the result of inadequate or unsuccessful fire safety management.

A triangulation approach has been taken to the methodology utilised in this research using two qualitative methods and one quantitative method. It offers three sets of results:

- The first set is an authoritative categorisation of the components of fire safety management consisting of a brief and concise description of each component rated in order of importance. The categorisation fills a gap for a comprehensive definition and aspires to become the accepted definition validated by objective evidence.

- The second set of results are the opinions and priorities of those with most influence on the practice and enforcement of fire safety on a university campus. Diverse opinions and viewpoints between the practice and enforcement of fire safety are highlighted and indicate a need for a greater understanding of each other's roles.

- The third set is the analysis of two sets of fire incident data comparing fire

damage occurring on a university campus against the fire damage occurring throughout the area administered by one fire and rescue service. Frequencies of fire damage occurring at different times of day, month and year are emphasised and compared. The cost of fire damage on a university campus is postulated. The model of analysis is one that could be developed into a predictive management planning tool.

This research signals that the management of fire safety is important and its importance lies in reducing the amount of damage and impact which is the consequence of fire. It contributes to that aim and opens the way to further research that could turn the subjective subject of fire safety management into an objective science.

List of abbreviations

CCTV Close circuit television

CFOA Chief Fire Officer's Association

FIA   Fire Industry Association

FRS   Fire Research Station

GBP   Great Britain Pound (pound sterling)

IFE   Institution of Fire Engineers

NASA National Aeronautics and Space Administration

NIST National Institute of Standards and Technology

PEPCON Pacific Engineering Production Company of Nevada

Responsible Person The person designated under the Regulatory Reform (Fire Safety) Order 2005 in England and Wales

UK   United Kingdom (a term used to describe England, Northern Ireland, Scotland and Wales)

USHA University Safety and Health Association

WUI Wildland urban interface

Preface

Warehouse fire

When fire broke out in a large 45,000m^2 warehouse unit belonging to an international clothing retailer, the outcome was the destruction and demolition of a building built five years previously at a cost of £8 million. Half of the company's entire stock of clothing, said to be worth tens of millions of pounds in financial terms alone, was destroyed in one night.

It is difficult for any business to continue after suffering such a large loss but, because of risk protection, a strategic plan of action and a nearby vacant warehouse, the company managed to not only survive this setback but is now, seven years later, one of the leading UK High Street clothing retailers.

The author's part in this fire incident, was to lead the investigation into the circumstances surrounding the fire to ascertain its cause. This question remained unanswered at the completion of the investigation and the cause is still unknown. However, in reviewing the substance of the investigation, some significant conclusions were drawn from the evidence and the course of events leading up to the ignition that caused the fire. These conclusions convinced the author of the crucial role that fire safety management should play in the everyday life of a business. The ability to measure the standard of fire safety management being performed would also offer some confidence in the continuity of any business organisation.

The circumstances preceding the fire

The fire occurred some ten hours after a pipe had burst in the system of pipes that supplied the whole site of twenty-eight warehouse units on a large distribution estate, with water for their fire sprinkler protection systems. Each warehouse was

fitted with sprinkler protection and the estate-wide system was designed to cope with three fires occurring, simultaneously, in different warehouse units. When the heat from a fire was detected, sprinklers in the affected unit operated and caused a pressure drop in the system of water pipes, triggering the operation of one of three water pumps situated in a pump-house on the edge of the estate. The pump operated to re-pressurise the system with water from an adjacent lagoon. The burst water pipe, positioned about two metres under the car park in front of the pump-house, occurred spectacularly whilst the three pumps were being put through their weekly tests.

The system of water pipes formed a ring main around the estate which was fed by the spur from the three water pumps. The burst pipe in the pump spur meant that, in effect, the ring main could not be re-pressurised with water from the lagoon, until the burst had been repaired. This meant that the sprinkler protection in all twenty-eight warehouse units was compromised should a fire occur whilst the condition remained; a circumstance that had not been the subject of detailed planning.

The hastily formed action plan to repair the burst water pipe consisted of employing a mechanical digger to expose the pipework underneath the car park so that it could be repaired. However, during this operation, a gas main lying near to the water pipe was ruptured causing a gas escape. This made further work to expose the pipework impossible. The area around the the hole in the car park was evacuated and cordoned off and the gas company were informed. No further work on the repair of the burst water pipe could take place until the ruptured gas main had been stabilised or repaired.

The original plan had estimated several hours for the repair of the water pipe but the complication of the ruptured gas main now included a dynamic that was difficult to evaluate. The gas company had to attend, assess and repair the gas main making it difficult to estimate the amount of time it would take. It could now take, perhaps, several days before the sprinkler system was re-commissioned.

It was during this period of uncertainty, approximately ten hours after the burst water pipe had occurred, that a fire started in the midst of the racking of the warehouse unit occupied by the international clothing retailer. The sprinklers above the fire operated as soon as their operating temperature was reached and initially controlled the fire for several minutes. The initial control provided by the stored pressure in the system of pipes was lost over the next two or three minutes because

the pumps were unable to supply replacement water from the lagoons. The fire, having resisted the efforts of the sprinkler system to control it, now traveled away from the point of ignition at an estimated speed of five metres per minute and, having started near to the rear of the building, broke through the front face of the building some thirty-five minutes later.

The exact cause of the fire has never been determined. That is to say, the source of the ignition was not determined, the material that was ignited first was not determined and, if the fire had been set by a human, the motive for setting the fire was never determined. This was despite much sifting through evidence, particularly in the form of CCTV images. However, this was of little consequence as, publicly, all fault and certainly the focus of the insurance companies, was being placed firmly on the shoulders of the management of the site claiming ineptitude in their repair of the damaged pipe and incompetence for their being no method of bypassing the faulty pipework.

Lack of management foresight

The author's reflections on the investigation and, perhaps, the lack of a vested interest in the fire incident, forced conclusions to be drawn which were different from those being held publicly. If blame was to be placed, the author was inclined to place it on the management of the warehouse unit and the present activity in writing this thesis has its roots in this alternative conclusion.

Earlier on the day of the fire, only a short time after the burst pipe had occurred, a verbal message had been circulated by the site management, to all twenty-eight occupancies on the estate. The message informed each management team that its sprinkler protection system would not operate if a fire should occur. The same message was sent to inform the Control Centre of the fire and rescue service prompting a decision by them to augment their pre-determined emergency response should a fire call be received while the situation remained[1].

The nature and character of the message was hardly appropriate for the crucial information it contained; it was a short verbal telephone message that simply told whoever received the message, the fact that there was a problem with the sprinkler

---

[1]This decision would prove to be quite inadequate but it may have been proved to be adequate if there had been some action on the part of the occupiers.

ring main and that their building's sprinkler system would not operate successfully if it was needed to. The message did nothing to spell out the danger to the continuity of each business, the potential consequences of a fire to them or the environment and it did not suggest any counter-measures that might be put into effect to compensate for the deficiency. It was simply a hastily thought out attempt to alert the management of each occupancy to a potential threat.

The message was received in the offices of the international clothing retailer by a telephonist and immediately passed on to a manager. However, there is no evidence that the manager took more than a passing glance at the information and also, there was no evidence that any action was taken as a result. Much of the damage that occurred in terms of finance, environmental damage, employment etc. could have been avoided had there been a recognition of the threat that had been posed by the situation.

For instance; initially, the information could have been confirmed by returning the call from the site management asking for clarification of the message; was the information correct, how long would the system be out of commission, what contingencies, if any, were in place and had they any suggestions regarding what to do? Following confirmation, an assessment of the situation could have been carried out which would have posed urgent questions about what the sprinklers were designed to do and what would happen if they failed. A telephone call to the insurance company would have been in order and would have produced some immediate advice from people experienced at mitigating against fire loss. The insurers would have known the chance of a fire occurring and what the consequences would be if one did occur. They would have assessed the risk and advised on the best course of action to take to protect the building and its stock.

Once the management team were aware of the danger and provided with advice, it would have been a simple matter for them to formulate an action plan. The effect of the plan would have been to compensate for the lack of the sprinkler system. It could have taken the form of a team of look-outs with ready access to fire extinguishers, briefed of the circumstances and led by a manager. The chances are that the fire would have occurred, it would have been quickly spotted and dealt with manually, calling the fire and rescue service (five to seven minutes attendance time) to make sure that the fire was extinguished.

The fact that this did not occur and, probably, did not happen in the other twenty-

seven occupancies on that day, provides the volition behind this thesis. Adequate fire safety management is integral to any management system because the threat of fire presents a clear and present danger to any company or business or, for that matter, any domestic household. Some way of measuring fire safety management could offer a strategy to fire safety managers of assessing the standard enacted in an individual property allowing them to concentrate on the elements that would have most effect on reducing the probability of an ignition getting out of control. Having reference to an index of the most likely types of property to suffer from poor fire safety management based on the amount of damage resulting from a fire would offer a strategy to fire officers to target and advise those properties on how to better protect themselves.

Jim Baker

Hinckley, Leicestershire 2013

1. Introduction

1.1. The problem

When a fire incident is reported on the television news, a dramatic incident unfolds. A reporter is seen talking to camera, firefighters can be seen hurrying about at their task and a column of smoke pouring out of the roof of a building. The reporter presents the facts of when the firefighters were called, what factory is involved, how many jobs are at risk and so on. Sometimes, dependent on the strength of evidence presented to them at the scene, they will speculate about the cause of the incident; an electrical fault, deliberate ignition, contractors working on the roof are some of the causes often speculated.

Realistically, not much more can be expected from the reporter and, for most people, it concludes their interest in the incident, but the report may be misleading because it does not give the actual root cause of what led up to the fire. That sort of information will, very often, be denied to all but the most assiduous researcher. Information about the root cause, however, is critical.

Consider the following case; when the space shuttle Challenger exploded during take-off in 1986, killing all seven crew members, there was much speculation by NASA and the US Government regarding the continuation of the programme of launches. The cause of the accident was identified and published by the Rogers Commission in US Government (1986) but the shuttle programme was effectively frozen and decisions had to be made about existing contracts that supplied the shuttle project. One contract involved the supply of ammonium perchlorate, an oxidiser used in the manufacture of solid rocket fuel, by a company situated in Las Vegas.

PEPCON was one of only two producers of ammonium perchlorate who continued to manufacture the oxidiser even though NASA had cancelled the contract because they believed the shuttle programme would re-commence once the investigation into the

Challenger accident was over. However, as can be seen in National Aeronautics and Space Administration (NASA) (2012), PEPCON were not shipping the product and the problem they faced was one of storage. Their solution was to store the product on site in the car park surrounding the manufacturing plant. Storage was usually in aluminium drums but when their supply of these ran out, PEPCON started to use plastic drums to store the product.

There are conflicting reports on what caused the ignition of one of the plastic drums containing the product but Routley (1988) attributes the ignition to either a discarded cigarette or the sparks from a welding torch whilst employees were repairing a steel structure that had been damaged in the wind. About twenty minutes after the ignition of the plastic drum a series of explosions took place involving about 4500 tons of product. The explosions also ruptured a high pressure natural gas pipeline buried underneath the plant. The incident claimed two lives, injured 372 people and caused damage estimated at over $100 million.

If the events and circumstances that contributed to this incident are analysed, the root cause is not obvious. There are several possible causes that could have contributed. It may have been:

- the lack of supervision and risk assessment among the stored drums of product;

- the use of plastic drums because of the shortage of aluminium drums;

- the decision to stockpile the product in the car park and not a more secure location;

- the decision to carry on producing the ammonium perchlorate because of indecision on the part of NASA and the US Government;

- the decision to build the plant producing and storing potentially explosive substance over a high-pressure natural gas pipeline.

An overview of the incident could be taken which suggests that the cause of the accident was down to a lack of foresight for what might happen and a lack of awareness for what was happening. With hindsight, it seems obvious that the complacency shown in the decisions and lack of supervision by the managers when dealing with something so potentially explosive, would lead to the outcome. But it was apparently not obvious at the time.

Ammonium perchlorate along with many other flammable substances is stored safely under certain conditions every day and in all parts of the world. It is the instiga-

tion and maintenance of the conditions of storage that is the essence of fire safety management.

The problem is the lack of objective information gleaned from the investigations into fire incidents and the misperceptions about what actually causes the property fires seen on the television. Most people are unlikely to suffer a fire and are unable to imagine the consequences of a fire in their home, in their village hall or at their place of work. Still less, to consider the loss of employment, the loss of a community facility, the increase in insurance premiums etc. There are no means of measuring the standard of management needed to manage fire safety successfully. Most people are forced to rely on their own knowledge and experiences when concluding under what circumstances an ignition is more likely to take place.

1.2. How would research impact on the problem

The problem has three strands:

1. There is a misperception about the root cause of a fire because there is a lack of objective information about the cause of fires associated with certain types of property or with certain categories of business.

2. The long-term consequences of a fire are difficult to imagine because, for the majority of people, their only experience of a fire incident is experienced vicariously.

3. There is no means of measuring whether the standard of fire safety management associated with a certain type of property or certain category of business is adequate.

The aim of this thesis is to add to the current level of information about the connections between fire damage and fire safety management. If there is a correlation such that the level of fire damage decreases when the level of fire safety management increases, then this will be a mechanism for the use of fire safety managers and regulators alike. It can also confirm the assertion:

> *The majority of fire damage resulting from property fires in the UK, occurs as a result of a failure to manage fire safety successfully*

If this assertion is accurate and a capability of measuring fire safety management could be developed from it, fire safety managers would be able to improve their

management strategies to not only counter the threat of prosecution but also to build in a safety margin. In addition to this, regulators would be able to improve the targeting of businesses and organisations and concentrate their inspection regime on those where objective evidence suggests they are at a higher risk than others. If there is a correlation between the standard of fire safety management and the amount of fire damage, an improved standard would equal a reduction in damage. This may also lead to a reduction in the number of emergency responses from the fire and rescue service and the opportunity for them to turn reactive resources into proactive resources.

1.2.1. Is there a financial aspect to the research

The rising financial cost of fire gives rise to another need for research. Particularly when the rising cost of fire in England and Wales is compared against the falling number of fire deaths. The fire and rescue service in England and Wales has, for a number of years, pursued the aim of reducing the number of fire deaths caused in accidental fires in dwellings. They have been successful in this endeavour and, as can be seen in Figure 1.1, the number of fire deaths has reduced quite significantly over the period from 2000 to 2008. In contrast, as can also be seen in Figure 1.1, the cost of fire has been increasing over the same period.

The outcome of this research will not in itself, reduce the cost of fire but its results offer opportunities that could assist in achieving that outcome. For instance:

- The categorisation of fire safety management given in Chapter 4 on page 60 is a foundation on which could be built a rudimentary system of measurement. The measurement would be aimed at measuring the ability of each management category to reduce the amount of fire damage that occurs and could be based on objective evidence acquired from the fire incident database. This would allow both the fire safety managers and the fire and rescue service to concentrate on those categories associated with the most damage;

- The interviews reported on in Chapter 5 on page 82 give an idea of the opinions and motivations of those with influence on the fire safety management of Loughborough University campus. They reveal some differences that currently impede progress in reducing fire damage. Understanding the differences could help to overcome the impediments;

- The quantitative results of the case study found in Chapter 6 on page 103 indicate the potential for a model used for forecasting the likely amount of fire damage at certain times of day, month or year and so on. The ability to forecast this allows more informed management decisions to take place.
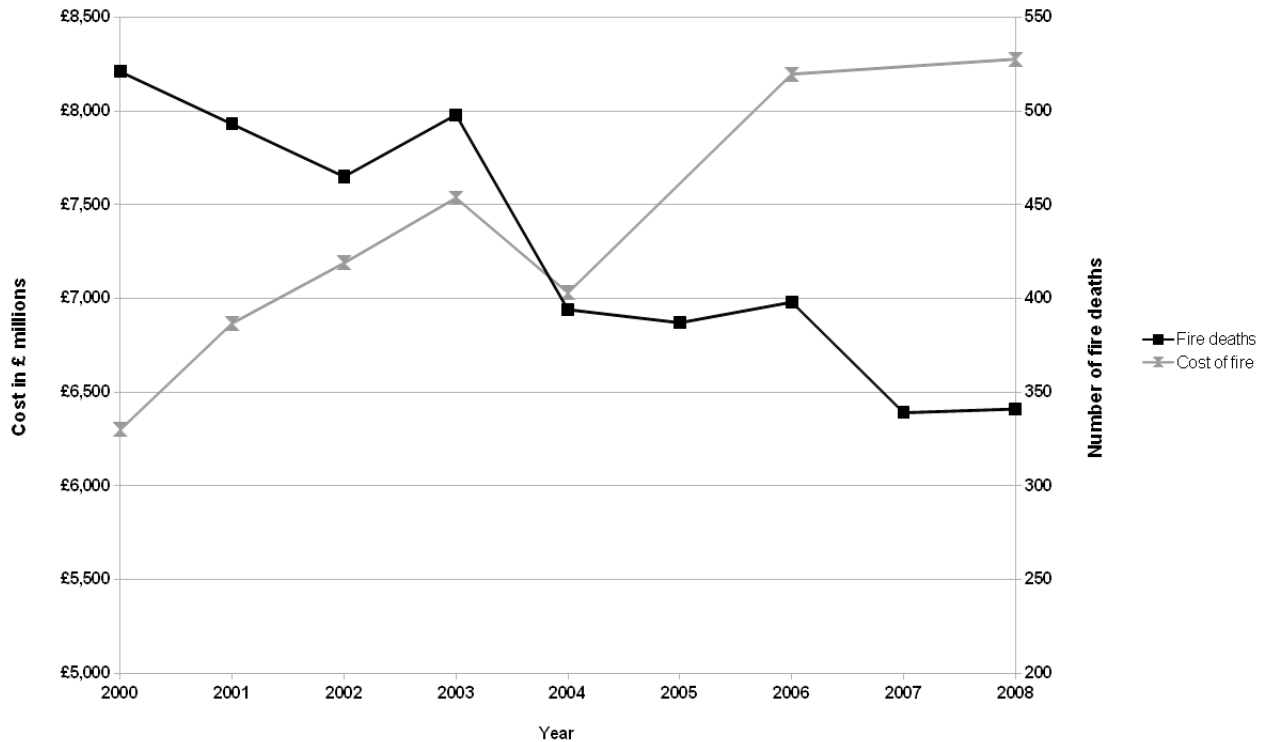
Figure 1.1.: Comparing the decrease in fire deaths with the increase in the economic cost of fire

Figures from 2000 to 2004 are for England and Wales; figures from 2005 onwards are for England only (Source: UK Government)

The research investigates the relationship between fire damage and fire safety management using the Loughborough University Campus as an example. The research postulates the hypothesis:

> *If it is the case that an acceptable standard of fire safety management is practiced in Loughborough University then there is likely to be less fire damage when a fire occurs.*

The hypothesis makes certain assumptions:

Firstly: that there is a correlation between the standard of fire safety management and the amount of fire damage.

Secondly: that there is no measure of the standard of fire safety management.

Thirdly: that there is no measure of fire damage that takes into account all of its impact.

Confirming the hypothesis would be addressing all three strands of the problem. Establishing a correlation between the level of fire safety management and the amount of fire damage could yield objective evidence suggesting that certain types of property are susceptible to more, or less, fire damage. Objective evidence could take the place of experience and knowledge to reduce misperceptions and to inform interested parties. Associating fire damage with types of property and/or types of business could introduce and promote a system of measuring the level of management needed to reduce the amount of fire damage.

The performance of fire safety management could be measured by the following logic:

1. Fire damage assessed to an agreed model is recorded and linked to the type of property in which the fire occurred. This will produce a hierarchy of property types associated with the most damage to those with the least damage.

2. A continuum of property types is developed from the hierarchy if those with the most recorded fire damage are situated at one end of the continuum and those with the least recorded fire damage are situated at the other end. This, in itself, would be a simple visual measurement indicating which types of property are more prone to fire damage.

Inferences could made from this simple visual measurement because those properties associated with the most recorded fire damage are likely to be those that:

- generate the most reactive activity by the fire and rescue service in terms of an immediate response with extinguishing and rescue equipment;

- create most damage to the local economy in terms of local disruption, loss of employment and business interruption;

- constitute most damage to the environment in terms of air and ground pollution.

It becomes obvious that identifying and tackling those property types associated with the most recorded fire damage could have a beneficial effect overall.

3. A much more detailed focus on the types of property associated with the most fire damage would be achieved by accurate investigation of the circumstances

of the fire. National fire incident reporting in England, Northern Ireland, Scotland and Wales collects such variables as:

a) the cause of the fire,

b) the source of the ignition of the fire;

c) the item that was ignited first;

d) the material mainly responsible for the development of the fire.

These variables are all elements in the process of combustion and they can all be controlled. For instance, the item first ignited could have been kept separated from the ignition source so that it did not ignite. Or the material responsible for the development of the fire could have been separated from the item that was ignited first so that it did not assist with the combustion. Because they are capable of being controlled, the variables could be the subject of a system of management to maintain their separation. As such, they have a direct relationship with the management of fire safety. Associating these variables with certain types of property and/or categories of business begins to generate property and/or business profiles. This would improve and add to the understanding of the relationships between the recorded fire damage and the controllable components of fire safety management.

4. Analysis of the variables that have a direct relationship with the management of fire safety provides a deeper understanding of their influence on each other. Studying the frequencies of data collected in the variables would indicate which variables have a bigger probability of occurring.

5. Monitoring the fire incident and fire investigation data allows refinement of the analysis to improve the quality of the data.

1.3. The solution to the problem

The management of fire safety is the control and supervision of combustion countered with adequate contingencies for when that control or supervision breaks down. There are three things that come together to create combustion; some kind of fuel, heat from a variety of sources and oxygen from the atmosphere, all mixed together in their correct proportions. Good fire safety management can be defined as the control and supervision of these three elements, whilst effective fire safety management can

be defined as the control and supervision of those three elements having regard for the circumstances in which they are to be found.

However, this is not very helpful to someone who has been appointed as a fire safety manager in a company or an organisation and is looking for advice regarding how best to control and supervise combustion. There are definitions; and there is also a plethora of guidance and helpful assistance available from many creditable sources[1]. Yet, it appears, from research into fire incidents, that, to some extent, it is ignored. Take, for example, these incidents:

- a textile factory in Karachi, Pakistan in September 2012 when 289 factory workers died when fire broke out. The evacuation was obstructed by a lack of satisfactory fire exits, storage of finished and unfinished garments and security measures (source: http://www.bbc.co.uk/news/world-asia-19566851: accessed 6 August 2013);

- the Lame Horse Nightclub in Perm, Russia on 5 December 2009 when 150 people died and 160 people were injured when a firework used as part of the performance ignited the plastic ceiling above the stage. Smoke quickly filled the nightclub but the evacuation was obstructed by one leaf of a double fire exit door being sealed shut and alternative exits not illuminated to indicate they were there (source: http://news.bbc.co.uk/1/hi/8396587.stm: accessed 6 August 2013);

- the Station Nightclub in Rhode Island, USA in February 2003 when 100 people died when a firework on stage ignited the walls and ceiling of the stage. The evacuation was obstructed by a table placed in the hallway leading to the main entrance, security guards preventing use of the exit by the stage and a lack of direction by staff (source: Grosshandler et al, 2005).

This last example, that of the Station Nightclub in Rhode Island, was widely reported and thoroughly investigated by NIST following the incident. The report of the incident by Grosshandler et al (2005), is extensive and comprehensive and freely available over the internet. The investigation was assisted by the existence of a video recording taken by one of the surviving occupants at the time the fire occurred. The video dramatically shows the inception of the fire and its dynamics as it begins to

---

[1]Examples of guidance for the management of fire safety, in the UK alone, are the British Standards Institute (BSI) and the UK Government (guidance is freely available to download from the UK Government).

evolve the smoke that caused the high death toll[2].

If this illustrates the problem, then the solution to the problem is an adequate standard of fire safety management. That means firstly; adequate control and supervision of ignition sources and combustible materials. Secondly, satisfactory contingencies for when that control and supervision falters.

1.4. Life safety and property protection

The protection of life from fire is treated very seriously in the UK. Community fire safety is described by London Fire Brigade as the effort made by them to help people stay safe from fire and other emergencies in the home, at work and in London's other buildings. Their community fire safety efforts include; offering fire safety visits to people in their own homes and fitting free smoke alarms where necessary. Visiting schools to talk to schoolchildren about fire safety. Working with other agencies to target those identified as the most vulnerable from fire. Reducing the frequency of deliberately started fires. Advising on safety in the workplace and working with developers and building inspectors to improve safety in buildings. Enforcing their responsibilities under fire safety legislation[3].

This emphasis on life safety is characteristic of the way fire safety is addressed in England, Northern Ireland, Scotland and Wales. All individual fire and rescue services emulate London Fire Brigade to some degree. The emphasis is present in building codes relating to the construction of buildings and in fire safety legislation relating to the occupation and use of buildings. For example, the legislation covering construction of buildings in England and Wales (the Building Act, 1984) allows the Government to make regulations in respect of the design and construction of buildings with regard to the health, safety, welfare and convenience of persons who are in, affected by or connected with the buildings. While the fire safety legislation relating to the provision of fire safety in non-domestic occupied buildings in England and Wales (the Regulatory Reform (Fire Safety) Order, 2005), identifies a duty to ensure that the premises are safe for occupants.

---

[2]A copy of the video recording can be found on YouTube at http://www.youtube.com/watch?v=OOzfq9Egxeo (accessed on 26 March 2013)

[3]Information taken from London Fire Brigade's website : http://www.london-fire.gov.uk/CommunitySafety.asp (accessed on 29 March 2013).

The duty is for preservation of life rather than the preservation of such matters as the building, the continuity of the business, the investment in jobs and resources etc. and the roots of this in Britain, probably lie in a report from the Departmental Committee on the Fire Service chaired by Holroyd (1970) and known as *'The Holroyd Report'*. One of the recommendations in this report was that fire safety should be organised to reflect a natural division in the subject; one aspect should have regard to new and altered buildings and the other to occupied buildings.

The report proposed a new Fire Safety Act but concluded that it was not practical to combine the two aspects into one law. So it advocated that the maintenance of safety in occupied buildings should be the subject of a new law giving the statutory responsibility for enforcement to the fire and rescue service. The result was the Fire Precautions Act (1971), enacted in England, Scotland and Wales, which gave the fire and rescue service the implementation and enforcement of the *"protection of persons from fire risks; and for purposes connected therewith"* to premises designated by the British Government Secretary of State.

The Fire Precautions Act (1971) was exceptional because it was the first piece of fire safety legislation in the UK under which the fire and rescue service had been given responsibility for enforcement. The requirements of the legislation were principally to do with life safety:

- the provisions for means of escape in case of fire;

- the provisions for securing the means of escape in case of fire;

- the provisions for fighting a fire;

- the means for giving people warning in case of fire.

This division between the focus on life safety and the focus on protection of property was reflected in the House of Lords by Lord Windlesham in 1971 when outlining the passage of the Fire Precautions Act (1971). He emphasised that the legislation was concerned with the preservation of life rather than the preservation of buildings when he said that the parliamentary committee had come to the conclusion that

> *"it would be neither appropriate nor practicable to try to compel owners, by legislation, to protect their property against damage by fire, but that this should continue to be left to voluntary arrangements between owners and their insurance companies."* HL Hansard (1971)

The Fire Precautions Act (1971) was regarded as a milestone in fire safety legislation because the Home Office had involved the Fire Inspectorate in its drafting and its implementation and enforcement had been entrusted to the fire and rescue service. Fire safety had become politicised due to a number of fires with loss of life associated with poor fire safety (HC Hansard, 1960, 1961, 1970; HL Hansard, 1971). Those fires that became the subject of politics include:

Eastwood Mills in Keighley UK in 1956 where eight people died because of a lack of a fire warning system and inadequate means of escape from fire. The consequences of this fire led to an amendment of the Factories Act (1959) (Grice, 2009).

Henderson's Store in Liverpool UK in 1960 where eleven people died because of the rapid spread of fire in the ceiling voids and through fire doors wedged open because it was a hot day. The consequences of this fire gave an impetus to review the fire provisions in the Offices, Shops and Railway Premises Act (1963) (Grice, 2009).

The Top Storey Club in Bolton UK in 1961 where nineteen people died because of the lack of fire warning and their inability to use the single access stairway from the ground floor. Some of the nineteen died by attempting to jump into the canal that ran alongside the building. It was felt that many more would have died but for the fact that there were only twenty-five people in the premises at the time of the fire. The nineteen who died represented about 75% of the people in the premises. The consequences of this fire led to an amendment of the Licensing Act (1964) (Grice, 2009).

The Rose and Crown Hotel in Saffron Walden UK in 1969 where eleven people died in a hotel built in the 16th Century. The fire started in a TV set even though the set had been switched off. Heat and smoke was allowed to spread through the building because fire-resisting doors were left open or did not fit properly. The fire warning system was operated but it only lasted a short time before fire destroyed its control panel. The consequences of this fire gave impetus to the enactment of the Fire Precautions Act (1971) (Grice, 2009).

The Club Cinq-sept at Laurent du Pont near Grenoble in France in 1970 where 146 people died when a fire rapidly developed because of the combustible décor and furnishings. People were trapped because the emergency exits were padlocked and barred with planks of wood to deter gatecrashers. The consequences of

this fire focused attention in the British Parliament during the passage of the Fire Precautions Bill and assisted its passage into law (Grice, 2009).

Woolworths in Manchester in 1979 when 31 people died and 53 people were injured when fire broke out in the furniture department on the second floor. Thick smoke from burning polyurethane furniture obscured fire exit signs and confused many faced with finding their way out. The consequences of this fire led to the enactment of the Furniture and Furnishings (Fire) (Safety) Regulations (1988).

Bradford City Football Stadium in Bradford UK in 1985 when 58 people died. This fire occurred during a televised football match in full view of the TV cameras. A lighted cigarette ignited litter and debris underneath a timber stand. The majority of deaths occurred at the rear of the stand where people tried to exit through the entry turnstiles which had been locked when the match started. The consequences of this fire led to the enactment of The Fire Safety and Safety at Places of Sport Act (1987) (Popplewell, 1985).

King's Cross Underground Station in London UK in 1987 when 31 people died. A lighted cigarette or match ignited the debris, grease and fluff underneath the timber escalator in the machinery room and then ignited the wooden escalator steps. The spread of fire into the Ticket Hall at the top of the escalator was assisted by the flow of air coming from arriving and departing trains in the tunnels below. The incident led to the enactment, following the inquiry by Desmond Fennell, of the Fire Precautions (Sub-surface Railway Stations) Regulations 1989 (Fennell, 1988).

These fires were all notable in that they gave impetus to a change in UK legislation. The public outcry following the incidents caused the UK Parliament to react with new legislation. This occurrence gave rise to the term, 'stable-door legislation'.

There is no such emphasis on property protection in the UK. All of the above fires caused extensive damage to the properties from heat, smoke, water and so on and some damage to the capability of the occupiers to carry on with business the next day. Property protection and business continuity have little meaning when compared with the protection of life. The resultant legislation from these fire incidents was focused on preventing more damage to life rather than more damage to property.

1.4.1. Incidents in nightclubs

A nightclub fire has occurred during the writing of this thesis causing the death of some 230 patrons out of an estimated 1000 to 2000 people in the building at the time. The fire occurred in the Kiss nightclub in Santa Maria, Brazil on 27 January 2013 and was reportedly the result of a firework being let off on stage. Allegations from eyewitnesses appearing in the press itemise the use of an outdoor firework on stage, the quick ignition of the ceiling material above the stage, the fast evolution of dense choking smoke, the prevention of people evacuating until they had paid their bills, a single point of entry and exit and so on. All items that would have been addressed, controlled and minimised by a competent system of fire safety management. One that had fully considered the risks involved around the suitability and use of the building as a nightclub permitting an occupancy of more than 1000 people. Not addressing these issues could easily be argued as failings in the management system.

This is not the first nightclub fire associated with a high death toll. The Lame Horse Nightclub in Perm Russia and the Station Nightclub in Rhode Island have already been mentioned above. In the case of the latest one, the Kiss nightclub in Santa Maria, Brazil, it seems unlikely that anyone would have considered that over 1000 people relaxing, drinking and enjoying themselves late at night, could have successfully evacuated through one exit in an emergency. It is worth hypothesising that if the fire had been situated so that it involved and effectively blocked off the one available exit, then conceivably the death toll would have been far higher than it actually was!

Nevertheless, a competent system of fire safety management would have been mindful of the inadequacies of the building and would have either run an enterprise suitable to those conditions or made such changes to the building that would have eradicated or minimised the risk that became so apparent.

The list of nightclub fire tragedies is, unfortunately, still growing and it is becoming increasingly difficult to believe that nightclub managers are so naive and unaware of their responsibilities that they do not realise the potential for disaster.

1.5. The cost of fire in the UK

In a UK Government publication, Roy (1997) reported on an attempt to measure the cost of fires to society. He determined two major categories:

- direct and indirect costs such as the loss of and damage to property, fatalities and injuries and disruption to business;

- the costs of preventing, containing and fighting fires such as the provision of a fire and rescue service and the cost of reducing the risk of a fire occurring.

This seems inadequate when attempting to place a true value on a property. Perhaps the question should be re-phrased:

If the cost of a property fire were the total of the costs of:

- fatality, injury and rehabilitation (the costs of a death and the hospitalisation and rehabilitation of injured people);

- the emergency response (the actions of fire, police, ambulance, local authority and so on);

- interruption to business including:

  - the inability to produce goods;

  - the loss of business potential because the business was exclusive, or it was a skilled trade or it was a unique supplier or other;

  - the interruption to adjacent businesses because of their inability to produce because of pollution, flooding, or until the area has been made safe and so on;

- damage to the environment because of air and ground pollution, loss of habitat and flora and fauna, pollution of watercourses and so on;

- re-building (i.e. design, planning and building permissions, building materials, contractors, employees and so on);

- damage to the climate because of the production of energy used in producing new building materials for reconstruction and energy used in the reconstruction itself;

- damage to the community because of loss of employment, loss of convenience, loss of independence and so on;

- damage to heritage because it was irreplaceable, it was unique, it had emotional value and so on.

Then, conversely, a more realistic value of a property must be its potential:

- to protect the health and lives of those who use it;

- to survive a fire without the assistance of the emergency services;

- to carry on its business or purpose during and following a fire incident;

- to refrain from disrupting its adjacent buildings;

- to cause no damage to the environment;

- to fully serve the community that depends on it;

- to preserve its heritage.

1.5.1. Fire damage

Compare two scenarios: the first scenario is a fire incident that destroys the community facility in a small village in a rural district. The second scenario is a fire incident that destroys the community facility in the centre of a large city. It is worth looking at the differences when estimating the loss of the two properties or the damage caused to each community.

For the sake of argument, we will assume that the economic loss or the cost of re-building, is roughly the same; the damage to the environment through smoke, pollution from fire-fighting water and so on, is roughly the same; but is the loss to the community different?

It is likely that the community facility in the small rural village is used for meetings of the council, meetings of local groups such as Scouts and Guides, wedding receptions, birthdays and celebrations and it is likely to be in use every day. To lose this would be quite significant to the life of the village because the nearest alternative might be in the next village some distance away. Its replacement would be imperative and the focus of the ruling authority.

With regard to the community facility in the centre of a large city, the facility might be used for much the same reasons and also in use for much the same periods of time. However, the need for its replacement would not be so urgent because there

would be alternatives within easy reach and it is doubtful that the ruling authority would focus on its replacement with such zeal as it would in the rural village.

So, it could be argued that the loss of the community facility in the rural village would result in more damage to the village community than the loss of the community facility in the centre of a large city would to the city community.

2. Literature Review

2.1. Overview

The capitals of many countries are characterised by shanty towns where impoverished people seek employment and and build unauthorised dwellings. In its 2008 report *A Big Devil in the Jondolas*, Abahlali baseMjondolo Movement SA (2008); a shack dwellers movement in South Africa[1] state that on average in South Africa, there are ten shack fires a day, with someone dying in a shack fire every other day. Abahlali baseMjondolo complain that lack of tenure stops shack dwellers from upgrading their homes with less flammable building materials and the refusal to allow shack settlements access to electricity leads to the use of dangerous sources of light and heat, such as paraffin stoves and candles. Most fire safety practitioners would agree that given these conditions, it is little wonder that fires occur, that they spread quickly from dwelling to dwelling and that they cause injuries and fatalities amongst the population. Historians would agree that similar conditions existed in the major cities of the UK during the Industrial Revolution[2] in the 18th and 19th Centuries when people in rural areas moved into the cities for employment.

Efforts to control fire in the UK came in the form of control over the construction of buildings. Acts of Parliament, such as an Act for rebuilding the City of London (1666), enacted by Monarch Charles II and an Act for rebuilding the town of Warwick and for determining differences touching houses burnt or demolished by reason of the late dreadful fire there (1694) enacted by Monarchs William III and Mary II, were the result of major fires. They were designed to prevent a fire in one building

---

[1]Abahlali baseMjondolo is a shack-dwellers' movement in South Africa well known for its campaigning for public housing. "Jondolo" is a South African term for a shack. "Abahlali" are the residents who have no option except to live in one.

[2]The Industrial Revolution describes the process of mechanisation of agriculture, the manufacture of textiles and the process of industrialisation and forced sweeping social effects on the lives of rural workers.

easily transferring to an adjacent building either through the connecting/party wall[3] or via the roof. It was recognised that combustible roofing materials encouraged the fire to travel from one building to the next and so the legislation insisted that roofs should be constructed in non-combustible materials such as lead, tiles or slate.

This approach to the problem of fire spreading quickly and travelling from building to building, was effective and is the reason that so many pre-war buildings still survive in the UKs major towns and cities following the large fires and conflagrations caused by bombing in the Second World War. This is not to be disingenuous to the efforts of the firefighters during that conflict as the part they played in the protection of the UK capital is well documented. A quote from the book '*Firemen at War* by Wallington (2005), gives a flavour of their organisation, determination and fortitude:

> *"During Blitz raids, firefighters were often the only human signs of life in the streets. Their tasks involved facing the enemy perils of bomb blast, flying shrapnel and collapsing buildings, to tackle fires that quickly grew into conflagration proportions, bigger than anything seen in peacetime. Choked by thick smoke, scorched by swarms of burning embers, often dehydrated and suffering severe water shortages, the firefighting teams somehow gained the upper hand before the first bombers of the Luftwaffe arrived on the following day, heralding the beginning of the struggle all over again. And, in September 1940, this was only the beginning..."*
> Extract from the book 'Firemen at War' by Neil Wallington.

The fires of the Second World war highlighted another issue in the UK to do with protection of buildings regarding the provision of a fire-fighting force. It was obvious that the biggest protection of buildings stemmed from the methods of construction and the type of materials used in construction. This would prevent the passage of fire from building to building but, as buildings became more complex and more valuable as business premises, there was an increasing need for a firefighting force capable of extinguishing a fire in the building where the fire originated. However, the method of providing a firefighting force in the UK before the Second World War was not nationally organised. Many pre-war fire brigades were organised by the municipal authorities or by large manufacturing businesses; some were publicly funded, some were privately funded, some employed paid firefighters and others were staffed by

---

[3]A party wall refers to the wall (or walls) that usually separate buildings. For example, in a semi-detached or terraced house the party wall is the wall shared with the adjoining house (source: Royal Institution of Chartered Surveyors).

volunteers. There were few standards to regulate the training of firefighters or the type of equipment they used. The issue that became critical during the defence of the major cities in the UK during the Second World War was that there were differences in the make and type of equipment that each fire brigade was provided with. This lack of standardisation of equipment meant that, in many cases, the equipment used by one fire brigade could not be supported by or used with the equipment from another fire brigade simply because there were different makes of equipment and it was not designed to fit together. Recorded in HC Hansard (1945), the solution was to form the National Fire Service out of the existing fire brigades and the Auxiliary Fire Service[4] in which common standards could be regulated. Following the ending of hostilities consideration was given to re-organising the fire service in the UK and led to the enactment of the Fire Services Act (1947).

2.2. Fire Safety

Andrews (1891), in his book Old Church Lore relates that when the monarch, Alfred the Great[5], founded the University at Oxford in 872, he directed that a bell should be rung every night at eight when all the inhabitants of Oxford should cover up their fires and go to bed. Why this rule was imposed is not recorded but it may be speculated that it was because of the inconvenience and disruption caused by the structure fires resulting from open hearth cooking and heating fires.

Andrews (1891) also writes that William the Conqueror, following the Norman's colonisation of Britain after their invasion and victory over the English at Hastings in 1066, reinforced Alfred's rule by passing his own legislation that the population should extinguish all cooking fires and candles at the sounding of a church bell at eight o'clock each evening[6]. There is debate about William's intentions for re-inforcing the rule; Andrews (1891) writes that some scholars attribute it with no intention, insisting that it was a common rule in Normandy where it was usually accompanied by a religious service. Other scholars say that it was a method of

---

[4]The Auxiliary Fire Service was formed to assist the existing fire brigades which had become overwhelmed by the amount of work caused by bombing during the Second World War.

[5]Alfred the Great reigned as King of England from 871 to 899.

[6]The sounding of a church bell at eight o'clock each evening is a custom still practised in some European villages and towns. Two examples are Castleton in Derbyshire (see webpage: http://www.peaklandheritage.org.uk/index.asp?peakkey=31002121: accessed 7 August 2012) and Strasbourg in France.

preventing seditious associations and conspiracies. It is pure speculation to suggest that it was a form of fire safety but it is tempting to suppose that lives and property were saved as a result of this order.

Extinguishing the cooking fire was assisted with the use of a *couvre feu*,[7] which was a clay bowl-shaped device that fitted over the fire. This excluded the oxygen and hindered the combustion whilst, at the same time, preserving the heat of the fire and enabling the fire to be easily re-kindled next morning. Andrews (1891) also writes that the phrase, *couvre feu* became anglicised by usage to *curfew*, a word that is still in use associating the control of a population by force during periods when authorities believe treacherous acts will be carried out under cover of darkness.

Fire continued to be commonplace throughout the Middle Ages. Two major fires were recorded in London before the one reported by Samuel Pepys as the Great Fire of London in 1666. Bucholz and Ward (2012) write that fires that devastated the city were recorded as early as 125. As an illustration, they relate that the first St. Paul's Cathedral burnt down in 675, the second in 961 and the third in 1087.

The fire in 1666, commonly known as The Great Fire of London, started in the shop of the baker to Charles II in Pudding Lane. According to Samuel Pepys' account of the fire[8], the baker's maid failed to extinguish the ovens and the heat ignited the timber-framed building. The fire quickly spread to other neighbouring timber-framed buildings and then spread throughout the city, transferring from house to house, assisted by the congested streets and the wooden buildings with thatched roofs. Fewer than ten people lost their lives in this fire because the fire was spotted early, it progressed slowly from building to building and sufficient warning was given to the people affected by it. St Paul's Cathedral was again devastated by fire but, as Lang (1956) records, this was rebuilt in the years following the fire by Sir Christopher Wren and is the building that is recognisable as St Paul's Cathedral today.

It is arguable that modern fire safety started with the 1666 Great Fire of London and that this was the spur necessary for those in authority in London to take a hard look at measures that might prevent the same thing happening again. This meant deciding whether or not it was wise to construct timber-framed buildings so closely together that flames could easily jump from one building to another.

---

[7]'Couvre feu' was literally 'fire cover' in French.
[8]Samuel Pepys (1633 to 1703) became famous for chronicling the turbulent years of the 17th Century in his diaries.

It was recorded that very few people lost their life or were injured in the Great Fire of London yet a great many people lost their property and belongings to the fire. This was probably because although the fire occurred around midnight and most of the population had retired to bed (supposedly the most unsafe time for the occupant of a dwelling), the fire was discovered very quickly and gave time for the occupants of neighbouring buildings to evacuate their buildings and get to a place of safety. However, very many more of London's population were affected by the fire and many people who escaped with their lives from the fire, nevertheless became homeless over the ensuing days as the fire spread from house to house.

The reaction to the destruction of a large part of London by the Monarch, Charles II, was speedy and effective but it was because of the property loss and not because of the loss of life. The Act for rebuilding the City of London (1666), enacted by Charles II, specified four types of house that could be built in the regeneration of London. The Act stated that only four types of house would be permitted to be built and the choice of which house type could be built was dependent on its location. The property had to be the first type of house if it fronted onto a lane, the second type if it fronted onto a street, the third type if it fronted onto a principal street and the fourth type if it was a large mansion house built for a 'person of quality'. The Act went on to dictate certain principles that had to be embodied into the design of each property to guard against the 1666 fire re-occurring.

The Party Wall etc. Act (1996), enacted in England and Wales, has its root in Charles IIs legislation. Hannaford and Stephens (2004) report that a series of statutory codes in respect of the concept of the party wall, commencing with the Act for rebuilding the City of London (1666), culminated with the London Building Acts (Amendment) Act (1939). In effect, the 1996 Act extended the provisions in the 1939 Act to the whole of England and Wales while repealing any local legislation relating to party walls[9].

Bird and Dockling (1949) make reference to an earlier regulation in 1189 enacted by Richard I of England, prescribing the design of stone party walls to be three feet thick and sixteen feet high. In this earlier legislation, the monarch Richard, obviously understanding what the problem was and probably with the intention of

---

[9]The Pyramus and Thisbe Club, an association of party wall surveyors, claim credit for the 1996 legislation after lobbying Parliament following the case of Gyle-Thompson v Wall Street (Properties) Ltd 1 WLR 123 [1974] 1 ALL ER 295 (1974), a notorious tort involving a party wall.

preventing the spread of fire over the top of a party wall, added:

> *"whosoever wishes to build, let him take care, as he loveth himself and his goods, that he roof with reed nor rush, nor with any manner of litter, but with tile only or shingle or board or, if it may be, with lead."* Bird and Dockling (1949)

It is tempting to claim the adoption of the notion of a party wall as success for the original concept of completely separating one property from another but the lack of objective evidence of the successful performance of party walls in fire since 1189, makes this a conjecture rather than a fact. Possibly, the only arguable position is to state that although there is more than one recorded Great Fire of London (1135, 1212 and 1666), each of which threatened the existence of London as a capital and as a city, there has been no instance of a single property fire threatening the whole city of London with destruction since 1666[10].

2.3. Post-war Building Studies

Regulations for construction of buildings in the UK have, generally, extended from those introduced in London. This is presumably because of London's importance as the home of the Monarchy and the centre for Government and the lead taken by Charles II after the destructive fire that occurred in 1666. The legislation following that fire[11] was meant to prevent the power of fire reeking the same amount of destruction again in London and the legislation governing party walls applied in London for many years before being enforced throughout the country. It is disingenuous to say that initiatives to control the construction of buildings were not proposed and enacted in the rest of the country but the measures that were put in place were subjective and dependent on the experiences of the influential people in the villages, towns and cities concerned. Naturally, those locations that had suffered devastating fires causing the destruction of many buildings gave more than a passing thought to how the power of fire could be averted than those that had not. In 1693, for an example recorded in the book '*Provincial Towns in Early Modern England*

---

[10] Although much of London was destroyed by fire as a result of the air raids in 1940 and 1941, the continued bombing over 57 days/nights, in September and October 1941 can hardly be compared to the occurrence of a single property fire threatening the whole city similar to that which occurred in 1666.

[11] The Act for rebuilding the city of London 1666.

and Ireland'; edited by Borsay et al (2002), the City of Warwick suffered a fire on a hot day in June when the weather conditions were particularly supportive in fanning the flames from a thatched roof that had caught alight from a kindling torch. The fire became so large and out-of-control that the city centre was abandoned and houses in the path of the fire were demolished in vain attempts to stop the fire's inevitable progress from dwelling to dwelling. Even St Mary's Church, built in the 14th Century, was almost totally destroyed by the fire. However, the performance of one house; Archer Mansion in Jury Street, stood out from the rest. This is because Archer Mansion was a brick-built building with a tiled roof that managed to withstand the progress of the fire forcing it to burn itself out.

Lessons were learnt and the performance of Archer Mansion did not go unnoticed because the devastation of Warwick resulted in an Act of Parliament enacted by William III and Mary II in 1694[12] modelled on the earlier legislation enacted by Charles II following London's fire in 1666. Further local Building Acts were enacted in other towns and cities following serious fires throughout the 18th century and were mostly aimed at substituting the use of timber and thatch as roofing materials in favour of lead, slate or tile. However, it was always the threat of fire, rather than other causes, that prompted the need for controlling the construction of buildings in England before the 19th Century.

In his book, '*A History of Building Control in England and Wales; 1840 to 1990'*, Ley (2000) records that threats, other than the threat of fire, were taken into account during the 19th Century following a series of Government Inquiries into the living conditions in Victorian London brought about the Metropolitan Building Act (1844). This Act and the Local Government Act (1858) extended control of building regulation, already present in London, to other local authorities in the UK.

In the 20th Century, during the Second World War, bombs were dropped on towns and cities creating fire storms which threatened to destroy and lay waste to the buildings not destroyed by the power of the bombs. What is surprising is the number of buildings that were still standing at the end of hostilities; a good example is St Paul's Cathedral in London.

Compare the attempt at mass destruction in London brought about by the Second World War against the attempt brought about by the slow inexorable march of the

---

[12]An Act for rebuilding the towne of Warwick, and for determining differences touching houses burnt and demolished by reason of the late dreadful fire there 1694.

fire that started in Pudding Lane in 1666. The Pudding Lane fire starting in the baker's building, ignited the adjacent buildings by burning away the party wall or igniting the adjacent thatched roof then jumped the gaps between houses by the mechanics of radiated heat. Efforts to extinguish the fire becoming more and more unsuccessful as the fire grew because of the increased availability of material to burn.

This same slow, inexorable process did not occur in London during the Blitz even though there were many seats of fire caused by the bombings than just the one in 1666. Firefighters were assisted in their efforts because of the design and construction of the walls and roofs of the buildings. It is difficult to believe that the difference in the consequences of the fire in Pudding Lane and the Blitz in the Second World War was not due, in some way, to the inclusion of adequate barriers to prevent fires easily spreading from building to building.

In the years following the Second World War, the number of unoccupied buildings in London and elsewhere gave an opportunity to experiment with and progress the science of fire using the resource of bombed and vacated buildings awaiting demolition and development. Experiments and tests were carried out on suitable buildings awaiting demolition, to observe and test the natural phenomena of fire in search of general laws governing the effects and consequences of fire in various types of property.

This opportunity led to the Post-war Building Studies: No.20 (1946) and the Post-war Building Studies: No.29 (1952) published by the Joint Committee of the Building Research Board of the Department of Scientific and Industrial Research and of the Fire Office's Committee. These studies were an attempt to grade the fire precautions necessary in different types of buildings by investigating and assigning suitable fire precautions to attain an adequate standard of safety, dependent on the fire hazard of the building under consideration.

In Post-war Building Studies: No.20 (1946), the Joint Committee defined the three objectives of fire precautions to safeguard life and property. These were:

1. to prevent or reduce the number of outbreaks of fire;

2. to provide adequate facilities for the escape of the occupants, should an outbreak occur; and

3. to minimize spread of fire both within the building and to near-by buildings.

The first objective, that of preventing outbreaks of fire, was most important and

one of primary concern, according to the Joint Committee. They considered that there was sufficient objective data available to conclude that most outbreaks were attributable to acts of carelessness by people. These, they determined, could be tackled by educating the public but they doubted that this was practicable, so the only course of action was to place reliance on protection of the structure of the building and of fire-fighting measures. This led the Joint Committee to concentrate on the second and third objectives.

The second and third third objectives, those of providing means of escape facilities and of minimising the spread of fire both within a building and to nearby buildings, the Joint Committee divided into two different concepts; passive defence of fire and active defence of fire[13].

Passive fire defence, the Joint Committee described as the provision for limiting the development and spread of fires that have started along with adequate means of escape and other safeguards for the occupants. The provisions included:

- proper subdivision of large buildings by walls and floors of adequate fire resistance;

- fire-resisting protection to load-bearing members of structure;

- measures to facilitate the access of firefighters and;

- steps to minimise the spread of fire from one building, or part of a building to another building.

Active fire defence, the Joint Committee described as the provision for the extinction of fires or the availability of fire extinguishing equipment such as a sprinkler installation, the provision of hand extinguishers or a dry rising main[14].

It was the opinion of the Joint Committee that the correct approach to the design of a building would be to incorporate these two concepts of fire defence in an ideal

---

[13]The two terms; passive and active fire protection, are much used in current building construction but these references in the Post-war Building Studies are possibly the first attempt to publish a definition.

[14]A dry rising main, or 'dry riser', is a vertical pipe located in a multi-level building to deliver water for fire-fighting to outlets on each level of the building. The pipe is usually supplied with water pumped from the tank of a fire appliance. If the pipe is kept fully charged with water supplied by a tank or a water main, it is known as a wet riser. If the pipe is supplied from a tank on the roof of the building, it is known as a 'downcomer'.

balance for the type of building and occupancy. They were convinced that there were trade-offs possible between passive and active fire defence and that if sufficiently good active fire defence measures could be guaranteed, then onerous passive fire defence would be uneconomical. The concept of a trade-off between passive and active fire defence measures surfaces in the discussion between acceptability and equivalency and has much to do with a fire engineering approach to design.

Stollard and Abrahams (1999) state that it would be unreasonable and costly to ask designers to design for absolute safety. They refer to the acceptable level of fire safety traditionally defined through legislation. An acceptable level of fire safety is one where the risks to people and property have been reduced to a level which society regards as acceptable. Legislation for fire safety has tended to be produced in response to a major incident, so it does not always offer a balanced solution to every building design.

The concept of equivalency is engaged once the architects have achieved an acceptable level of safety. Stollard and Abrahams (1999) explain that an acceptable level of fire safety can be achieved by different fire safety designs if one fire safety measure is traded-off against another. For example, perhaps, fire safety measures introduced to decrease the likelihood of ignition might be balanced against a decrease in the amount of fire safety measures introduced to contain a fire. Or, perhaps, an increase in fire safety measures to protect the means of escape from a building might be balanced against a decrease in methods of fire extinguishment.

The definition of a fire-engineered solution given by the Chief Fire Officer's Association (CFOA) better explains the concept[15]:

> *"A fire engineered solution is a scientific based approach to provide an alternative way of providing adequate fire protection measures within a building, the measures taken can often deviate from established procedure and normally recognised guidelines. This could be by using sprinklers and smoke control as a compensatory feature."*

---

[15]A definition of fire engineering taken from CFOA webpage http://www.cfoa.org.uk/11822 on 31 July 2012.

2.3.1. Research into the science of fire

Research carried out by the Fire Office's Committee[16] after the Second World War informed the designers of dwellings during the post-war period which saw many houses and factories built. The work of the Fire Office's Committee and latterly, the Fire Research Station, began to offer objective data about how materials, specifically building materials, behave in fire and how fire behaves in buildings. Immediately after the war, experiments were carried out in the many half-demolished buildings that were waiting to be cleared. The principles of compartmentation and building separation were the focus of these experiments and informed the standard also used in the current Building Regulations.

2.4. Fire safety engineering

Fire safety engineering, according to the Building Research Establishment, is the application of scientific and engineering principles based on the understanding of the effects of fire, the reaction and behaviour of people to fire and consideration of the ways to protect people, property and the environment from the consequences of fire[17] .

The Institution of Fire Engineers offers a similar description of fire safety engineering and lists six objectives that should be the focus of a fire engineered design. These include assessment of fire hazards, mitigation of damage by fire, detection of fire, suppression of fire, investigation and analysis of fire incidents etc.[18] .

The Society of Fire Protection Engineers holds an annual examination of fire protection engineering. The list of topics that they include in the curriculum for students to study gives some indication of the diversity surrounding their interpretation of fire protection engineering. Topics include; Explosion protection; Fire alarm systems; Fire dynamics; Fire protection analysis and management; Human behaviour; Passive building systems; Smoke management; and so on[19].

---

[16] The Fire Office's Committee was established in 1880 by the insurance industry both to advise the industry and provide technical support. Their testing facility at Borehamwood was taken over by Government at the outbreak of World War II and became the Fire Research Station.

[17] Source: http://www.bre.co.uk/page.jsp?id=1855 (accessed on 21 July 2013)

[18] Source: http://www.ife.org.uk/about/about/fireengineering (accessed on 21 July 2013)

[19] Source: http://www.sfpe.org/SharpenYourExpertise/Education/2013FireProtectionEngineeringPEExam.aspx (accessed on 21 July 2013)

Christian (2003) offers a more effective description in his book *A Guide to Fire Safety Engineering.* He describes fire safety engineering as the provision of adequate fire safety precautions in a building or structure that departs from those prescribed by some form of building control. He explains that the performance criteria usually required by the prescribed method is achieved or surpassed by a different means involving trade-offs between passive and active fire protection measures. This allows the designer the freedom to use new and different materials and to make optimum use of the available space. He comments that fire safety engineering may be the only viable means of achieving a satisfactory level of safety in some large or complex buildings. Christian (2003) associates the application of fire safety engineering with separate ideas, such as:

- the process of fire safety engineering with regard to the application of engineering methods, scientific study and experience and judgement;

- the context in which the design of a building or structure accommodates the identified fire hazard and risk and sets the required performance criteria;

- the methods of measurement and calculation that describe the relationships between materials that incorporate the results of study and research;

- the necessary framework surrounding the discipline which permits an engineering approach to be taken towards fire safety departing from traditional, prescribed methods.

British Standard 7974 (2001) is a code of practice to enable the principles of fire safety engineering to be applied to the design of buildings. It is intended to constitute a framework in which a fire engineering approach to building design can be taken. Following the code of practice will result in a building design that itemises the fire safety objectives, the likely fire safety hazards and fire scenarios and the criteria that has been applied for acceptance. Alongside these will be documented the assumptions, judgements, calculations and analyses carried out to arrive at the final design and how these compare against the acceptance criteria. These concepts are particularly important for the future occupiers of the building and the code of practice states that they should be included in a fire safety manual to be handed over. The fire safety manual contains the management and operational procedures for the fire safety systems necessary for the occupier to maintain the safety margin engineered into the building design.

British Standard 7974 (2001) benefits from one of the main criticisms arising from

Cullen (1990). The criticism arises from the inquiry into the fire and explosion that occurred on the Piper Alpha oil platform in the North Sea in 1988 and concerns the prescriptive regime of safety that Piper Alpha was subjected to. The criticism is an important one with regard to fire safety engineering because it supports the argument in favour of replacing the prescriptive measures used in building codes with a different system. In his report, Cullen (1990) recommended that the prescriptive regime of regulation should cease and be replaced by a system of goal-setting. He thought this would create a regime where the potential major hazards on each individual installation were identified and provided with appropriate controls to manage them to help prevent a recurrence of the disaster. It would also solve what he saw as a major problem revealed by the inquiry; that prescriptive regulations encouraged a mentality where compliance with the regulations was the focus of the regulators rather than a full consideration of the actual risk. This new approach was embodied in the The Offshore Installations (Safety Case) Regulations (1992) requiring a consideration of the case for the safety of every offshore installation to be acceptable to the Health and Safety Executive. The principle used in British Standard 7974 (2001) and fire safety engineering is similar to this in that it provides for the case of fire safety in the buildings to which it is applied.

Salter et al (2011) looked at the way fire safety engineering is currently practiced in the UK. Interestingly, he found that fire engineers commonly used traditional resources such as building codes and design guides to validate their fire engineering designs. He also determined that the provision of life safety was not the only consideration for a fire engineer when designing a system specification; property protection was also a consideration

Wilkinson (2013) investigated fire engineering design to identify best practice and to discover the gaps in skills and knowledge. He thought that the development of a successful engineering strategy depended on three factors:

1. The first, and most fundamental, was that the end-user should be encouraged to state accurately what the completed building should achieve so that the process of design and construction could be agreed and as focused as possible.

2. The second factor was that the commercial property insurers should be consulted and involved in the process of design as much as possible. Recruiting them onto the design team would be a successful way of achieving this.

3. The third factor related to the role of the fire engineer acting as advisers to

the design team.

Fire safety engineering has already provided many benefits for society. It has encouraged the design of many buildings that, before its inception, would have proved extremely difficult, if not impossible, to design and build. This new way of designing buildings, permitted by the relaxation of adhering to the prescriptive regulations present in many building codes, has given the opportunity of designing eye-catching and intriguing buildings. With this method, the building designer has more flexibility to create the type of building in which occupants can pursue their business in the way that they wish to pursue it. Fire safety engineering allows the building designer to design a limitless number of imaginative, functional buildings, each tailored to the needs of the future occupier and each one considered to be as safe from fire as could be achieved under the prescription of building codes.

One such functional building, for example, is the shopping mall, a large enclosed shopping area from which traffic is excluded[20]. Some shopping malls in English town centres were formed just by covering entire streets[21], while others have been constructed into purpose-built properties on brown or green-field sites allowing good access for car owners. Their attraction was the grouping together of shops from which shoppers could easily walk from one shop to another, in a comfortable indoor environment. The problem for fire engineers was, how could travel distances (the actual distance to be travelled by a person from any point within the floor area to the nearest storey exit, having regard to the layout of walls, partitions, and fittings) be extended safely. The answer was to control the products of combustion in a way that gave sufficient time for people to evacuate safely. New concepts such as this one created opportunities for much research releasing new knowledge for fire engineers to improve their models of, for example, controlling heat and smoke in shopping malls as documented in Butcher and Parnell (1994); Building Research Establishment (1999); Hansell (1992); Sanderson (2007).

The concept of an alternative to the prescription of building codes was dealt with

---

[20]Definition of a shopping mall from http://oxforddictionaries.con/definition/english/mall (accessed on 8 April 2013)

[21]One example was Walsall in the West Midlands where the Old Square was covered in 1969 and became Old Square Shopping Centre.

comprehensively by Malhotra (1986), a researcher at the FR[22] and who wrote a report on behalf of the Department of the Environment on fire safety in buildings in which the concept was expanded upon. Malhotra (1986) held the opinion that fire safety engineering could meet the need for alternative building design whilst providing an equally valid option to the prescribed building codes. He stated that the reasoning for fire safety engineering was to enable the fire safety provisions of a building to be based on a quantitative assessment following the simple logic that the fire safety measures, whatever they were, should be equivalent to the assessed hazard posed by the products of the fire.

One of the major stumbling blocks to quantitative assessment of fire hazards, an essential concept in fire safety engineering, was that fire safety guidance was based on qualitative assessments. The Post-war Building Studies: No.20 (1946): Part I: General Principles and Structural Precautions and also Post-war Building Studies: No.29 (1952): Part II: Fire-fighting Equipment Part III: Personal Safety and Part IV: Chimneys and Flues, key components in Marathon's tool kit, were largely sub-jective judgements based on the knowledge and experience of the Members of the Committee. Research and testing to gain numerical data that allowed quantifiable assessments to be made and to use the methods of the engineer and scientist, were new concepts in the field of fire safety and were in need of development.

Fire safety engineering as a way of achieving safe and satisfactory conditions in a building is different from the traditional methods of achieving safe and satisfactory conditions. The difference lies in the way that the fire safety measures are determined. Traditionally, they were determined subjectively and are merely a reflection of how the building designer assesses the situation. Logically, a building designer who has experienced the ferocity of a fire in a building such that it has left a deep mental impression is likely to be far more rigorous in an assessment of the hazards than a building designer who has not. However, Malhotra (1986) pointed out that this method, the subjective method, is not suitable for the level of detail and precision necessary for an engineer, a more objective method is needed, one that exploits the science of probability and one that can offer insights into the relationships between the different elements of fire. An example to illustrate this point is the question of

---

[22]The Fire Research Station (FR), founded in 1949, replaced the testing facility of the Fire Office's Committee. It quickly established a reputation and became a leading centre of research into fire prevention and fire protection and was involved in the investigation of major fires such as the fire involving the stand at Bradford City Football Club in 1985 and the fire involving the Brunswick Tower and staterooms at Windsor Castle in 1992.

how long a fire with an unlimited supply of fuel can be contained in an average-sized room if, on the one hand, there is a sprinkler system fitted which operates when a certain temperature is reached and if, on the other hand, there is no sprinkler fitted. The determination of this question can be obtained by estimation, based on the estimator's experience and knowledge; by experimentation, based on lighting a fire in a model of the room; or by calculation, based on many experiments and much research into the nature and characteristics on how fire performs in the presence, or absence, of a sprinkler system.

This aspect of analysis, looking at the performance of the fire and how the performance is affected by different materials, different configurations, different processes, different maintenance regimes etc. is a critical part of fire safety engineering. Malhotra (1986) recognised that if you took away the prescription of a set of regulations that, if followed precisely, would produce a building with similar conditions, then you had to replace it with something equally as good or else it was worthless. At the time he wrote his report in 1986, objective data about the performance of building materials, the products of combustion and the behaviour of people was not available because it had not been generated. This severely limited the effect of the new method.

In his paper *The Role of the Fire Safety Engineer*, Malhotra (1991) lists some of the components of a fire-engineered solution for which data were available when the paper was written in 1991 and some items which were under consideration as components for research and analysis. Components for which data were available included; production and movement of smoke, occupant behaviour in fires, the severity of a fully developed fire, the extinction capabilities of sprinklers etc. Some of the components under consideration included; techniques for assessing hazards, the effect of sprinklers on the severity of a fire, the performance of different fire safety measures, the performance of integrated fire safety systems and so forth.

2.4.1. Summerland

A stark example of the consequences of constructing a building to standards other than those in the prescriptive codes is presented by the fire at the Summerland holiday complex in Douglas, Isle of Man in 1973. Stollard and Abrahams (1999) use it as an example in their book *Fire from First Principles*. The project was born of an attempt to compete with the growing number of holiday-makers who

were rejecting British seaside resorts. It was conceived to emulate a Cornish village with a Mediterranean climate but, by the time it opened, housed a large amount of entertainment and leisure facilities on different mezzanine and basement floors. The building was conspicuous because of its roof and walls which were made from transparent plastic covering a large open space where the entertainments could take place in sunlight.

The fire that destroyed the Summerland complex was ignited at about 7.40pm one August evening in 1973 by a boy who was playing with matches whilst smoking in an unused kiosk on an outside terrace next to the mini-golf course. The floor of the kiosk caught light and resisted the boy's efforts to extinguish the fire. Staff were alerted to the fire at around 7.55pm and joined other holiday-makers in trying to extinguish the kiosk fire with hose-reels and extinguishers. They were confident that, although the kiosk had collapsed against the wall of the main building and the flames were playing on the sheet steel from which this part of the wall was constructed, the flames would be resisted. However, unknown to them, the heat from the flames had already ignited the combustible coating on the inside surface of the sheet steel and was burning in the cavity formed by the Galbestos sheet and the inner wall which was constructed from Decalin fibreboard also with a combustible coating. The fire burned and travelled through the cavity for some minutes before finally breaking through into the interior of the building.

Once the fire was inside the building, the combustible furnishings and fittings soon ignited, including the transparent plastic promenade wall which also proved to be combustible. Survivors of the fire in the building at the time verify how quickly the fire spread to involve the whole of the building and how the transparent plastic wall and ceiling melted and burnt, dropping molten plastic onto escaping occupants. They also confirm the lack of fire warning they were given save that of the message of a show compere who used his microphone and speaker system to urge people to evacuate.

The account of the fire, which killed fifty people and injured many more, is contained in the Report of the Summerland Fire Commission and is also the subject of an unpublished book by Phillips (circa 2010)[23]. There were many lessons to be learnt from the tragedy and there were many recommendations enclosed in the report,

---

[23]The unpublished book by Ian Phillips was downloaded from his webpage at http://www.birmingham.ac.uk/schools/gees/people/profile.aspx?ReferenceId=9695&Name=dr-ian-phillips#staffdetails (accessed 19 September 2012).

some of which were used to change the regulations used in building construction. The report highlighted a number of unfortunate circumstances which combined and contributed to the high loss of life caused by the fire including:

- the lack of communication between the authorities, architects and developers during the planning stage of the project;

- the waiving of Manx Building Bye-Law 39 without sufficient justification. This byelaw required all external walls of a building to be non-combustible and fire resistant;

- the fast evolution of smoke made sure that escapees quickly became lost and disorientated;

- parents of children separated from them because they were in other parts of the complex and went off in search of them instead of making good their escape;

- the parts of the building reliant on lighting were denied this when the manager shut the power off in the misguided belief that this would prevent further electrical fires. The secondary (emergency) lighting, designed to replace the primary lighting on failure of power, did not operate because either the generator was faulty or because it had been isolated;

- the fire alarm system was never sounded because the member of staff, whose responsibility it was to respond to the indication in the Control Room that a break-glass call-point had been triggered, had had insufficient training to be sure of her expected actions. She also reported to the Summerland Fire Commission that sounding the alarm was not necessary because everyone knew the building was on fire;

- the call for assistance from the fire service, designed to be automatic when the fire alarm sounded, was never made because it was dependent on the operation of the fire alarm and the fire alarm was never operated. The first call received by the fire service was made from the control room of a local taxi company relaying a message from one of their drivers who could see the fire. This was some twenty minutes after the fire had started. The second call to the fire service was made by the Coastguard relaying a message received from a passing ship!

This list of circumstances not only points to the failures in the construction of Summerland which is the usual reason that this fire disaster is used as an example

but it also highlights the crucial part played by the management of fire safety and the provision of contingency plans to ameliorate deficiencies in the design of buildings.

2.5. Protection of property and life safety

One big advantage offered by following the prescriptive method detailed in many building codes, is that it revolves around the concept of compartmentation. At the core of this concept is the idea that the spread of fire in a building can be restricted by sub-dividing the building into fire-resistant smaller units. This method inhibits the ability of the fire, which is burning but confined with limited fuel and, perhaps, limited oxygen, in one of the smaller units, to spread quickly through the building. It also provides time for the building's occupants to evacuate and for fire-fighting strategies to have an effect before the fire becomes too large

The most serious criticism of the approach offered by a prescriptive building code, stated by Stollard and Abrahams (1999), was that aspects of fire safety such as the prevention of fire and the control of smoke evolving from a fire were ignored. The approach, they said, was to regard components of fire safety such as, travel distances and escape routes, fire protection of loadbearing elements, roof construction, compartment walls and floors etc. as being disconnected from each other. A building code required a reasonable standard of provision in each separate component but the components of fire safety were looked at in isolation and not as connected parts.

Stollard and Abrahams (1999) regarded this approach as the traditional approach and claimed that its inflexibility caused architects to resent prescription and start to seek loopholes or ways to get round its requirements. They also thought that it created an artificial distinction between the requirements of legislation that concentrated on the ability of the occupants of a building to evacuate safely (usually referred to as 'provision of life safety') and the requirements of the insurers of a building who were more concerned with the protection of the property as an asset (usually referred to as 'provision of property protection'). They reasoned that this artificial separation could only lead to conflict in the two areas which would be most beneficial if they operated synergistically.

The view that the building code applicable in England and Wales (Approved Document B, 2010), did not cater sufficiently for the provision of property protection was

underlined by the Fire Protection Association (2008)[24] when they published their copy of *Approved Document B*; *Incorporating Insurers' Requirements for Property Protection.* This was a copy of the original document supplemented with extra requirements considered by the FPA to be necessary to provide sufficient protection to property and to acceptably reduce business interruption. In the document, the insurers' requirements are printed in italics, in green font, next to the text, tables and diagrams that they are meant to replace or amend. The FPA claim their extra requirements give guidance in the provision of property protection and business interruption that are increasingly viewed as requirements for a resilient and healthy community.

Also included in the document was a new Appendix; Appendix J: Insurer requirements for the implementation of fire safety engineering solutions. Appendix J follows the format of British Standard 7974 (2001) and stresses the importance of contact and consultation with the insurer in respect of buildings being designed and constructed by an alternative method to that offered by the adherence to Approved Document B (2010). The objective of Appendix J is to set out eight requirements agreed by the insurers as being critical which will, if followed, meet the twelve principles listed in Design Guide for the Fire Protection of Buildings (2003) essential, in the opinion of the insurers, to give the best protection to property and business in a building subject to the fire safety engineering approach.

In contrast to the traditional approach, the fire safety engineering approach considers a building as a complex system and, as one aspect of that complexity, tries to achieve a satisfactory level of safety by assessing the equivalence of alternative fire safety strategies. This, according to Stollard and Abrahams (1999), calls for a greater depth of understanding by the building designer, of the principles of fire safety and the science of fire as well as the ability to demonstrate to the approving authorities that the strategies achieve the same level of fire safety as the traditional approach.

Analysis of fire legislation through the centuries from Alfred the Great and William the Conqueror requiring the populace to cover their fires; to the Monarch's of Charles II and William and Mary's attempts to protect the cities of London and Warwick by legislation, the focus on protecting property can clearly be seen. The method

---

[24]The Fire Protection Association (FPA) was established in 1946 as a national fire safety organisation working to identify and draw attention to the dangers of fire and to minimise the potential loss from fire. Their work includes consultancy, publishing, research, risk auditing, risk surveying, training etc.

adopted by the Monarchs was to analyse what was wrong and to learn from the mistakes that caused the damage to property, livelihoods and economies. However, contemporary legislation reveals that current lawmaking has a different focus and is more concerned with life safety rather than property protection.

2.6. Fire safety management

Malhotra (1986), in his report, *Fire Safety in Buildings* had noticed something else that was a necessary component of adequate fire safety in a building which was also a critical support for the new concept of fire safety engineering. It was something that could be argued as being common sense but something that was not normally recognised in its own right; this was the concept of fire safety management. Generally, Malhotra (1986) saw the notion of fire safety in a building in levels of fire protection. The first level included the basics of fire safety; how an ignition was to be prevented, how the occupants of the building were to avoid the products of a fire, how the fire would grow and be contained and how far the fire could travel if it was not controlled. The second level included how the products of fire were to be identified, controlled and extinguished. The third level was the management level or the level that assessed, provided, maintained and monitored the first and second levels. This was the level that most people regarded as common sense.

Malhotra (1986) states that the main objective of fire safety management is to ensure that all the provided fire safety measures will be available so that people can use them to assist their escape. He goes on to give examples of major fire incidents where this objective has not been achieved and where this contributed greatly to the loss of life and property, namely, the Stardust Disco, Dublin in 1982. This was also reported and published by the Irish Government in Coffey (2008); Woolworth's Store, Manchester in 1980 and Bradford City Football Club Stadium in 1985 researched by Firth (2005) in his book, *Four Minutes of Hell: The Story of the Bradford City Fire.* Malhotra (1986) draws attention to the lack of preparedness on the part of those responsible for management at the time of the incidents when something out of the ordinary occurred.

Marathon's report was written in 1986 yet, travelling forward in time, this lack of preparedness is still evident. In June 2009, in respect of an offence that was discovered in January 2007, Shell International Ltd was prosecuted by the London

Fire Brigade for its management failings with regard to its Shell Centre Headquarters in London. The inspecting officers, being called to the building because of the concerns of operational officers following two fire incidents within a week of each other, found blocked escape routes and fire exits, defective fire doors and excessive fire loading caused by a refurbishment of the upper floors of the building. London Fire Brigade responded by preventing access to parts of the 27-storey building to all employees and members of the public until remedial work had been carried out on the affected areas and they were considered to be safe[25]. The failure of management, in this instance, to consider the responsibilities of maintaining a safe workplace for its employees and visitors during planned refurbishment of the building, was manifestly an example of poor management that Malhotra would recognise.

There is much research into the science of fire brought about by the demand for objective data to fuel the new concept of fire safety engineering but there is, by no means, the same amount of research into the concept of fire safety management or, more specifically, the role of managing fire safety. The reason may lie in the notion that there is a difference between the two ideas in that, fire safety engineering is a 'hard' science coming under the scope of engineering while fire safety management is a 'soft' science coming under the science of management. This is reminiscent of the efforts of eminent physicist, Jim Al-Khalili, in the task he has set himself in trying to bridge the gap between quantum physics and biology. This is because he can see that biology is powered by quantum physics and he wants to progress science[26]. In a similar manner the science of fire safety management can be progressed by bridging the gap between the science of fire safety engineering and the science of management.

There is much advice about fire safety management in the public domain, particularly in England and Wales, to assist with the introduction of the Regulatory Reform (Fire Safety) Order 2005. The advice gives guidance on the responsibilities, duties and regulations encountered under the legislation and practical advice about how it affects different property types. In addition, there is guidance that deals with the principles of means of escape for disabled people from different property types[27].

---

[25]Information accessed from London Fire Brigade's website: http://www.london-fire.gov.uk/news/NewsReleases09_PR1119.asp (accessed on 21 August 2012).

[26]See http://www.ias.surrey.ac.uk/workshops/quantumbiology/report.php to access Jim Al-Khalili's series of lectures (accessed on 1 April 2013).

[27]There are twelve Guides and one Supplementary Guide available for free download at http://www.communities.gov.uk/fire/firesafety/firesafetylaw/ (accessed on 23 August 2012).

The thrust of the advice considers the need for the Responsible Person[28] in a property, to carry out a suitable and sufficient fire risk assessment. This is the mechanism required by the legislation to make sure that fires are avoided and that people are safe if an ignition does lead to a fire.

Guidance about the management of fire safety abounds but there is little advice about how to assess its performance or the probable consequences of a fire in this type of business or that type of property.

Howarth and Kara-Zaitri (1999) looked at passenger terminals throughout Europe and asked how safe they were for people using them and how they compared against each other. They devised a model for fire safety management and, using a simple method of assessment, used the model to give points for each component allowing the safety of each terminal to be assessed whilst building up a continuum of terminals from the most safe terminal to the least safe terminal. The endeavour was novel and positive but the results can be criticised in that they were arrived at by a subjective method reliant on Howarth's own knowledge and experience[29]. This means that anyone re-creating the assessments might conclude with different results because they may make different assessments based on their own knowledge and experience. This is not necessarily wrong but it can lead to disputation and difficulty in resolving issues. One solid achievement of Howarth's work is the model which has at its core, a comprehensive categorisation of the management of fire safety.

The management of fire safety is assisted by two important concepts; the fire risk assessment and the fire strategy. According to the Best Practice Guide to Fire Safety (Unknown date), published by the Fire Industry Association, the fire risk assessment is:

> *"... an organised appraisal of your premises to enable you to identify potential fire hazards and those who might be in danger in the event of fire and their location. You should evaluate the risks arising from the hazards and decide whether the existing fire precautions are adequate and identify any measures that need to be taken to further remove or reduce the fire risk."*

Whilst the description of the fire strategy given in Publicly Available Specification

---

[28]The term Responsible Person is defined in the Regulatory Reform (Fire Safety) Order 2005.

[29]Howarth's experience in assessing fire safety is extensive. After completion of a long fire service career largely involved with the enforcement of fire safety, he joined British Rail and Railtrack carrying out fire assessments whilst further studying the subject at Bradford University.

911 (2007) states:

> *"... prior to undertaking new build projects, making alterations to a building, preparing fire system designs, or specifying fire prevention and management practices, an overriding document setting out the base requirements would greatly assist in the focus of subsequent, more detailed specifications, reducing the need to go back to first principles when a new aspect of the fire safety and protection provisions is foreseen. The document is often referred to as a fire strategy, although other names such as fire policy or fire plan are also used."*

2.6.1. Fire risk assessment

The thrust of current fire safety legislation in the UK is the fire risk assessment, an integral component of the management of fire safety. The assessment is carried out by the occupier of a designated property as a requirement of the legislation. The logic of the process is that the assessor identifies all possible ignition sources in a property, all items that will burn if ignited and considers all those who will be at risk should a fire start. He/she then assesses the likelihood of a fire starting or of a person becoming trapped by a fire and reduces the risk of either of these happening to an acceptable level, introducing measures to maintain these conditions and also control any remaining risk. He/she re-assesses the risk at a suitable interval, decided by the severity of the risk and/or a change in conditions, amending the control measures to correspond with any new risks. These may be associated with different ignition sources, different combustibles or different occupants and so on.

The approach to fire safety embodied in regulations in the UK is commensurate with the approach to general health and safety brought in by the Health and Safety at Work etc Act (1974) and refined by European Directives. There is much advice, guidance and debate on what constitutes a suitable and sufficient fire risk assessment required by the regulations offered by Todd and Ltd (2012); Chow (2002); Ramachandran (1999), amongst others.

One of the main problems facing the application of fire risk assessment is the amount of capability required by the fire risk assessor. It is unclear who has the necessary competence to carry out an assessment. The booklet, *A Short Guide to Making your Premises Safe from Fire (2005)*, states that achieving fire safety is often a

matter of common sense and that by working through the step-by-step process set out in the booklet, the safest possible outcome will be achieved without the need for specialist or formal knowledge and training. CFOA do accede, however, that in more complicated premises or those premises with many people at risk such as care homes, hospitals or large cinemas, more expert assistance may be needed

The IFE sees the conundrum as a continuum with, at the one end, the case of a small organisation and, at the other end, a large organisation. It argues that the most appropriate risk assessor in a small organisation will be an employee, insisting that, although this person may overlook some matters that a more skilled risk assessor would identify, they will understand and be better able to manage the fire risks in the premises. In this type of organisation such a person will more readily 'buy into' the fire risk assessment and, if they do overlook some matters, this is unlikely to increase the risk to the occupants significantly. This view is endorsed by the Management of Health and Safety at Work Regulations (1999), enacted in England and Wales, where Regulation 7(8) asserts that a competent employee should be appointed to assist with the risk assessment rather than someone from outside the organisation.

In a large organisation there are likely to be one or two individuals with the competence to carry out or assist with the risk assessment in some, but not all, of the premises belonging to that organisation. In this case the services of a suitable person external to the organisation can be sought, as advised by Todd (circa 2010) on behalf of CFOA.

The Guide, *Competency Criteria for Fire Risk Assessors (2011)*[30], details what is seen as the standard of competence necessary for third-party certifiers of fire risk assessors to achieve. In a series of appendices, the document details the knowledge and experience that a fire risk assessor should possess relevant to the type of property that is being assessed. The concept behind the document is that of assisting managers of companies and organisations to make decisions based on an acceptable level of competency. This addresses one of the main reasons for enforcement by the fire and rescue service; that of a failure, on the part of the responsible person; to carry out a suitable and sufficient fire risk assessment.

Ramachandran (1999) discussed the evaluation of fire risk in a building without

---

[30]The Fire Risk Competency Council is made up from a broad group of relevant stakeholders established following encouragement from the UK Government. Its objective is to establish agreed, industry-wide, criteria against which the competence of a fire risk assessor can be judged.

reference to any legislation. He used mathematical models that could assist with assessing the risk. He looked at the amount of damage caused to people and property and found that, although a fire may be devastating to the local community in terms of employment, viability of the local economy, community facility and so on, nationally, the total loss from fire has very little impact on the remaining production capacity of the rest of the UK

With regard to damage caused by fire, Ramachandran (1999) decided that there were two types; direct damage and indirect damage. He defined direct damage, as the obvious damage caused to people and property and indirect damage, as that impacting on production, profits, employment and exports. The solution to prevent and/or counter the amount of damage was having a system of management in place before the fire occurred. A satisfactory management system would identify, quantify and reduce the probability of ignitions occurring and reduce the amount of fire damage as a consequence. Ramachandran (1999) also considered the capability of the company or organisation to begin again the day after a fire incident had occurred. This, he thought, was best dealt with by the mechanism of transferring risk with insurance to protect a company's assets.

2.6.2. Fire safety strategy

The term *fire safety strategy* is a collective phrase used to clarify and assist the concept of managing fire safety. It has not been defined in fire safety legislation but it has been described in British Standard 7974 (2001) as the combination of fire safety measures that has been shown by reference to prescriptive codes or a fire engineering study to be capable of satisfying the specified fire safety objectives. It consists of a number of components structured around the need to protect people, to reduce the impact of fire on its environment and to mitigate the interruption to business processes. The fire safety strategy applies to public and commercial buildings as well as wildland urban interfaces (WUI)[31]. Itis aimed at influencing the evolution of a fire, protecting people from the products of combustion and making sure that the cost of avoiding a fire is less expensive than that of experiencing a fire.

The management of fire safety, according to Stollard and Abrahams (1999) in their

---

[31]A wildland-urban interface (WUI) is the area where houses meet or merge with land that has not been cultivated or has been set aside as wilderness. It is the setting where wildfires can lead to the destruction of homes, the loss of eco-systems and the decline of wildlife.

book *Fire from First Principles*, is part of the fire strategy. They considered that the fire strategy was implicit in the design of a building. They thought that the consideration of fire prevention fulfilled by the design team should be extended to include other provisions of fire safety in need of management such as the provisions for emergency evacuation, fire containment, fire extinguishment and so forth. This would mean that the management of those fire safety measures throughout the occupied lifetime of the building by a succession of different occupiers, should be something that incorporates the decisions and assumptions contemplated by the building design team before the building was constructed.

Stollard and Abrahams (1999) also point out another function of the management of fire safety. This is that a building, throughout its lifetime, will gradually be altered, adapted and modified and that any of the alterations, adaptations or modifications might have a bearing on the fire safety measures provided as part of the construction of the building. To keep control of this necessitates a rolling programme of full and regular fire safety audits allowing new risks to be identified and appropriate measures taken to address them. Stollard and Abrahams (1999) also mention that the more familiar a person is with the layout of a building, the less difficult it will be for them to escape from a fire. They use the fire at the Summerland complex as an example of this and indicate that the lack of familiarity with the building was a contributing factor to the high death toll that occurred as a result of that fire. It could be argued, therefore, that the task of overcoming the difficulty of lack of familiarity of the occupants is part of the fire strategy and another function of fire safety management.

Using the Summerland fire as a focus (see a description of the Summerland fire on page 32), it is worth looking at some of the defects brought out in the inquiry into the fire and evaluating whether their resolution was another failing of fire safety management. One of the recurring points in the testimonies of the survivors of that fire was that parents, who were separated from their children in other parts of the building, did not move towards the escape routes but, instead, went off in search of their children:

> Following the fire, the Isle of Man Examiner reported: *"When the alarm sounded mothers ran screaming for their children."*(Phillips, circa 2010).
>
> A survivor stated: *"Many children seemed to be on the lower floor,*

where there is a fairground and roundabouts. Parents, who must have been on the upper floor where the bars and refreshment rooms are, were rushing around searching frantically for their children." (Phillips, circa 2010)

This aspect of human behaviour is referred to as *The Summerland Effect*, recorded in the unpublished book, Summerland Fire Disaster by Phillips (circa 2010), and led to a section in the publication Guide to Fire Precautions in Existing Places of Entertainment and Like Premises (1990) which made the following points:

"Section 5.9: The inquiry into the fire at Summerland Leisure Centre in August 1973 found that parents had tended to be separated from their children since pursuits for each were located in different places and floors. Instead of going directly to exits, parents naturally tried to find their children, making their way against the flow of persons on the escape routes, thus adding to the danger. In order to minimise the risk, if children are to be accommodated separately from their parents or guardians in places of entertainment, the following measures are recommended:

(a) the accommodation for children should be at or as near ground level as practicable (or the level at which the final exits discharge). In no circumstances should the accommodation for children be:

> (i) on a floor above the level at which their parents or guardians are accommodated unless the route of escape is through the upper level; or

> (ii) at basement level unless the children are adjacent to the accommodation for parents or guardians;

(b) the room or enclosure for children should be adjacent to an external wall and should not have fewer than 2 exits, one of which should be a final exit;

(c) if the room adjoins parents accommodation, the aggregate width at the exits from both areas, exclusive of the doors between the room and the parents' or guardians' accommodation, should be sufficient for the total number , i.e. children plus parents, guardians and other persons; and

(d) a notice should be prominently displayed where the children are

deposited, saying that in the event of an emergency children will be escorted by a member of staff to a named collection point outside the building."

Whether some of these points of guidance were considered before the Summerland complex was constructed and whether that guidance was passed on to the management of the completed building is difficult to say. What can be said with some justification is that there is little evidence in the statements of the witnesses that suggests that they were considered and children were certainly at locations other than the guidance advises. But it is easy to see that such, seemingly trivial advice, could be overlooked and unless building managers see it as important and as a function of managing fire safety, such advice will most likely be lost in the normal day-to-day crises of building management.

2.7. What is the next step

The discipline of fire safety engineering and the principles of the fire risk assessment and the fire strategy, impact on fire safety management to a large degree. The criteria for adequate fire safety management includes, as reported by Ramachandran (1999), an evaluation of the fire risk leading to strategies to prevent the fire occurring and ways of transferring the risk. The measures to control the risk constitute the standards to be achieved if the risk is to be managed adequately. Then, because the use of a building develops over time, the impact of this change has to be monitored and constantly compared with the principles and assumptions made by the building designers while the building was still in the design stage. Altering the layout of a building because of a change of occupancy or the use of a building by demolishing an internal wall, for example, may affect the dynamics of the design of the building and the calculations used to justify the layout and the occupancy. Therefore a constant assessment of the changing risk is necessary in any building to guard against any detrimental impact on the assumptions justifying its design.

Stollard and Abrahams (1999) describe the impact of fire safety engineering and its principles as the first part in the strategy of fire safety management. They specify audits of fire safety provisions in a building to allow new risks to be identified and the appropriate measures taken to counter the dangers. They state that any large building will gradually be altered, adapted and modified over time. Regular audits

of the fire safety provisions will enable the provisions to be modified to cope with the changes.

Stollard and Abrahams (1999) also describe the second part of the fire safety management strategy as controlling those actions necessary if an ignition occurs. Alterations, adaptations and modifications to the layout, use or occupancy of a building will inevitably have an impact on the provisions for safe evacuation from the building. Monitoring this and adjusting the evacuation plan accordingly being another function of fire safety management.

The opinions of Malhotra (1986) on fire safety engineering, Ramachandran and Todd and Associates (2012) on fire risk assessment and Stollard and Abrahams (1999) and Howarth and Kara-Zaitri (1999) on fire safety management give a suggestion of their importance. However, it is only when analysing the details of fire investigation into well-documented fires causing multiple deaths and injuries that their importance begins to become clear. For instance:

- the behaviour of parents inside the Summerland complex in the Isle of Man, at the time of the fire in 1973, was not anticipated by the designers or the managers of the building. Many of the parents who perished in the fire, did so whilst attempting to get from one location in the building to another location where they thought their children would be (see Phillips, circa 2010). It is inconceivable that a building designer would presume that a parent would rescue themselves without first making provision for their children's safe escape, yet it appears that no provision to manage this aspect of human behaviour was considered;

- at the fire incident in the Underground Station at King's Cross in London in 1987, the concourse at the top of the escalators quickly became unsurviveable to those trying to escape. The fire was thought to have been caused by a cigarette igniting accumulated rubbish underneath one of the escalators and then developed ferociously assisted by the layers and type of paint used, over many years, to paint the escalator tunnel (see Fennell, 1988). The consequences of not controlling smoking or of keeping the undersides of the escalators clear of combustible rubbish or of the consequences of re-painting the escalator tunnel had simply not been considered by the management of the Station;

- at the Bradford City Stadium fire in 1985, many of those that died, did so while trying to get through the narrow and locked turnstiles at the rear of

the stand (see Popplewell, 1985). Neither the speed and ferocity with which the fire in the stand developed nor the need for people to evacuate through the rear of the stand had been anticipated by the management of the football ground;

- at the Station Nightclub in Rhode Island in 2003, 100 people died whilst trying to escape from the single-storey building when the combustible linings on the walls and ceiling of the stage were ignited by the fireworks of the band during a concert. All the exits were available but the speed with which the fire developed and the lack of direction given by members of the staff on duty at the time meant that the majority of people tried to evacuate through the front door of the building. The obstruction of a ticket table and the subsequent narrowing of the entrance slowed down the evacuation until the majority of the people who died were overcome by smoke within a few metres of the front entrance door (see Grosshandler et al, 2005). The consequences of allowing pyrotechnics to be set off during the performance or the lining of the walls and ceiling received little consideration by the management of the club.

Given a continuum of public or private properties in all towns, cities and countries ranging from the one extreme of those with an excellent system of fire safety management to those at the other extreme with a deplorable system of fire safety management, it can be assumed that all fires in buildings, including notorious fire incidents, are contained somewhere along the continuum. What can also be assumed, because of the conclusions of investigations into the incidents, is that inadequate fire safety management was a contributing factor at such fires as those at Summerland, King's Cross, Bradford City Stadium and the Station Nightclub and played some part in the tragedies that occurred. Therefore, logic dictates that adequate fire safety management could have ameliorated the incidents in a some way.

How much the incidents could have been ameliorated can only be speculated about but if the management of fire safety could be quantified then it would be possible to measure its impact on them. If measurement were feasible and the impact was quantified then the amount of rectification necessary to raise the system of management above a given threshold could be calculated. This raises the need for a strategy of targeting those companies or organisations that fall below the given threshold and occupy buildings objectively shown to produce most fire damage.

3. Methodology

3.1. Introduction

The collection and analysis of data for use in this thesis was preceded by a review of the literature (Chapter 2 on page 17). Reviewing the literature showed the destruction to property that has occurred by fire over many centuries because of the types of building materials used and the ways that buildings were constructed. It also indicated that construction and planning decisions can be made without complete consideration for the potential hazards or consequences. This is evident, for example, both in the fire at Summerland on page 32 and the explosion at PEPCON on page 1. The literature has also indicated that the way that a building is managed has an impact on its potential to harm its occupants. This is evident again in the fire at Summerland on page 32, but also at the Station Nightclub on page 8 and the Kiss nightclub on page 13.

There is little in the literature about the the amount of fire damage caused. In fact, it quickly becomes obvious that the way that fire damage is measured and recorded does not reveal the true cost of fire to the community (see section 1.5.1. on page 14). Whether the amount of damage is linked to the standard of management of the building is not fully explored by researchers such as Malhotra (1986) and Ramachandran (1998).

Fire damage is financially accounted for by insurers and also reported on by Government in publications such as Fire Statistics United Kingdom (2008) but, because it cannot be measured and linked to the standard of management, good advice coming from those sources can go unheeded because it is unspecific and lacks credibility.

Protecting life from fire in buildings appears to have overshadowed the protection of the property and the sustainability of the occupying businesses. This can be better understood if you consider that the management of fire safety is at the core of the fire

risk assessment legislation in the UK. The Regulatory Reform (Fire Safety) Order
(2005), applicable in England and Wales, for instance, is only focused on the safety
of life; it pays little attention to the sustainability of business and the consequential
damage to the community or the environment. This is the gap that this research
concentrates on that justifies studying the relationship between fire damage and
fire safety management. The study investigates this relationship to determine the
relevance of the hypothesis:

> *The majority of fire damage resulting from property fires in the UK,
> occurs as a result of a failure to manage fire safety successfully*

Following on from the pre-stage literature review, the study involves three stages
using three different research methods (see Table 3.1).

Table 3.1.: Methods used in this research

Stage	Method	Type of study	Answers the question...	Chapter (and pages)
Pre-stage	Literature review	Qualitative	Where the gap in knowledge lies	Chapter 2 (on page 17)
1	Delphi method	Qualitative	How fire safety is defined and described	Chapter 4 (on page 60)
2	Interviews	Qualitative	How fire safety is managed and enforced	Chapter 5 (on page 82)
3	Case study	Quantitative	How fire damage is defined and described	Chapter 6 (on page 103)

The research was carried out consecutively, using three different research methods,
documented as Stage 1, Stage 2 and Stage 3. The reason for this order of stages was
not because one method was dependent on the completion of another but rather
that the two later stages were developments brought about by the earlier stage, to
progress the research. Looked at holistically, the three stages produce a synergistic
exposition of the relationship between fire damage and fire safety management.

Stage 1, the Delphi method, was necessary to provide a firm foundation to initiate
the research and to define a subject that lacks a distinct definition. A comprehensive
definition of fire safety was needed and, although, there are existing definitions of

fire safety, they were not sufficiently complete. For example, the definition offered in British Standard 9999 (2008), is a practical, but not exhaustive, list of factors necessary for assessing the level of management in an organisation. This is a key function in the implementation of the document but insufficient to define the whole range of fire safety management. The Delphi method could exploit the technology of electronic mail and an online survey website and pull together the opinions of respected people in the field of fire safety. It was seen as a way of achieving the most inclusive definition of fire safety management possible with a high level of efficiency.

Stage 2, the interviews, was necessary to understand the influence of management and legislation on fire safety. Loughborough University campus was chosen as a case study because it was a good example of an assortment of different buildings on one site, administered by one overall system of management. Carrying out interviews of those people with influence on the management and enforcement of fire safety in connection with Loughborough University campus was critical to understanding the different motivations involved.

Stage 3, the case study, was necessary to quantify the amount of fire damage that takes place in a defined area over a defined period. The area circumscribed as Loughborough University campus is a fraction of the total area administered by Leicester, Leicestershire and Rutland Fire Authority but a large site to be overseen by one system of management. The different property types present on the campus allowed it to be easily compared against the greater area of Leicester, Leicestershire and Rutland. In addition, the data are organised to represent an intimation of the cost of the consequences of fire on the campus, currently an unknown quantity.

Two of the stages take a qualitative approach to the research and the third takes a quantitative approach but this is not detrimental to the study. Mixing qualitative and quantitative methods is regarded as advantageous and it improves the validity of the research because it examines a research topic from more than one vantage point (Holtzhausen, 2001). The technique is described as *triangulation* and is a practice advocated by Jick (1979). It represents a discursive approach to a subject that is broad and complex and can combine the opposing approaches of quantitative and qualitative studies (Holtzhausen, 2001). Jick (1979) contends that to use a mix of methods in a research project assists in balancing out the strengths and weaknesses inherent in each individual research method.

The sequence for the progression of the research is given in Figure 3.1.

Order in which the methods were carried out

| Stage 1 | Stage 2 | Stage 3 |

| Chapter 4 Delphi Method (Qualitative) | Chapter 5 Interviews (Qualitative) | Chapter 6 Case study (Quantitative) |

Chapter 7 Analysis

Chapter 8 Conclusions
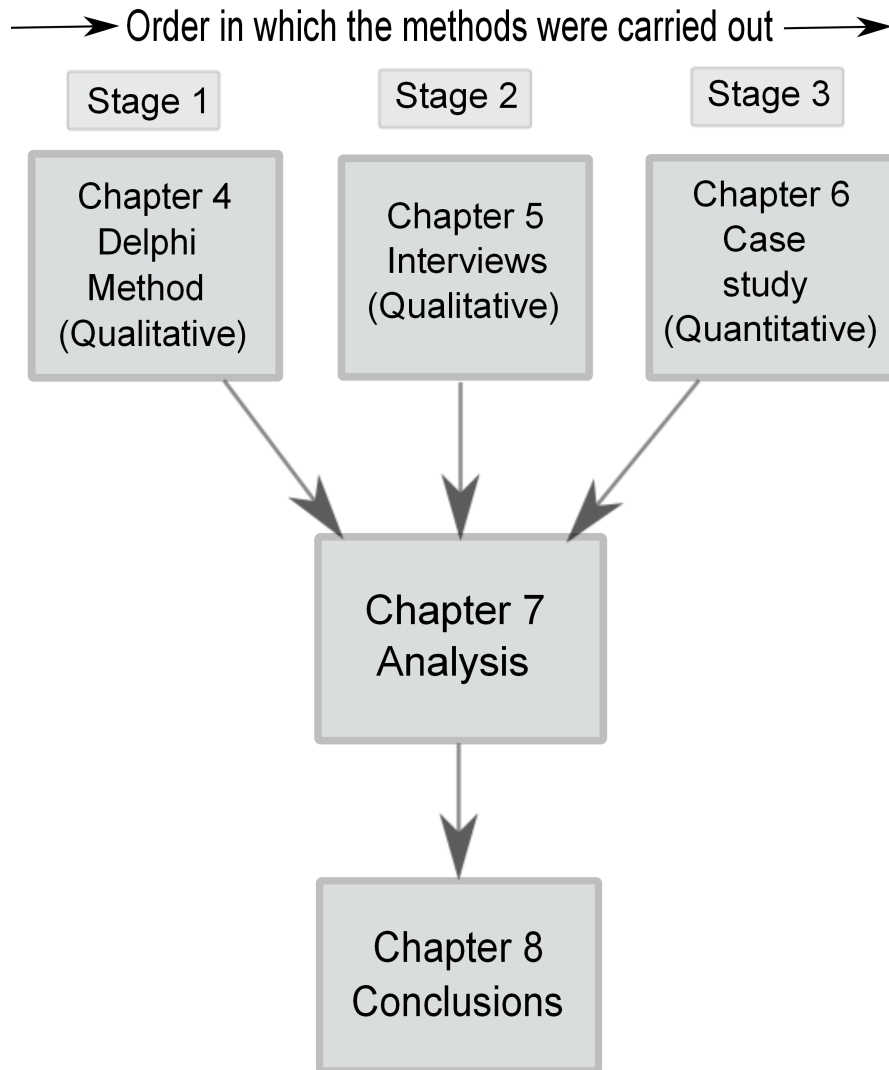
Figure 3.1.: Triangulation method of research

The following paragraphs explore each of the three stages to a greater degree and justify the use of each method.

3.2. Stage 1: Delphi method

The concept of fire safety management can only be measured subjectively, there is simply no agreed or objective system with which to measure it. It is a subjective subject relying on subjective interpretation for its administration by practitioners and regulators.

The main reason that fire safety management cannot be measured is that it has no standard or universally accepted definition. This may be, perhaps, because the subject is difficult to define and no comprehensive definition has been attempted but, more likely, it is because the subject is thought to be easy to define so it has not demanded an overscrupulous definition.

However, any description is of little use to fire safety managers or for those who enforce fire safety legislation unless it is accepted and agreed by all who will use it. To reach an accepted definition, the Delphi method was used; the details of which can be found in Chapter 4 of this thesis on page 60 but also reported by Baker et al (2013).

The Delphi method is a method that has been used before in the field of fire safety. Nelson (1982) used the professional judgement of a Delphi panel to evaluate the components of a fire safety evaluation system for health care facilities in the USA. Marchant et al (1982) used the Delphi method to evaluate the fire safety components in patient areas within hospitals; essentially, to determine the relevant fire safety components of the patient areas and to estimate their relative values and the coefficients of how they interact. Shields (1986) took the same method used by Marchant et al (1982) and adapted it so that it could be applied to dwellings.

Marchant (1988) subsequently commented on the use of the Delphi method by Shields (1986). One of the comments made was on the use of a central tenet of the Delphi process, the principle of anonymity. This is where, during the Delphi process each panel member remains anonymous from every other panel member. Marchant (1988) was of the opinion that anonymity should be forfeited and replaced with face to face meetings arguing that any of the disadvantages caused by dominant peer pressure in such meetings would be balanced by the educative interaction between intelligent people.

du Plessis and Human (2007), analysing the use of the Delphi method as an informed decision-making tool, were persuaded differently. They thought that anonymity amongst panel members allowing them to express their opinions freely without the limiting factors of peer group pressure was its main advantage. It allowed panel members to either, alter their original judgement or to hold on to their previous opinion without losing face. There was a disadvantage, though, because they saw, as a slight risk, that the cloak of anonymity might lead to a lack of accountability amongst the panel members unless, as part of the process, they were asked to justify

the opinions they gave.

For the purposes of the method detailed in this thesis, the argument put forward by du Plessis and Human (2007) was accepted and implemented. Anonymity was offered as a condition of becoming a panel member and it remains secured following the dissolution of the panel.

3.3. Stage 2: Interviews

Fire safety management is not traditionally regarded as a science, that is, if the definition of a science *"is the pursuit of knowledge and understanding of the natural and social world following a systematic methodology based on evidence."*[1] This truth becomes obvious when speaking to the people involved in the practice and the enforcement of the legislation. One person's opinion of what constitutes the correct management of fire safety in a particular building or location is a subjective opinion and could be quite different from another's opinion of the same building or the same location.

There are many people who manage fire safety; every occupier of every home is a fire safety manager in that they have to manage the ignition sources and the combustible materials if they are to reduce the threat of ignition raised by heating appliances and cooking appliances igniting the combustible materials found in every home. The success of these residential fire safety managers is evident in that the majority of people survive and live their lives quite comfortably without fire loss though they are surrounded by ignition sources such as matches and electricity and highly combustible materials such as natural gas and polyurethane foam furniture. Most people would call this success a natural occurrence attributable to common sense but, unfortunately, this is a subjective opinion that is not measurable and is of little value to the researcher.

This thesis focuses on the management and regulation of fire safety in companies and organisations rather than residential dwellings and uses the management of fire safety on Loughborough University campus as an example of an organisation faced with normal day to day legal and moral obligations.

---

[1] Source: The Science Council. A membership organisation that brings together learned societies and professional bodies across science and its applications.

Fire safety on Loughborough University campus is managed formally and is the responsibility of Facilities Management who have appointed a fire safety manager for the purpose. The role of fire safety manager operates within a management hierarchy and budget and its responsibilities include the administration of fire safety in the buildings necessary for producing a higher education environment on a university campus. This includes over one hundred buildings of thirteen different property types on a site measuring 438 acres.

Fire safety is regulated by UK legislation in the design and construction of buildings by the regulatory authorities using the building codes and then, following construction when the building has become occupied, mainly by the Regulatory Reform (Fire Safety) Order (2005). Fire safety officers from the UK fire and rescue service are consulted in the fire provisions for the design of buildings under the building codes and, under legislation, they have responsibility for administration and enforcement.

To explore the different opinions held by those who enforce fire safety or who have the capability of influencing the fire safety management of Loughborough University campus and to answer the question of *'how is fire safety managed and regulated.'*, interviews were arranged with four people. These four people, it was thought, could assist in explaining the differences.

The interviewees were:

- fire safety manager of Loughborough University campus with responsibility for the administration of fire safety across the Loughborough University campus. This interviewee had been employed in this role for eight years but had spent 28 previous years employed in an industry with a culture and environment similar to the fire and rescue service;

- district fire officer for Charnwood with Leicestershire Fire and Rescue Service with responsibilities that include the operational response to an emergency incident at Loughborough University campus. This interviewee had spent 19 years as an operational firefighter and fire officer and was responsible for the management of fire safety on three fire stations. However, during his career, he had not specialised in fire safety;

- senior fire safety officer for Leicestershire Fire and Rescue Service with responsibilities that include the enforcement of fire safety legislation on Loughborough University campus. This interviewee had spent 26 years as an operational firefighter and fire officer but had specialised in the enforcement of fire safety for

the last fifteen years;

- consultant fire engineer who, although not directly influential with fire safety on Loughborough University campus, nevertheless because of his experience with fire safety in the insurance industry, could give an opinion with regard to the way that the insurance industry considers fire safety on the campus. This interviewee had been awarded a doctorate in fire engineering and had spent the last few years working in the Fire Protection Association providing fire safety advice to the insurance industry.

Interviewees, according to Kvale (1996), should be provided with an indication of the topic to be discussed which can take the form of a rough outline or a sequence of carefully worded questions. A rough outline with suggested questions would be defined as a semi-structured interview. Each of the interview questions should contain two aspects:

1. A thematic aspect with regard to the relationship between the question and the topic for discussion; and

2. A dynamic aspect having regard to the the relationship between the interviewer and the interviewee.

The object being to engender a positive contribution to knowledge by a favourable interaction with the interviewee (Kvale, 1996).

Britten (1995) describes the techniques that can be used in medical research and states that using interviews as a form of research, is well-established in the medical world. She explains that this has developed from the clinical environment where a clinician interviews a patient to arrive at a diagnosis. From that, it is a natural step to interview a patient for the purpose of research. She states that there are three main types of interview that can be successfully used; structured, semi-structured and in-depth interviews.

Denscombe (2010) concentrates on advice for social research and believes that social research has become a mechanism for many people to undertake small-scale research as part of professional development. He advocates the use of surveys and interviews as part of a research strategy to enable the completion of a research project.

Cerda (1981) used a survey when looking at the application of fire safety to architectural design. He sent a questionnaire for completion to schools of architecture, fire authorities, architects in small and large practices in his research. Following

analysis of his data, he concluded that, to address the problem of increasing fire loss, educating the architect in the principles fire safety was a viable alternative to legislating to enforce fire safety.

Qualitative analysis of interviews and a review of case studies was used by Puybaraud (2001) to investigate the failures of management in fires occurring during the construction, repair or refurbishment of a building. Following analysis of the data, she concluded her research by offering a qualitative model to the construction industry, developed from her research findings. The model was intended to assist with creating an effective fire safety strategy to eliminate and/or control fires during construction activities.

In respect of this research, structured interviews were considered to be the best way to garner data from interviewing the chosen four.

The interviews were structured with five questions, the same five questions for all four interviewees, designed to draw out qualitative information about the administration of fire safety and different aspects of the management of fire safety on Loughborough University campus.

Question 1 was designed to examine how the interviewees thought managing fire safety assisted Loughborough University in meeting its regulatory requirements.

Question 2 was designed to examine how the interviewees thought managing fire safety assisted Loughborough University to prepare for any interruptions in its business undertakings and enterprises.

Question 3 was designed to encourage the interviewees to express a view on the relationship between fire damage and fire safety management.

Question 4 was designed to encourage the interviewees to state what benefits they thought there were to Loughborough University arising from the current CFOA campaign to reduce unwanted fire signals.

Question 5 was designed to encourage the interviewees to express a view on a performance metric that could potentially measure the performance of the fire and rescue service with regard to the reduction of fire damage.

The same five questions were used in each interview so that there would be a consistent framework against which the responses could be analysed.

The interviewees were aware of the questions before the interview took place. A letter was sent to each potential interviewee (see Appendix 1 on page 167 for an example of the letter) containing the five questions. This was thought necessary because it indicated the nature of the interview discussion and it allowed the potential interviewee the opportunity to consider their response before the interview took place. Each interview was recorded with the interviewee's permission and transcribed. The transcriptions can be found in Appendices 2, 3, 4 and 5.

Details of the methodology, the questions and the results of the interviews can be found in Chapter 5 on page 82. But also in Chapter 5 can be found:

- a list of items that emerged during the discussion, prompted by the questions, that were relevant to, and have impact on the subject (see page 92);

- a list of the priorities with which each interviewee sees their role. Each interviewee was asked to agree or dispute a list provided for them and, once agreed, to place the items on the list in order of priority (see page 100).

3.4. Stage 3: Case study

Fire incident data was acquired from Loughborough University so that actual and false alarms of fire within the boundaries of Loughborough University campus could be analysed and used to assist with the definition and description of fire damage.

To give some context to this analysis Leicestershire Fire and Rescue Service was approached and fire incident data for the whole of Leicestershire, Leicester and Rutland was acquired. This acquisition, which consisted of data between April 2009 and March 2012, enabled the potential for comparing the fire incident data for Loughborough University campus against that of Leicestershire Fire and Rescue Service using Loughborough University as a case study.

The comparison was desirable because of anecdotal evidence that Loughborough University was managing fire safety quite well. The main indication of this was the ratio between the number of times that a fire alarm operated within one of the buildings on Loughborough University Campus and the number of time that the fire and rescue service was requested to respond because of this. This ratio was anecdotally said to be approximately 20:1.

Case studies can be used to assist in understanding a complex subject and are often used as a research method across many fields of study. Thomas (2011) defines case studies as analyses of persons, events, decisions, periods, projects, policies, institutions, or other systems that are studied holistically by one or more methods. Using Loughborough University as a case study and comparing it against the larger dataset from Leicestershire Fire and Rescue Service, satisfies a criterion that Thomas (2011) demands because it is a dataset of fire incident variables capable of being analysed against the same variables in the larger dataset.

Yin (2008) looked at the design of case studies insisting that certain criteria should be satisfied. He suggested that there should be sufficient data relevant to the research subject and a robust rationale behind the research. The subject of the case study should be firmly within the context of the research area. Yin (2008) determined four tests to assess whether the case study was well grounded, efficient and of a good enough quality.

It looked at

- whether the case study used data that was robust, relevant and measured appropriate variables (construct validity);

- whether the analysis of the data was logical, explainable and made the correct inferences (internal validity);

- whether the results of the study are applicable generally in similar circumstances and are capable of being replicated (external validity);

- whether the method is capable of being audited and found to be dependable (reliability)

Yin (2008) acknowledged that the case study strategy was seen as the weak sibling among other research methodologies. He challenged this notion by insisting that a case study was not just a data collection tactic but a rigorous method of research.

Santos-Reyes and Beard (2002) used a case study to assist in developing a fire safety management model. The safety management of a national organisation was analysed and compared to existing safety management systems. The interest was, not only in developing a fire safety management system model but also in proactively measuring the performance of a safety management system rather than measuring it reactively. Santos-Reyes and Beard (2002) concluded that the management of fire safety was no different from the management of any category of safety and it needed

to be addressed in a logical, structured manner in the same way. Measuring the performance of the management system also needed to be done in the same manner but proactively as the system operated. As the functions of each part of the overall system are carried out their performance is monitored, creating the basis for the functions of the next system which is dependent on the performance. This mode of management is called recursive management and is at the heart of the model formulated by Santos-Reyes and Beard (2002).

London Fire Brigade collect data from the investigation of fires in the London area and populate a database known as the Real Fire Library. Steiner (1999) analysed data from the Real Fire Library and developed a more systematic methodology for the investigation of fires to be used by officers specialising in the discipline. The methodology was meant to render more effective analysis that could be used by London Fire Brigade's fire safety department and in particular Steiner (1999) looked at fires that originated in a lounge of a dwelling. Analysis of the data had indicated that there was a preponderance of deaths in the lounge of dwellings. These were associated with the ignition of upholstered furniture.

Finland has a national, internet-based, database named Pronto, containing data regarding accidents, resources and emergency responses for communities in Finland. Tillander (2004) used Pronto to investigate the ignition frequency, the consequences of fires and the performance of the Finnish Fire Department. Using the data, Tillander (2004) was able to generate new information and quantitative tools to assist the assessment of fire risk. The new information was particularly suitable for use in fire engineered design.

Further details of the data used in the case study and the results that came from the analysis can be found in Chapter 6 on page 103.

4. Delphi Method

4.1. Introduction

The Delphi method is a method of generating authoritative information and guidance in a discipline or area of study which is dominated by subjectivity. Introduced in the 1950s by the American Douglas Aircraft Company, the Delphi method was developed as a component of Project RAND (Research and Development) which has since grown into the RAND Corporation, a non-profit organisation helping to improve decision-making and public policy. The Delphi method was advanced as a method by Dalkey (1969) of studying the imponderables of inter-continental warfare, a highly subjective area relying on the speculation, conjecture and guesswork associated with deciphering scraps of intelligence gained by diverse means. The method only offered subjective conclusions to scenarios posed in a subjective fields but the strength of the conclusions came from two concepts; firstly, that a panel of people, accomplished and knowledgeable in the field under scrutiny could give their opinions and then evaluate their own opinion against the opinions of people in their peer group and; secondly, they could do so in isolation with opportunity to alter their opinion anonymously, without fear of being ridiculed.

The discipline of fire safety management is one such area of subjectivity which, because of the lack of objective statistical evidence, is reliant on the experience and knowledge of participants in the field to advise and give guidance on best practice. It is possible for a system of fire safety management practiced by a company or organisation to be considered as 'good' by one adviser but as 'poor' by another simply because of the different knowledge base and experience of the two advisers.

In particular, in England and Wales, much weight is placed on the subjective opinions of fire safety officers in their administration of the Regulatory Reform (Fire Safety) Order (2005). Evidence to be used in the prosecution of offenders, is gathered by fire safety officers via the mechanism of the fire safety audit, promulgated by

the Chief Fire Officers' Association (2008)[1] and presented to the court in the form of photographs, witness statements and the opinion of the fire safety officer. Most of the Articles in the Regulatory Reform (Fire Safety) Order (2005), and consequently the substance of the fire safety audit and the subjective prosecutory evidence, are centred on the quality of fire safety management within a company or organisation. Prosecutions account for only about 0.1% of the total number of fire safety audits carried out in the course of one year but this represented 64 successful prosecutions in England in 2010/11, as reported by Fire Statistics United Kingdom (2008), largely based on subjective evidence evaluated by the court. Although subjective, the evidence put forward by fire safety officers has proved to be extremely effective and has resulted in the imprisonment of offenders and record fines for companies and organisations.

Notwithstanding the success of fire safety officers in England and Wales in their administration of the Regulatory Reform (Fire Safety) Order (2005), the focus by the fire and rescue service is on those premises that pose the greatest threat to life and the subjective evidence gathered in this endeavour has limited usage because it is targeted towards the conviction of offenders. This is of little use to those who fear they may become offenders. These are the fire safety managers who have the responsibility of creating management systems with regard to fire safety that have to satisfy the scrutiny of the regulators. The evidence that they see has secured a conviction is only of value to them if the circumstances of the offence resemble their own premises or situation. Even then they suspect that because the evidence is of a subjective nature then two fire safety officers may interpret it in two different ways and ultimately detrimental to them. Because there is no science of fire safety management and also a lack of objective research into the subject there is little for fire safety managers to use to validate their fire safety strategies.

This lack of a science is what prompted the formation of a Delphi panel of people knowledgeable and experienced in the field of fire safety management. The criteria used to choose them is given below in the next section but the people themselves were those known to the author to have much experience and knowledge in the field of fire safety. Their task was to conclude with a categorisation of the subject which, because of the combined calibre of the panel, would be an authoritative

---

[1]The fire safety audit is a tool developed by the Chief Fire Officers' Association (CFOA) to assist in ascertaining how premises are being managed regarding fire safety. Guidance regarding the fire safety audit and an explanation of the audit form can be found at www.cfoa.org.uk/download/12191 (accessed on 1 March 2013).

categorisation that stood a chance of becoming the accepted categorisation. An accepted categorisation could be used as a basis for the objective measurement of the subject using statistical data gathered by investigators at fire incidents. This would fulfill the requirement of a science in the opinion of Lord Kelvin who said:

> *"when you cannot measure (a subject), when you cannot express it in numbers, your knowledge of it is of a meagre and unsatisfactory kind; it may be the beginning of knowledge but you have scarcely, in your thoughts, advanced it to the stage of science"* Lord Kelvin (1824-1907)

Measuring fire safety management carries the potential to improve its performance. Measurement enables statistics to be collated and analysed which will show the categories that have the most effect in terms of property damage and number of emergency responses. Carter et al (1992) thought that any programme or project should have some measurement of the effectiveness of its objectives and alternative ways should be evaluated to take advantage of the least cost. Measuring performance over a period of years would provide feedback about the appropriateness and effectiveness of the method chosen. Performance measures with regard to the management of fire safety can be created that can be used to improve performance. This raises the possibility that the cost of fire could be reduced by addressing the root cause of most structural fires; inadequate fire safety management. Linking statistical evidence gathered from fire incidents to each category regarding the characteristics of ignition and the type of property, would enable the creation of property profiles. Analysis of the profiles would enable predicting, forecasting and targeting of the most damaging profiles. This could result in efficiency savings, benefits to the community and the environment and allow the fire and rescue service to consider re-balancing its reactive and proactive resources.

4.2. Method

The value of the Delphi method in the determination of a subjective issue is that the determination can be said to be an authoritative one because it comes from the deliberations of experienced and knowledgeable people in the field. This greatly improves its chances of becoming the accepted determination. In the case of measuring fire safety management, it is seen as only the first stage because successful measurement using statistical data from fire incidents and fire investigations will, in

time, validate or negate the determination.

Powell (2003) and Beech (1999) considered that the Delphi method could not be counted as being an accepted scientific method. du Plessis and Human (2007) counteract the claim that the Delphi method is more art than science by stating that the Delphi technique could be seen as having added value because it has the advantage of being able to explore qualitative data such as attitudes and moral judgements. However, the conclusion they drew was that the technique could at best be viewed as subjective opinions regarding problems that can not otherwise be explored by means of more scientific instruments. It should only be used with caution placing emphasis on measures to enhance validity and reliability.

The essential features of the Delphi method were identified by Dalkey (1969)and designed to minimise the biasing effects of dominant individuals, of irrelevant communications and of group pressure toward conformity as:

- anonymous response - the opinions of the group are obtained by formal questionnaire;

- iteration and controlled feedback - interaction is effected by a systematic exercise conducted in several iterations with carefully controlled feedback between rounds;

- statistical group response - the group opinion is defined as an appropriate aggregate of individual opinions in the final round.

There is much in the literature, written by Dalkey (1969); Powell (2003); du Plessis and Human (2007); Adler and Ziglio (1996) amongst others, about the Delphi method. The exploration of its virtues is wide and diverse including use as a business tool, use in the nursing and care professions and use in deciding where and in what form the enemy might attack. Its original conception by the United States Army was as a tool to gain advantage during the Cold War, a period of political and military tension. However, there were three criteria advanced by Adler and Ziglio (1996) that the need for the Delphi method should satisfy and that would lend themselves to the determination in the subject of fire safety management:

1. The problem is not one that lends itself to precise analytical techniques, but one that can benefit from collective subjective judgements;

2. The problem has no monitored history and there is inadequate information regarding its present and future development;

3. Addressing the problem requires the exploration and assessment of a variety of issues with, potentially, many different outcomes.

Once the need of the Delphi method had been established the next stage was the choice of the Delphi panel members. The panel was chosen after consideration of the principles for expert opinion mooted by Rowe and Wright (2001) and Okoli and Pawlowski (2004), whose principles include:

- using between five and twenty experts, as diverse as possible, with knowledge and experience in the field of study;

- using questions that are clear and to the point, framed in a balanced manner and do not contain irrelevant information;

- giving feedback that gauges the average estimate of the panel plus the various perspectives of the other panel members.

Some more principles mooted by Adler and Ziglio (1996) further influenced the choice of the panel. These looked at the attributes and practicalities of the panel and insist that suitable people should have:

- the knowledge and experience necessary for the issues under investigation;

- the capacity, willingness and sufficient time to participate;

- sufficient communication skill to communicate effectively.

The literature regarding the formation of a Delphi panel suggested that the ideal panel would consist of about twenty panelists, so a mix of attributes was sought to arrive at this number. The panel consisted of practitioners, academics and enforcers who were either consultants, employees or fire safety officers asked to take part because of their experience, knowledge and influence in the subject on which they were to deliberate. All had come by their experience, primarily, in the UK.

No category of person (scientist, underwriter, building owner etc.) was deliberately excluded, but a fair balance of people with experience, knowledge and influence in the field was achieved. The chosen mix was thought to reflect those who exercised the most influence in the field.

The particular qualities of the three categories were seen by the author to be:

- practitioners having the task of balancing their legal responsibilities with the business they are involved in;

- academics having the opportunity of evaluating data and challenging the existing status;

- regulators having the task of interpreting and applying the legislation.

The amount of knowledge and experience of the panel members was critical to the research so they were asked to supply information which would indicate their combined ability. Fifty-six percent of panel members had been directly responsible for the management of fire safety in a commercial, public or heritage building with nearly half of these being so employed for over ten years. One hundred percent of panel members had assessed and reported on buildings belonging to commercial, public or heritage organisations with eighty-six per cent of them having made over fifty assessments; seventy per cent of these, as a local authority fire officer; fifteen per cent as a consultant and fifteen per cent as an employee (see Figures 4.1 and 4.2).

The length of time that 56% of Panel Members have been directly responsible for fire safety management:

Less than 5 years
22%

Between 5 and 10 years
33%

More than 10 years
45%
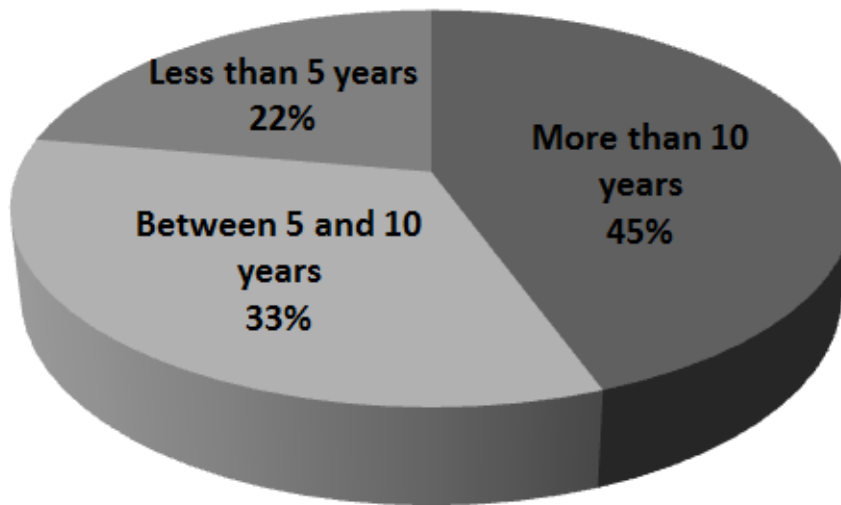
Figure 4.1.: Panel members who have been directly responsible for managing fire safety

Twenty-one potential panel members were contacted by e-mail and the process again explained in detail. Each had the option of accepting or declining to participate and eighteen members decided to accept the invitation to participate. The sequence

The capacity in which assessments and reports about fire safety management were made by Panel members

Consultants
15%

Employees
15%

Local authority
fire officers
70%
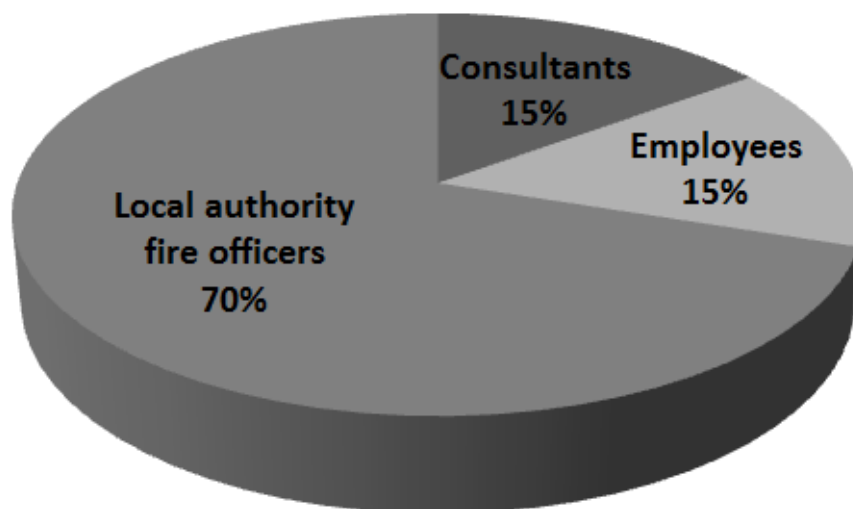
Figure 4.2.: Panel members who have been responsible for assessing and reporting on fire safety management

of events was outlined to them (see Figure 4.3) along with the output that was expected of them.

The task set before the Delphi panel was to deliberate on a given categorisation of fire safety management in an attempt to reach a consensus on the heading of each category, the definition of that category and an importance rating for the category. The stated intention of the exercise was to achieve a list of categories that contained the complete breadth of the subject in brief, concise form that could be used as the basis for a measurement system.

The means of communication chosen was an online website. Bristol Online Surveys (BOS) (website: http://www.survey.bris.ac.uk/) allows the development, deployment and analysis of surveys via the internet with only a modicum of technical knowledge being required. Once the survey questions were uploaded onto the website the only requirements needed to complete the survey questions were a computer, access to the internet and a login address.

One of the characteristics of the Delphi method is the anonymity of each Panel member which acts to negate or, at least, reduce the influence of peer pressure or an individual's dominance. This means that care must be taken by the administrator,

when using electronic mail, to send e-mails to panel members making sure that they cannot determine, by investigation of the metadata connected to the e-mail, who their fellow panel members are. This potential error was avoided by sending out individual e-mails to each panel member.
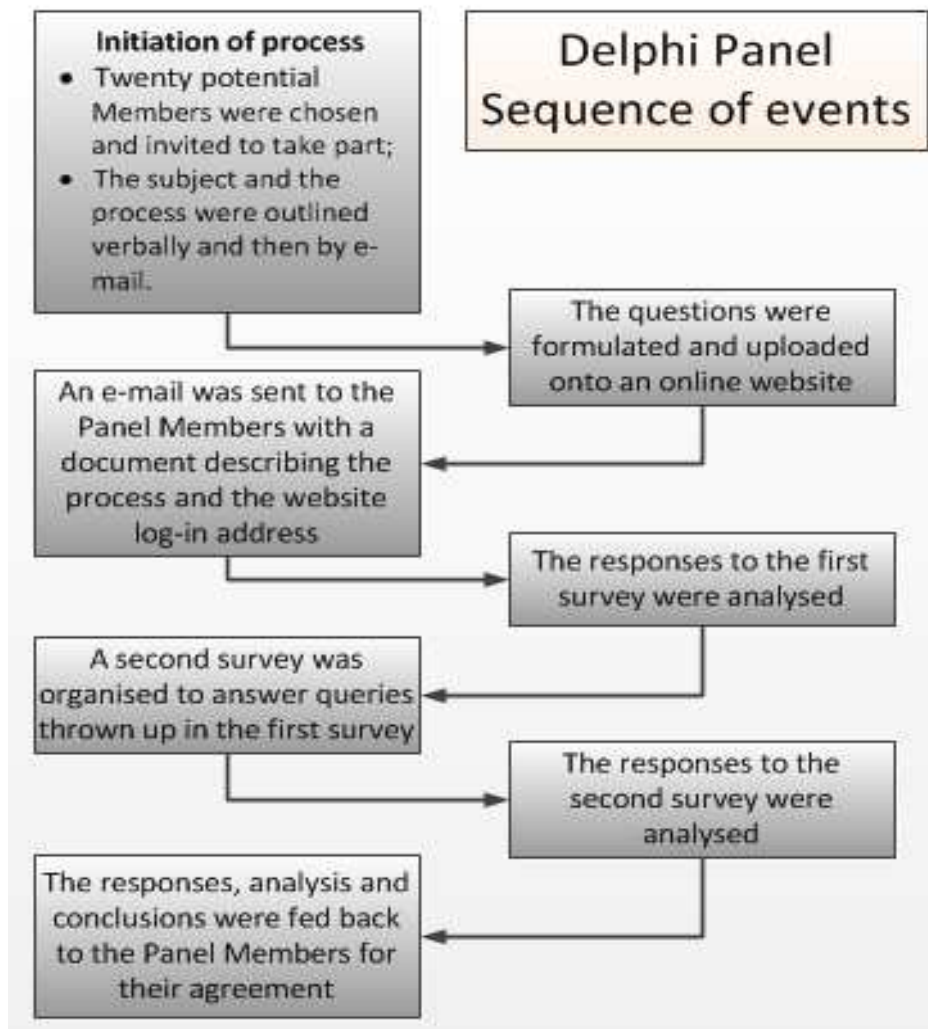
Figure 4.3.: The sequence of events during the Delphi process

For information and with regard to the questions: some were asked using a Likert scale of 0-5 for the response but which also invited a qualification with the answer. These responses were rated either; in agreement, in disagreement or in qualified agreement. A majority of the questions in the second iteration came from the qualifications raised in the responses to the first set of questions. Other questions asked for a written answer and were rated as either; in agreement, in disagreement,

in qualified agreement or ambiguously answered. The ambiguous answers reflected the future need to formulate the questions with care but they were not in sufficient number to seriously affect the results.

The response of the panel on each issue was analysed and summarised by the administrator in the form of a conclusion. The conclusions were fed back to the panel for agreement.

One of the questions asked of the panel dealt with the anonymity of panel members. The panel were asked if, when the process was concluded, they were willing to discard anonymity and let their identities be known to their fellow panel members and, subsequently, any interested parties. They were instructed that only by unanimous agreement would this course of action be facilitated and just one declination would mean that anonymity would be secured. In the event members chose to retain their anonymity and so the identities of the panel members will not be divulged.

4.2.1. The Survey Questions

The purpose of the whole exercise was to arrive at a concise and simple categorisation of fire safety management, so it was imperative that the panel members were given a starting point to focus their deliberations. Chosen for this purpose was a categorisation of fire safety management contained in a thesis written in support of a Master's degree at Bradford University by Howarth (1999). Howarth's task was to investigate and compare the management of fire safety in a range of passenger terminals throughout Europe. This necessitated the formulation of a succinct list of categories regarding fire safety management, allowing easy comparison between passenger terminals that could be illustrated as a model in the thesis. The Howarth model (see page 70) consisted of ten categories with brief and concise definitions that covered the supposed complete range of elements included in the term, fire safety management. This list could be used as a classification and could go forward to potentially supersede any other, less complete, fire safety management model if it was robust, if it captured the whole of the subject and if it could be universally accepted. The Howarth model offered a head start in the process of categorisation and eventual measurement of the subject.

The questions in the first survey covered a small range of issues. The first two questions were used to establish a calibre for the panel so the panel members were

asked to provide information about their background and experiences with regard to fire safety management (set out on page 65 and in Figures 4.1 on page 65 and 4.2 on page 66). Subsequent questions asked the panel's opinion on the wisdom of categorising fire safety management in this way. The approach taken to the concept of the measurement of the subject (see Figure 4.3 on page 67) Whether or not the categories were the correct categories.

The panel were asked to rank the importance of each category (see Figure 4.4 on page 74) and this was significant because this represented the opinions of experienced and knowledgeable people in the field of study.

The responses of each panel member were collected in the software of the online website and downloaded directly into a spreadsheet. Each response was identified by a reference number and a time stamp but it was not possible to link a response to a panel member because there was no link between the reference number and an individual panel member. This rendered each respondent anonymous from the administrator as well as from the peer group.

Table 4.1.: The Howarth Model of Fire Safety Management

1. ORGANISATION	6. REPORTING AND INVESTIGATING FIRES
Fire safety policy statement in place	Fire reporting procedure in place
Supporting fire safety standards	All fires reported and investigated
Director of Safety in the organisation	Other incidents investigated (e.g. false calls)
Fire safety manager appointed	Lessons learnt from incidents (e.g. staff briefing)
Quality management system in place	Records kept/seen/assessed
2. RISK ASSESSMENT	7. FIRE TRAINING
Recognised method in place	Arrangements in place
Applied at design/improvement/alteration stage	Trained according to position (e.g. duty manager)
Applied as a specific exercise	Induction fire training given
Applied as an ongoing process	Trained by qualified staff (e.g. a trainer)
Specialist advice available	Records kept/seen/assessed
3. COMPLIANCE WITH FIRE SAFETY LEGISLATION	8. MAINTENANCE OF FIRE EQUIPMENT AND STANDARDS
Approval sought (e.g. applied for)	Firefighting equipment provided, maintained & recorded
Partly approved (e.g. work still in progress)	Fire systems maintained and recorded
Full compliance (e.g. fire certificate issued)	Process to maintain means of escape
Fire certificate (or equivalent) seen and valid	Waste management regime in place
Full compliance plus (e.g. higher standard)	Fire safety protocols for contractors in place
4. EMERGENCY PLANS AND FIRE PROCEDURES	9. BUDGET
Emergency plans in place	Funds for local jobs (e.g. replace extinguishers)
Appropriate and up to date	Funds for maintenance (e.g.. systems)
Fire procedure in place	Improvement funds (e.g. major works)
Fire action notices displayed	Appropriate, aware and involved
Plans and procedures tested/recorded	Records kept/seen/assessed
5. COMMUNICATION AND INFORMATION	10. AUDIT
Management communications (e.g.. dialogue with tenants)	Appropriate method in place
Communications and information systems (e.g. radio/PA)	Local audit
Fire warning system in place (e.g. public/staff use)	Management audit
Fire service called to all suspected fires	Independent audit
Arrangements tested/recorded/assessed	Records kept/seen/assessed

The first survey was analysed and the analysis was fed back to each panel member by e-mail. It included the comments from each respondent as well as the response from the administrator. The questions raised during the first survey were used to influence the questions in the second survey which was administered in exactly the same way as the first survey. Some of the issues raised in the second survey included, whether or not:

- any panel member wished to alter any of their previous responses after contemplation of all the other responses to the first survey

- the key to each category should be its relationship with its category heading and not what was contained in it

- the category being aligned to a statutory duty (in UK legislation) gave it special significance when compared with another category that was not so aligned

- the contents of the Regulatory Reform (Fire Safety) Order (2005) should influence the structure of the categorisation

- there should be brief and concise descriptors of the categories such as in the Howarth model or whether they should be more descriptive

- the reference to a *fire warning system* was appropriate under the category heading of 'Communications and information'

- the concept of *fire prevention* was encompassed in the category heading of 'Reporting and investigation of fires'

- only items regarding fire safety management that are contained in the Regulatory Reform (Fire Safety) Order (2005) should be categorised and measured

- the panel agreed with the logic of weighting the categories in line with the ranking of importance

- the panel agreed that the idea of the Delphi method was to use the knowledge and experience of the panel members to set the initial direction of the potential measurement of the subject and that the understanding of each category would come from evidence as it accumulates over time

Following completion of the second survey, the analysis was again fed back to the panel members.

Analysis of the first and second surveys produced a set of conclusions following the Delphi panel members' deliberations. These were:

1. The ten fire safety management categories should be re-drafted to produce more clarity in line with the responses from the panel.

2. The categories should be supported by brief and concise descriptors assisted by a supplementary definition (following further work).

3. The key to each category should be its relationship with its category heading and not necessarily what the category referred to.

4. Elements of fire safety management which were a statutory duty in UK legislation should be measured commensurately with elements which were not a UK statutory duty.

5. Where relevant, each category should have distinct, co-ordinated and consistent references to the articles in the Regulatory Reform (Fire Safety) Order (2005).

6. Reference to the *fire warning system* should be contained within the category headed as 'Communications and information'.

7. Regarding the element of *fire prevention* as part of fire safety management, and following further work, either that:

   a) it should be split up into discrete parts and included in more than one category; or

   b) that it should exist in its own distinct category.

8. References in the analyses to the word *weighting* were misleading because the word has a specific meaning in statistical work. The word *weighting* should be substituted with the word *impact*. The impact of each category should depend on its relevancy and its context in any given situation and that this should be taken into account until, or unless, statistical evidence proves otherwise.

4.3. Results

There are two sets of results concluded by the Delphi panel:

1. The importance ranking of the ten categories; and

2. The ten definitive categories.

4.3.1. The importance ranking given by Panel members

The panel members were asked to rate the categories in order of importance. They were asked to give a score of 1 to 5 for each category where 1 represented important and 5 represented unimportant. Figure 4.4 shows the order of ranking given by the panel.

The importance ranking should be accepted for what it is, a best guess of the most and least important categories of fire safety management. This should facilitate future work in linking statistical data to each category for the purpose of measurement, beginning with the category considered by the panel to be the most important.

Figure 4.4.: The importance ranking determined by the Delphi panel

Degree of importance given by the Delphi Panel
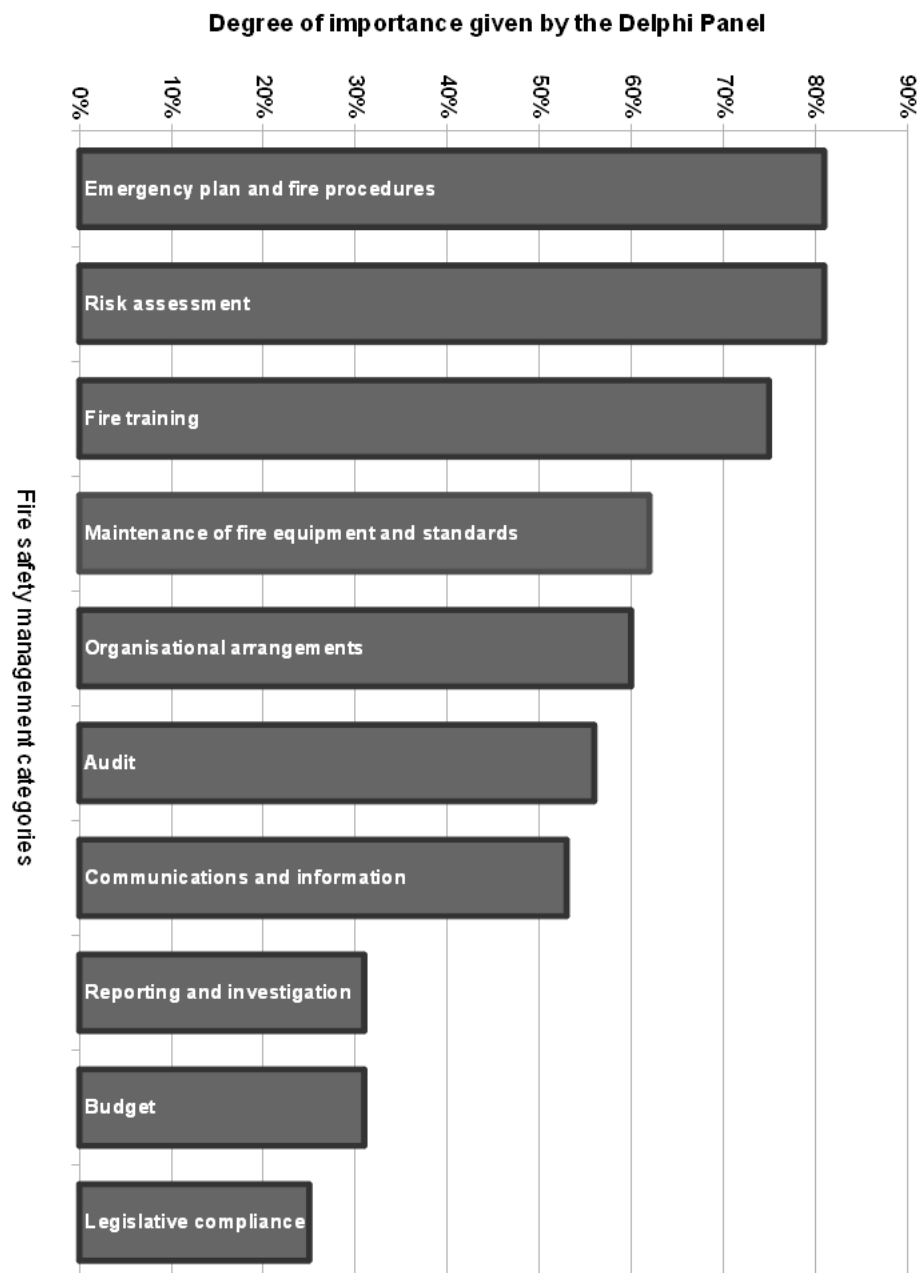
4.3.2. The Categories defined

The categories with their definitions are laid out below. They have been re-numbered from their original numbers in the Howarth model (on page 70) and now reflect the order of ranking determined by the Delphi panel. The panel were asked to set

the initial direction of the process of measurement by providing a categorisation of the subject. They were aware that the understanding of each category would come from evidence as it accumulates over time.

The references in italics at the end of each category refer to Articles in the Regulatory Reform (Fire Safety) Order (2005). The addition of the reference fulfills a request of the panel.

Category 1. Emergency plans and fire procedures

There should be evidence of proactive emergency planning for a wide range of foreseeable events accounting for:

- the use of the building;

- the fire growth characteristics; the type of occupants;

- the lines of communication between management and employees/occupants etc.;

- the fire safety systems; the roles and levels of staff.

There should be evidence of contingency planning for such instances as: lack of staff training; sickness and other unexpected absences of staff unexpected fire loadings arson attacks etc.

There should be evidence of dissemination and clarification of emergency planning with responsibilities and objectives clearly defined. These should be demonstrated by use of:

- emergency plans;

- fire procedures;

- fire routines notices.

There should be evidence that emergency plans and procedures are tested periodically, lessons are learnt and solutions are put into effect.

Reference to the UK legislation applicable in England and Wales; the Regulatory Reform (Fire Safety) Order (2005): Article 11 - Article 15 - Article 16 - Article 20 - Article 21 – Article 38

Category 2. Risk assessment

There should be evidence of a recognised method of fire risk assessment in place that:

- is carried out by a specialist with appropriate knowledge and experience;

- identifies fire hazards and people at risk; evaluates the risk to people and property;

- puts controls in place to remove or reduce the hazard; records the significant findings and disseminates them to employees and other relevant people;

- reviews the assessment and causes the emergency plans and procedures to be revised after changes to the occupancy and/or the fire growth characteristics of the building and its contents.

Reference to the UK legislation applicable in England and Wales; the Regulatory Reform (Fire Safety) Order (2005): Article 8 - Article 9 - Article 11 - Article 12 - Article 13(a) - Article 13(b) - Article 15 - Article 16 - Article 19 - Article 20

Category 3. Fire training

There should be evidence of arrangements for fire training incorporating: training on induction;

- training according to position or role;

- training by trainers qualified to accepted standards;

- periodic refresher training.

Training content should include instruction on: fire prevention, fire protection and fire evacuation procedures;

- new or changed risks, new or modified equipment and new technology;

- new systems of work and safe handling of hazardous and combustible substances; etc.

Evidence of training should be available in the form of written records.

Reference to the UK legislation applicable in England and Wales; the Regulatory Reform (Fire Safety) Order (2005): Article 10 - Article 12 - Article 15 - Article 16 - Article 18 - Article 19 - Article 20 - Article 21 - Article 22

Category 4. Maintenance of fire equipment and standards

There should be evidence of maintenance of fire equipment and standards that demonstrates support for the principles incorporated in the fire strategy in respect of occupancy, means of escape, fire prevention, fire loading, arson measures, fire safety protocols for contractors etc. which includes:

- a pre-determined maintenance regime for all fire prevention, fire protection and fire-fighting equipment and systems;

- a schedule of dynamic monitoring and maintenance of escape routes, waste management systems etc. including alternative procedures for complications discovered by dynamic monitoring.

Written evidence that demonstrates maintenance of fire equipment and standards is being carried out should be available for inspection.

Reference to the UK legislation applicable in England and Wales; the Regulatory Reform (Fire Safety) Order (2005): Article 8 - Article 11 - Article 13(a) - Article 13(b) - Article 14 - Article 15 - Article 16 - Article 17 - Article 18 - Article 20 - Article 21 - Article 37 - Article 38

Category 5. Organisational arrangements

There should be evidence of responsibility for fire safety at the highest level of the organisation with clear lines of responsibility throughout the organisation and empowerment at an appropriate functional level.

This should be consolidated with a comprehensive fire safety policy developed to expedite the fire strategy and supported by a quality management system that:

- plans and prepares for a wide range of foreseeable events using sufficiently trained and competent people;

- controls:

    - construction, building alterations and refurbishment;

    - systems of work including hot work and work using hazardous and combustible substances etc.;

    - informs employees and other relevant people;

− co-ordinates and promotes co-operation between responsible persons.

Reference to the UK legislation applicable in England and Wales; the Regulatory Reform (Fire Safety) Order (2005): Article 8 - Article 10 - Article 11 - Article 12 - Article 13(a) - Article 13(b) - Article 15 - Article 16 - Article 17 - Article 18 - Article 19 - Article 20 - Article 21 - Article 22 - Article 23 - Article 37 - Article 38

Category 6. Audit

There should be an audit of the fire safety management system carried out by an independent auditor or an auditor capable of acting independently and it should be recorded. It should demonstrate its examination of the system of management to determine whether it takes account of:

- any implications for, or impact on, the fire strategy such as changes to the occupancy and the fire growth characteristics;

- the awareness of employees and other persons, where relevant, of their duties and requirements with respect to the fire strategy;

- the documentation system supports and reflects the practices;

- the fire strategy is based on advice given in, for example, Publicly Available Specification 911 (2007) and British Standard 9999 (2008) and the fire strategy is being followed;

- the solutions where parts of the fire strategy are not being followed for practical reasons or for reasons of nonconformity;

- the areas where improvements can be made.

Reference to the UK legislation applicable in England and Wales; the Regulatory Reform (Fire Safety) Order (2005): Article 11

Category 7. Communications and information

There should be evidence of written and verbal communication encouraging co-operation and co-ordination to include:

- discourse between management, staff, occupants and occupier;

- contractors and other persons; dissemination of relevant and appropriate information regarding the fire strategy which includes the findings of the fire risk assessment;

- an appropriate relationship with the fire and rescue service which includes notification of material changes in the risk profile;

- an appropriate system and equipment necessary for giving warning in case of fire.

Reference to the UK legislation applicable in England and Wales; the Regulatory Reform (Fire Safety) Order (2005): Article 9 - Article 10 - Article 11 - Article 12 - Article 13(a) - Article 14 - Article 15 - Article 16 - Article 18 - Article 19 - Article 20 - Article 22 - Article 23

Category 8. Reporting and investigation of fires

There should be evidence of a management attitude towards fire safety that:

- reports, investigates and records all incidents (i.e. fires, near misses and false alarms);

- debriefs personnel and evaluates all reports to learn lessons from the incidents;

- incorporates all lessons learnt from the incidents to make sure that they are not repeated.

Reference to the UK legislation applicable in England and Wales; the Regulatory Reform (Fire Safety) Order (2005): Article 8 - Article 11 - Article 12 - Article 13(b) - Article 19

Category 9. Budget

There should be evidence of appropriate financial budgeting for fire safety including evidence of sufficient funds for:

- fire safety management;

- fire safety arrangements in building improvement and repair;

- fire systems and fire equipment and their maintenance;

- fire training.

Reference to the UK legislation applicable in England and Wales; the Regulatory Reform (Fire Safety) Order (2005): Article 11

Category 10. Compliance with legislation

There should be appropriate evidence of:

- compliance with relevant legislation including the Regulatory Reform (Fire Safety) Order (2005) applicable in England and Wales;

- adherence to regulations applicable to building construction, alterations and refurbishment.

Reference to the UK legislation applicable in England and Wales; the Regulatory Reform (Fire Safety) Order (2005): Article 8 - Article 9 - Article 10 - Article 11 - Article 12 - Article 13(a) - Article 13(b) - Article 14 - Article 15 - Article 16 - Article 17 - Article 18 - Article 19 - Article 20 - Article 21 - Article 22 - Article 23 - Article 37 - Article 38

4.4. Summary

In summary, at the end of the Delphi process, there are a number of significant achievements:

1. There is a categorisation of the concept of fire safety management that purports to encompass the whole breadth of the subject.

2. A mix of people qualified by knowledge and experience to hold an opinion on one or more aspects of fire safety management, have deliberated on the subject. The mix included current or past practitioners and regulators of the subject who reflect the current influence on fire safety management in the UK.

3. A set of results based on the authority of the mix of experienced and knowledgeable people and bolstered by a supervised process. A process where people could give an initial opinion then alter that opinion anonymously and without losing face, in the light of others' opinions.

4. The potential for developing a deeper understanding of the relationship between fire damage and fire safety management by accumulating objective evi-

dence against each distinctive category of fire safety management. Beginning with the categories held by the process to be the most important.

5. A paper that describes the process titled, *Categorisation of Fire Safety Management: Results of a Delphi Panel* by Baker et al (2013) published in the *Fire Safety Journal.*

5. Interviews

5.1. Introduction

Face to face interviewing is particularly useful for eliciting information around a subject and for questioning a response if that response is unexpected. This gives an advantage over a survey where a misperception by the participant cannot easily be corrected. An unexpected response can often open up a line of enquiry that may not have been anticipated by the interviewer. Of course, the competence of the interviewer is critical to the process and prior knowledge of the subject is a requisite.

When a series of interviews are planned for a research project, asking the same questions of the interviewees simplifies the analysis and allows comparisons between the responses. Valenzuela and Shrivastava (2011) refer to this approach as a standardised open-ended interview stating that it allows a degree of freedom and adaptability in eliciting information from the interviewee while concluding in a faster interview.

Preparation for an interview is critical in regard to the location and setting and the interviewee should be furnished with certain information. The interviewee should be put at ease by the location and setting for the interview, they should be aware of the probable length of the interview and not be worried about issues of confidentiality. Permission must be obtained for the method of recording the interview and assurances given for the use and storage of the data.

5.1.1. What is in this chapter

In this chapter can be found:

- the questions asked of the interviewees and their responses;
- items brought out in the interview discussions that were relevant to the subject and need consideration in future research;

- a list of priorities appropriate to each role, in order of the importance perceived by the interviewee.

5.2. Method

In the case of the interviews carried out as part of this research, the four interviewees were chosen because of their roles. They were considered to be in roles that were best placed to give an opinion on the administration, supervision and management of fire safety involving the Loughborough University campus.

Each interviewee agreed to be interviewed and chose the venue for the interview with a choice of dates. They knew what questions would be asked and they were told that the interview discussions would be based on the questions. They were asked to set aside an hour of their time and, in the event, each interview lasted between 48 and 62 minutes. With regard to recording the interview, they were asked to agree that the interview could be recorded so that it could be later transcribed for analysis. The transcripts of the interviews can be found in Appendices 2 to 5 at the end of this thesis.

The logic that was pursued to determine the choice of interviewees is set out in the following:

Interviewee 1: The statistics indicate that Loughborough University deals with most fire alarm actuations using university staff. This has resulted in a large reduction in the number of times that it asks the local authority fire service for assistance. Interviewing the fire safety manager for Loughborough University campus was seen as vital to begin to understand the management system;

Interviewee 2: Leicestershire Fire and Rescue Service divides its area of administration up into districts so it was natural that the fire service officer responsible for the district in which Loughborough University campus was situated, should be interviewed. This fire officer's primary function is the operational performance of the three fire stations that cover the Charnwood District (which includes Loughborough University campus) so it was seen as necessary to explore the environment which has been influenced by the large reduction in responses to the Loughborough University campus;

Interviewee 3: Each fire and rescue service in the UK appoints an officer to administer and enforce its responsibilities to fire safety legislation. The Senior Fire Safety Officer's role in Leicestershire Fire and Rescue Service is primarily fire safety enforcement with a secondary role as an operational officer with responsibility for fire safety issues at operational incidents. His responses were of interest because most of the legislative enforcement of fire safety surrounds the deficiencies in managing fire safety.

Interviewee 4: How the insurance industry view fire safety management was of interest because fires start through the mismanagement of an ignition source and a combustible material. Fire damage is the result of this occurrence and the UK Government (2010-2011) report that the amount of fire damage in England, Scotland and Wales is increasing year on year. Better management of the occurrence would lead to a reduction in the amount insurance companies pay out so an interview with someone familiar with this area would allow an exploration of this area and how they viewed fire safety management on Loughborough University campus.

The interviewees were:

Interviewee 1: Fire Safety Manager, Loughborough University Campus - eight years in post with long previous experience in an emergency role with the Mines Rescue Service (interviewed on 11 December 2012: length of interview - 50 minutes);

Interviewee 2: Fire Service District Manager for Charnwood District, Leicestershire Fire and Rescue Service - nineteen years operational service; responsible for all fire service activity within the Charnwood area; individual performance is measured by operational output (interviewed on 17 December 2012: length of interview - 48 minutes);

Interviewee 3: Group Manager Fire Prevention and Protection, Leicestershire Fire and Rescue Service - twenty six years experience, fifteen years dealing specifically with fire safety (interviewed on 15 January 2013: length of interview - 56 minutes);

Interviewee 4: Consultant Fire Engineer - now a consultant fire engineer but with five years experience at the Fire Protection Association dealing with fire and risk management (interviewed on 18 January 2013: length of interview - 62 minutes).

5.2.1. The questions

Question 1: How does the management of fire safety assist a company or an organisation to meet the requirements of regulation and the scrutiny of regulatory inspections.

Question 2: How does the management of fire safety assist in the protection of property or the continuity of business.

Question 3: Do you think that a good standard of fire safety management reduces the likelihood of fire damage and, if so, do you think there is a parallel between the standard of fire safety management and the amount of fire damage.

Question 4: What are the benefits of the current fire and rescue service campaign to reduce unwanted fire signals. The benefits for the fire and rescue service are that it reduces the number of false calls they receive with a corresponding saving of time and money. Does it also lead to a reduction in the amount of fire damage.

Question 5: Do you think it would be beneficial to measure the operational performance of the fire and rescue service with a performance metric that evaluates the efforts of companies and organisations that demonstrate an improvement in business continuity or reduction of fire damage.

5.3. Results

5.3.1. Question 1

Question 1: How does the management of fire safety assist a company or an organisation to meet the requirements of regulation and the scrutiny of regulatory inspections?

1. The Fire Safety Manager:

   a) uses the regulatory framework to organise his work using the fire risk assessment as the vehicle to monitor standards of fire safety management that he expects from each building manager.

    b) knows that by using the regulatory framework he is ready to be scruti- nised by the fire safety officer as well as his own department.

    c) uses the national standards but he is aware that these focus on life safety and he is equally concerned with protecting the assets of the university by which he means the university buildings, its resources and its ability to continue supporting students after a fire incident. So he enhances the assessment to include asset protection.

2. The District Fire Service Officer:

    a) uses the regulations to provide a framework for the administration of fire safety on the three fire stations he is responsible for, to provide a safe place of work.

    b) knows that by doing this he is prepared for the scrutiny of his fire safety colleagues and can avoid the embarrassment of inadequate fire safety standards.

    c) also considers the critical functions of the three fire stations in case of fire so that the fire appliances can still operate as normal following a fire in one of the buildings.

3. The Senior Fire Safety Officer:

    a) considers that the regulatory framework simplifies his tasks because if there is a good standard of fire safety management there is more prospect of creating good and robust partnerships with companies and organisa- tions. This will assist in meeting the current Government's wish for less regulation.

    b) reasons that although the regulatory focus is on life safety, any good fire safety inspector would consider the protection of property from fire as well as life safety and knows that if a building is being properly maintained, there is less likelihood of a fire occurring. As a bonus for the company or organisation, it is less likely to be targeted in a programme of inspections.

    c) can see evidence of the consideration for property protection and business continuity in the change of name of the CFOA[1] Enforcement Working

---

[1]CFOA is the acronym for the Chief Fire Officers' Association which describes itself as the pro- fessional voice of the UK fire and rescue service, supporting members to fulfill their leadership role in protecting local communities and making life safer through improved service delivery.

Group to the CFOA Business Safety Group. This is CFOA's acknowledgement of the change in emphasis because it indicates that they are embracing the Government's wish to supporting business by reducing its burdens and stimulating growth.

4. The Consultant Fire Engineer thinks that the insurance industry has little interest in whether or not a company or organisation complies with regulation. What does concern the insurers is how much of a financial risk to them the destruction of the property is.

5.3.2. Question 2

Question 2: How does the management of fire safety assist in the protection of property or the continuity of business?

1. The Fire Safety Manager:

   a) thinks that the fire risk assessment is not sufficient on its own to fully protect property or to guarantee business continuity. However, if it is enhanced to include property protection and business continuity, it can be used to monitor the enhanced standard.

   b) gives an example of introducing a standard to facilitate business continuity using the utilisation of acetylene cylinders in some of the university buildings. He is aware of the prohibitive operational decisions that are being made by the fire and rescue service at incidents where acetylene cylinders become involved in fire and sees the potential for huge disruption on the campus. Information related to the disruption caused by incidents involving acetylene can be found in a BBC News report on the BBC News Website archive at http://news.bbc.co.uk/1/hi/england/7932429.stm (accessed on 10 January 2013)

2. The District Fire Service Officer thinks that more effective fire safety management assists a business to become more resilient and more likely to survive a fire incident.

3. The Senior Fire Safety Officer:

a) thinks that fire safety management is the critical factor and uses his initial assessment of it, when he enters a building, to influence his dealings with that business.

b) insists that although the determinant for the inspection programme is life safety, the bigger picture is considered by taking into account those fire incident statistics recording a fire that has spread beyond its room of origin. He uses this data to fine tune the inspection programme.

4. The Consultant Fire Engineer suggests that the insurance industry has no interest in the quality of fire safety management in regard to property protection or business continuity. This is because insurers see no gain in relying on the involvement of a human because they know that a human will err and human error is all too prevalent. They are swayed by the potential performance of the building construction to physically prevent the spread of fire no matter what. Good fire safety management, if it is present in the building, is seen as a bonus.

5.3.3. Question 3

Question 3: Do you think that a good standard of fire safety management reduces the likelihood of fire damage and, if so, do you think there is a parallel between the standard of fire safety management and the amount of fire damage?

1. The Fire Safety Manager:

   a) thinks there is a correlation between the standard of fire safety management and the amount of fire damage.

   b) suggests that the amount of fire damage is reduced by:

      i. a good standard of automatic fire detection;

      ii. by monitoring the standard of fire safety management in each building and concentrating on those buildings which exhibit poor fire safety management.

2. The District Fire Service Officer:

a) thinks that a good standard of fire safety management reduces the likelihood of fire damage provided the ignition was not a deliberate act designed to negate the management of fire safety.

b) thinks that a correlation exists between the standard of fire safety management and the amount of fire damage but the amount of fire damage would depend on the type of property involved.

3. The Senior Fire Safety Officer thinks there is a direct correlation between fire safety management and the amount of fire damage and an example of why this would be is that of a fire door. If the fire door is of the required construction and it operates correctly as it would in a building with a good standard of fire safety management, then the fire would be confined in a defined area. This means that the consequent damage would be less than it would be if the fire door had not operated correctly.

4. The Consultant Fire Engineer thinks there is a direct correlation between fire safety management and the amount of fire damage. An example that indicates this is the case of a building in a UK university which accounted for 60% of the income stream of the university. All occupants evacuated successfully when a fire occurred in the building, however the building was lost, along with 60% of the income stream, because of:

a) the lack of training in the use of fire extinguishers for the university staff;

b) the lack of liaison between the university and its local fire and rescue service;

c) the lack of timely and expeditious information available for the use of the fire service at the point of entry into the building. The firefighters made their initial assessment deciding that they had not enough information to enter the building safely taking into account that the building was now empty of people.

5.3.4. Question 4

Question 4: What are the benefits of the current fire and rescue service campaign to reduce unwanted fire signals? The benefits for the fire and rescue service are that it reduces the number of false calls they receive

with a corresponding saving of time and money. Does it also lead to a reduction in the amount of fire damage?

1. The Fire Safety Manager:

   a) suggests that the CFOA policy to reduce unwanted fire signals is encouraging companies and organisations to manage their systems better thus improving the standard of fire safety management. The example given is that of the University which has greatly reduced the number of false alarms on campus by initiating a protocol of trained fire marshals assisting in each building during daytime and security officers investigating fire signals throughout the day and night. Currently, the fire service are only being called to a confirmed fire which the protocol has decided cannot be dealt with by university staff.

   b) thinks that there is a direct benefit to the university from liaising and forming a partnership with the fire and rescue service. The benefit comes from becoming known to the fire officers and from the fire officers familiarising themselves with the risks on the Campus.

2. The District Fire Service Officer thinks that the campaign is advantageous in that it forces a company or an organisation to sort themselves out. This would most likely cause a reduction in fire damage because of putting extra effort into discovering a fire, training staff and having the correct extinguishers ready to deal with a fire.

3. The Senior Fire Safety Officer:

   a) suggests that the campaign has forced companies and organisations to improve their management of fire safety if they have responded by forming first-aid firefighting teams to tackle small fires instead of asking the fire and rescue service for assistance;

   b) thinks that the main driver for the policy on unwanted fire signals is to cut down on the number of vehicle movements by the fire and rescue service;

   c) is not aware of any research into whether fire damage has reduced or increased as a result of the policy;

d) thinks that the biggest impact has been on the alarm receiving centres (ARC) who have had to deal with the different ways that fire and rescue services have chosen to implement the policy.

4. The Consultant Fire Engineer:

   a) thinks that a benefit of the policy on unwanted fire signals is that it gives the occupant more confidence that when the fire alarm sounds, it is likely to be an actual fire. This is because the policy is forcing building managers to maintain their fire alarm systems so that there are no extraneous fire signals giving false alarms.

   b) suggests the policy may lead to an increase in fire damage because of the delay in calling the fire and rescue service that is being built into the system.

5.3.5. Question 5

Question 5: Do you think it would be beneficial to measure the operational performance of the fire and rescue service with a performance metric that evaluates the efforts of companies and organisations that demonstrate an improvement in business continuity or reduction of fire damage?

1. The Fire Safety Manager:

   a) thinks that a performance metric that measured the performance of the fire and rescue service on its ability to encourage companies and organisations to demonstrate an improvement in business continuity or a reduction in fire damage would be beneficial to the university. The main barrier is the reluctance of the fire and rescue service to give advice and encouragement when that same advice and encouragement might be held to be negligent at some point in the future. They, defensively, choose to put the onus back on the occupier by declining to give advice.

   b) cannot see how the logic of how the fire and rescue service would be measured.

2. The District Fire Service Officer:

a) cannot see a link between the performance of the fire and rescue service and the management of a commercial site;

b) thinks that even if the concept of measuring the performance of the fire and rescue service was feasible there is insufficient in common with different parts of the area administered by a fire and rescue service for a comparison between areas to make any sense;

c) thinks that fire safety officers know too little about the technological solutions to fire safety problems for them to have any influence on a company or an organisation;

d) reasons that when a fire occurs, particularly in new modern buildings, the occupiers would prefer to demolish the building and re-build it because that is the cheaper option.

3. The Senior Fire Safety Officer:

a) thinks that a performance measure would be a good idea and an indication of the value of proactive resources in the fire and rescue service.

4. The Consultant Fire Engineer:

a) thinks that the concept of measuring the performance of the fire and rescue service would encourage and motivate it to focus its resources in a different way, a more proactive way;

b) suggests that the performance could be measured in terms of monetary loss.

5.4. Items emerging from the discussions

Some items surfaced during the interviews as extensions to the responses which referred to current issues and which were considered relevant to the subject of the thesis. The items have been listed below.

5.4.1. Dynamic risk assessment

The way that an operational firefighter assesses how to deal with a fire incident is handled by *dynamic risk assessment*, a method described in the Fire and Rescue Manual: Volume 2: Fire Service Operations (2008), as

> *"the continuous assessment of risk in the rapidly changing circumstances of an operational incident, which is done in order to implement the control measures necessary to ensure an acceptable level of safety"*

The product of the assessment will determine how the incident is handled and is based on the amount of risk that the firefighters are prepared to accept. Firefighters will take a larger risk to save a life that they believe they can save than they will to save property that they believe is already lost.

Other factors that may be crucial to the prosperity of the company or organisation because a building, perhaps, contains unique information or equipment vital to its survival is unlikely to change the dynamic risk assessment unless the fire service commander already knows this through prior liaison or there is some compelling information available at the time.

The two foci, life safety and property protection, are central to the methodology of dynamic risk assessment and are presented in Fire and Rescue Manual: Volume 2: Fire Service Operations (2008) as a statement given to firefighters to be applied when making their dynamic risk assessment:

> *We may risk our lives a lot, in a highly calculated manner, to protect saveable lives;*

> *We may risk our lives a little, in a highly controlled manner, to protect saveable property;*

> *We will not risk our lives at all for lives or property that are already lost.*

The definition of *'saveable lives'*, *'saveable property'* and *'lives or property already lost'* is obviously pivotal to the implementation of this guide. Of course, the provision of information at the point of entry into a building to assist the firefighters when making their assessment is a function of fire safety management. An example of this is when at an incident at Cambridge University, suitable, sufficient and timely information would have mitigated against the trouble and disruption that the incident actually caused. Because of a lack of such information, a small chemical fire in a fire-proof solvent cupboard in a university building that should have taken only a few minutes to deal with actually resulted in many fire service resources being committed to the incident and traffic flow through Cambridge being severely

compromised for about three hours[2].

5.4.2. Focus on life safety

The focus on life safety in England and Wales specifies fire resistance of building elements in Approved Document B (2010) to support that focus; as such, the regulations are indifferent to the protection of the property or the survival of the company or organisation. Architects and building designers are guided by Approved Document B (2010) and tend to focus on the minimum that they have to comply with to satisfy them. How the building looks, the materials used in its construction and how it is be used throughout its lifespan, for instance, are far more interesting to them. Of course, the focus on life safety will inevitably provide some fire protection to the property and itsability to function the day after a fire.

The Regulatory Reform (Fire Safety) Order (2005) also focuses on life safety and serves the protection of property from fire only by default. The targets set by the fire and rescue service to assist it to fulfill this focus on life safety provide little or no incentive to reduce fire damage. There is cause for complaint from the community if the fire and rescue service does not perform adequately and fails to reach its targets but there is less cause for complaint if the fire and rescue service does not reach targets that have never been set.

5.4.3. Unwanted fire signals

The high incidence of false alarm calls received by the fire and rescue service initiated the practice of challenging emergency calls to make sure of the appropriate emergency response. This practice was outlined in the document *A Guide to Reducing the Number of False Alarms from Fire-detection and Fire-alarm Systems (2004)*. False alarm calls are seen as a disruption to business and cause of loss of confidence in fire warning systems by the public. False alarms also unnecessarily increase the risk for road users, divert essential fire and rescue resources and impact on fire and rescue training and work programmes.

---

[2]Details relating to this incident can be found on the Fire Industry Association website at http://www.fia.uk.com/en/Information/Details/index.cfm/Cambridge-University-lab-evacuated-following-fire (accessed on 10 January 2013)

The policy, *CFOA Protocol for the Reduction of False Alarms and Unwanted Fire Signals (2010)*, which sets out the protocol introduced a system of filtering emergency calls to guide the staff of the fire control centre staff and the alarm receiving agencies in how to carry out the policy. The responsibility for reducing false alarms rests with the person responsible for the premises, who is encouraged to employ competent contractors to install, manage and maintain the fire warning system.

At the core of the policy is a process of filtering the emergency calls received via 999/112 or any other acceptable source. This is done by working with the alarm receiving centres (collectively called fire alarm monitoring organisations (FAMO) who have agreed to the Code of Practice: Best Practice for Summoning a Fire Response via Fire Alarm Monitoring Organisations (2010) which sets out the terms with which they should contract with their clients and with which they reach agreement with the individual fire and rescue services. This is meant to provide a consistent approach to reducing the incidence of false alarms and the number of unwanted fire signals transmitted to the fire and rescue service whilst providing an appropriate response for those calls which are not filtered out by the filtering process.

The Fire Protection Association published a report on unwanted fire signals to inform the insurance industry. One of the conclusions of the Report to Insurers: RI11 (2012) was that, in practice, the CFOA policy was not achieving its aims. What it was achieving was a saving of the time and effort expended on false alarm calls by the fire and rescue service and a reduction in the number of fire appliance movements. However, there was little evidence of the follow up of fire safety activities suggested in the protocol, to improve fire safety management or to carry out regulatory enforcement in the companies or organisations that were the worst offenders.

5.4.4. Competent fire safety management

With due regard to the balance between appetite for business profits and the considerations for fire safety and security in a business or an organisation, it could be that the appetite for profit outweighs all other considerations. For instance, it could be argued that, in the case of a large warehouse fire, reported on by Robinson and Baker (2006), that destroyed a large portion of a company's stock, immediately threatening the existence of the company, critical fire safety information was not acted upon because it was not given the importance it deserved.

At this particular incident, some hours before the fire started in the midst of high storage racking in a large warehouse, a telephone message with critical fire safety information stating that the sprinkler system was inoperative, was received by the management of the company. This information was quickly forgotten because it was not valued as important by the manager who processed the information. Had the perception been different and the manager had realised the risk that was being taken, a number of options for action could have been considered that would have detected the ignition and allowed the management to deal with it successfully. All of the options would have incurred a financial cost but the cost would have been a fraction of the eventual cost of the consequences of the fire.

5.4.5. Estimated Maximum Loss

The pricing of insurance policies is based on a concept called Estimated Maximum Loss (EML). EML represents the maximum possible economic loss envisaged. This means that the presence of a sprinkler system or an automatic fire detection system will do nothing to reduce the EML because such systems are not guaranteed to operate relying, as they do, on the correct design, installation and maintenance provided by a system of management. Insurers are distrustful of the human element involved in a management system. A fire protection component that does have a positive influence on the EML is compartmentation within a building; a physical barrier that separates part of the building ensuring that all of it is unlikely to be affected by a fire. The EML on a building split into two equal halves by compartmentation would attract an EML of 50% whilst an open plan building would attract an EML of 100% because of the absence of compartmentation.

The pricing of insurance policies is not based solely on the EML, it is also influenced by historical loss statistics for different types of occupancy, different types of industry and different types of construction. However, it does suggest that good fire safety management observed in a routine survey carried out by an insurance company is unlikely to affect the pricing of an insurance policy in a building that is the same type that statistics show is often subject to fire.

5.4.6. Fire safety information

Section 38 of Approved Document B (2010) requires that the person carrying out building work must provide sufficient information for persons to operate and maintain a new building or an extended building, in reasonable safety. Regarding fire safety, basic information amounts to the location and nature of the fire safety provisions in a small building but in the case of a larger building it means a much more detailed record of the fire safety strategy and the procedures for operating and maintaining any and all of the fire provisions.

5.4.7. Fire safety engineering

A building that has been constructed with a fire safety engineered design can differ from one that has been designed and constructed as per the requirements of a building code in many ways. The reason for a fire engineered solution is that it can be used to design buildings outside of the constraints of building codes overcoming, for instance, particular building issues that are difficult to resolve in more traditional ways.

However, fire safety, in the case of a building that has a fire safety engineered solution within its design, cannot be treated in the same way that it can be treated in a more traditional building. For instance, to correctly plan an alteration or building refurbishment, the original design and reasons for the fire safety engineering, concepts required in British Standard 7974 (2001), have to be completely understood by the person or team planning the work because changing any one of them may affect the level of safety inherent in the design.

The problem does not only apply to the occupier of a building that designs and carries out alterations without using the proper authorities. In the case of an occupier who does use the proper authorities, the problem transfers from the occupier to the building control officer and the fire officer. These people, in consultation, must fully understand the implications of the original design, which they may previously have had no knowledge of, and also how the applied for alteration affects and changes the original design so that they can fully evaluate whether the level of safety has been altered and whether the original design objectives are still valid

5.4.8. Profiles of property types

Because of the influence of the document Safe as Houses (1998), the average fire-fighter appreciates and recognises the profile of the most likely victims of fire in their area and is aware of how often they can expect to attend a fire involving a fire death. They are also aware of the areas of their station ground where they should target their fire prevention efforts with fire risk assessments and the provision of free smoke alarms, to reduce the risk of fire deaths .

Conversely, the average firefighter has much less knowledge of the type of property most likely to suffer significant fire damage on their station ground. They possess very little knowledge of the economics of fire damage and how they can proactively reduce the risk of loss of jobs, loss of amenities and damage to the infrastructure of the local community unless they have studied the subject on an individual basis.

One reason for this lack of information may be the effect of performance measures. Currently firefighters have metrics that measure their performance in their operational theatre as well as the areas of their administration and one of the most important operational measures is that of fire deaths in accidental dwelling fires. Fire deaths are an emotional and political issue for any community. Performance metrics that measure the amount of damage to property, the environment, the community etc. are currently not present in the UK.

The profile of the most likely person to become a victim is described as hard to reach by local authority departments and, to continually meet their targets, fire and rescue services in England and Wales have had to think of innovative ways to enable them to be reached. Thus the metric is seen as important by firefighters and much research and the dissemination of this research has been done within the fire and rescue service.

5.4.9. Protection of the environment

With regard to protection of the environment in England and Wales, the fire and rescue service is subject to environmental protection legislation and could potentially be prosecuted and liable for the clean up costs following an emergency incident. The relevant legislation is the Water Resources Act (1991)- controlling surface, ground and coastal waters; The Water Industry Act (1999)- controlling sewerage systems; The Groundwater Regulations (1998)- controlling groundwater and land/soil; The

Hazardous Waste (England and Wales) Regulations (2005)- controlling hazardous waste.

There are defences available for the fire and rescue service based on three criteria:

- the entry is caused or permitted, or the discharge is made in any emergency in order to avoid danger to life or health;

- that person takes all steps as are reasonably practicable in the circumstances for minimising the extent of the entry or discharge and of its polluting effects; and

- particulars of the entry or discharge are furnished to the Environment Agency as soon as reasonably practicable after the entry occurs.

The fire and rescue service in England, Scotland and Wales is encouraged to protect the environment under the Fire and Rescue Services Act (2004). The fire and rescue service in England, Northern Ireland, Scotland and Wales also has a duty to co-operate with environmental agencies under the the Civil Contingencies Act (2004) to work together with environment agencies in emergencies, incident response planning and information sharing. The Civil Contingencies Act (2004) defines an environmental emergency as

> *an event or situation, which threatens serious damage to human welfare in a place in the UK, the environment of a place in the UK, or war or terrorism which threatens serious damage to the security of the UK.*

The Civil Contingencies Act (2004) requires that the clearing up of a site, watercourse or groundwater after an incident is the duty of the land owner, site occupier/operator or polluter.

5.4.10. Primary Authority Scheme

With regard to the primary authority scheme administered by the Local Better Rregulation Office (LBRO) and the guidance published under the Regulatory Enforcement and Sanctions Act (2009). This is open to any business, charity or other organisation that is regulated by two or more local authorities in respect of a relevant function. A relevant function covers matters that are commonly referred to as trading standards, environmental health, fire safety etc. and an example of a

business that might enter into a partnership with a local authority is one that has multi-sites in a number of different local authority areas .

A local authority can form a partnership in respect of the relevant functions that the local authority has regulatory responsibility. In the case of the fire and rescue service, this includes the licensing of petroleum and the storage of fireworks but a consultation is currently underway to extend this to include fire safety.

5.5. Priorities of different roles

At the end of each interview a written list of tasks was put in front of the interviewee with a request to agree the relevance and comprehensiveness of the list to their role and then to put the tasks on the list in order of priority.

The lists of tasks are presented below. The order in which they are printed is the order to which the interviewee agreed.

Priority ranking	Interviewee 1: Fire Safety Manager
1	Meeting regulatory requirements
2	Good performance of fire strategy
3	Reducing the number of alarm actuations
4	Being ready for inspection
5	Co-operating with and advising others

Priority ranking	Interviewee 2: District Fire Service Officer
Equal 1st	Reducing the number of emergency responses
Equal 1st	Measurement of operational performance
Equal 1st	Reducing the number of unwanted fire signals
Equal 4th	Responding to calls with the correct response
Equal 4th	Policing the regulations

Priority ranking	Interviewee 3: Senior Fire Safety Officer
Equal 1st	Encouraging citizens to become responsible for their own safety
Equal 1st	Ensuring compliance with the Fire Safety Order
Equal 3rd	Reducing the number of emergency responses
Equal 3rd	Responding with the appropriate operational response
Equal 3rd	Assisting and supporting business continuity
Equal 6th	Reducing the number of unwanted fire signals
Equal 6th	Contributing to the community by partnership working

Priority ranking	Interviewee 4: Consultant Fire Engineer
1	Reducing the amount of fire damage overall
2	Generating repeat business from clients
3	Measuring the current standard of fire safety management
4	Measuring the resilience of management systems

The purpose of carrying out the exercise was to assist in identifying the motivations of each interviewee in respect of their role, to inform the analysis of the interview responses.

As the results show, Interviewees 1 and 4 were able to determine their orders of priority but the two fire officers experienced difficulty in this task, finally deciding that some of their tasks were of equal importance.

5.6. Summary

In summary, the four interviews give us a better understanding of the context in which fire safety is carried out on Loughborough University campus. The interviewees, save for the consultant fire engineer, can directly influence how fire safety is managed and enforced. Therefore it is important that their motivations are identified, understood and taken into account so that fire safety can be implemented optimally.

The list of agreed priorities adds to this information allowing the reader to make some assessment for themselves, whether or not the priority is correct.

Arranging face-to-face interviews and using a framework of questions allowed comparisons to be made between the responses of each interviewee. Whilst the method allowed other relevant concepts to be discussed.

6. Fire damage: a case study

6.1. Introduction

To investigate the character and nature of fire damage, a case study has been used which examines fire incident data collated by Loughborough University and fire incident data collated by Leicestershire Fire and Rescue Service (LFRS) referred to as LUData and LFRSData respectively. The case study compares the mean fire damage recorded over the five-year period of LUData against the three-year period of LFRSData recorded across the same variables in both datasets.

Comparing LUData against LFRSData gives a number of advantages:

1. It places Loughborough University campus in the context of the county of Leicester, Leicestershire and Rutland.

2. It gives a sense of the magnitude of the amount of damage on a small area when compared with the amount of damage in a much larger area.

3. It highlights the differences between the LUData and the LFRSData with regard to frequencies of recorded damage amongst different variables; such as property types, time of day, month of the year, cause of incident and so forth. Highlighting the differences gives a sense of the performance of fire safety with regard to each of the variables.

4. It justifies the need for organisations such as universities to collect fire incident data in the same manner that it is collected by the fire and rescue service. In the case of universities, this would enable them to benchmark their amount of fire damage against each other and also compare the amount with that recorded nationally.

6.1.1. Description of Loughborough University Campus

Loughborough University campus sits at the edge of the town of Loughborough. On its 438 acre site there are over a hundred buildings necessary to carry out its role as a leading UK university encompassing international research in diverse fields of study, effective teaching in many disciplines and facilities to accommodate, stimulate and support students and staff.

Many of the buildings on the campus have been built within the last few years and there is a gradient between the new modern buildings and the older more traditional buildings, However, there is always development and refurbishment of existing buildings to enable Loughborough University to maintain its competitive edge in the world of academia. This provides a constant challenge to the fire safety manager who tries to preclude future fire safety problems by giving advice on building layout during the design stage as well as carrying out fire risk assessments for the occupied buildings.

Between 2006 and 2010 there were 3145 recorded activations of a fire alarm in one of the hundred or so buildings on Loughborough University campus. Each activation of an alarm, of course, could be either a fire incident or a false alarm, so on 3145 occasions there needed to be an adequate response to each alarm. The University has a protocol that deals with each alarm activation and which tries to make sure that the response is adequate and correct. For its response, it can either deal with the alarm activation itself or it can use the '999' emergency system to summon the assistance of the fire and rescue service. The records show that the fire and rescue service were summoned 89 times during that five-year period, representing 2.8% of the total. This means that the University staff successfully dealt with the 97.2% of the alarm activations without outside assistance.

This is considered unusual in England and Wales, especially with regard to a university campus which, along with hospitals and airports, is responsible for many responses that turn out to be false alarms. So much so, during the last decade, the fire and rescue service has taken action to reduce the number of responses to false alarm calls it deals with, choosing to work with the biggest offenders and give advice on how they should be reduced[1]. Loughborough University's success in this

---

[1]See the press release from London Fire Brigade Brigade saves millions by reducing false alarm call outs at http://www.london-fire.gov.uk/news/LatestNewsReleases_PR2937.asp#.UffpxawlMv4 (accessed 30 July 2013)

regard was worth investigating and for this purpose fire incident data were acquired from Loughborough University covering the period January 2006 to December 2010 (referred to in this thesis as LUData).

6.1.2. Description of Leicestershire Fire and Rescue Service (LFRS)

The unitary authorities of Leicester City, Leicestershire County and Rutland County are served by a combined fire authority responsible for the service delivery of Leicestershire Fire and Rescue Service (LFRS). The University town of Loughborough sits in the north west of the area administered by LFRS and accommodates one of LFRSs twenty fire stations.

Fire incident data are collected by all UK individual fire and rescue services and used for local analysis. The data are also returned to Government for national analysis. Fire incident data were acquired by the author from LFRS for the purposes of this thesis regarding fire incidents in the whole of the area administered by LFRS for the period April 2009 to March 2012 (referred to in this thesis as LFRSData).

6.2. Method

6.2.1. Cleansing[2] the data

The task of data cleansing is pursued to satisfy the maxim *"error qui non resistur, approbatur"*, translated as *"an error that is not resisted is deemed to have been approved"* which acknowledges the popular book, *'Doctor and Student'* published in the 16th Century by Saint-Germain (1518), in regard to the dialogue between a doctor of divinity and a student of law. Simply put, it is the process of correcting inaccurate, incomplete or illogical data to improve the quality of the dataset, inevitably, leading to a more accurate analysis.

The LFRSData was received in a cleansed state. The dedicated data team at LFRS are experienced at cleansing data and know the standards that are expected of them

---

[2]Data cleansing is the process of amending or removing data in a database that is incorrect, incomplete, improperly formatted, or duplicated.

by the UK Government who are the recipients of fire incident data from UK fire and rescue services. The LFRSData acquired was in a prepared state, ready for analysis.

The LUData, however, was not received in the same cleansed state. Whereas, with regard to the LFRSData; the production of the data, its expected quality and its expected usage is well known and handled by an experienced team, this is not the case with regard to the LUData. The LUData is used by the University fire safety manager as a reference to compile reports for higher management and to submit reports to the Universities Safety and Health Association (USHA)[3]. The reports to higher management are usually quarterly reports containing details of fire incident statistics for the previous quarter, details of any fire incident of note and a copy of the statistics submitted to USHA. Consequently, because of the small usage of the data and the associated subsequent lack of rigour in its collection, the LUData was not received in a satisfactory state to compare with the LFRSData.

In cleansing the LUData, it was necessary to anticipate what the person who entered the record actually had in mind when the record was made. So an exercise in trawling through the LUData records was carried out to correct and complete inaccurate records and to amend illogical or erroneous data.

Following this, the LUData had to be arranged and presented in a way that was comparable with the LFRSData to enable an analysis to take place. The first action was to sort the records in a consecutive list in chronological order from January 2006 to December 2010. A new variable was created and to make each record a distinctive record, each record was assigned a unique reference number.

6.2.2. Variables

A total of nine new variables were created as can be seen in Table 6.1 along with a brief explanation of how the variable was created.

The lead in creating all nine variables came from the LFRSData which was collated and arranged to reflect the format given in the Incident Recording System (2009). This format relies on coding and prescribed words and phrases, so the challenge was to make the LUData reflect the coding and prescribed words by correctly interpreting the original entry.

---

[3]The Universities Safety and Health Association (USHA) is an organisation for the promotion of safety and health in higher education.

Table 6.1.: Variables created in the LUData to be comparable with variables present in the LFRSData

Name of created variable	Origination of the created variable
Unique reference number	Created from numbering the records, consecutively, from the first incident in 2006 to the last incident in 2010
Property type	Created by comparison against the three terms used in the Incident Recording System (2009): Residential, Other Residential and Non-Residential
Property category	Created by research of the building name on the Loughborough University website and Campus Map then categorising it against the property categories listed in the publication Incident Recording System (2009)
Time in hours	Created by filtering the time in the original data for each hour in a twenty-four hour period
Month	Created by filtering the date in the original data for each month in each year
Year	Created by filtering the date in the original data for each year
Accidental or deliberate	Created by analysis of the variable 'Cause' and reference to the publication Incident Recording System (2009)
Cause of the incident	Created by analysis of the variable 'Cause' and reference to the publication Incident Recording System (2009)
Total amount of damage	Created by analysis of the comments recorded in the dataset

There is no statistical framework that is accepted as a national framework in the UK. Perhaps the Incident Recording System (2009) is the nearest that comes to a national framework because of its use by the fire and rescue services throughout England, Northern Ireland, Scotland and Wales.

Variable: Property type   With regard to the variable 'Property type', research was carried out to identify all the buildings on the Loughborough University campus and designate them as a property type present in the list in the Incident Recording System (2009). This produced thirteen property types out of the 107 buildings (see Table 6.2).

Table 6.2.: Number and type of each property type present in the LUDataset

Property type	Number of each property type in LUData
Education	30
Entertainment and culture	4
Food and drink	5
Hotel/motel	1
Hospitals and medical care	1
Industrial manufacturing	1
Industrial processing	2
Laboratory/research establishment	12
Offices and call centres	16
Retail	2
Sporting venues	14
Sports pavilion/shower block/changing facility	2
Student Hall of Residence	19

Variables: 'Time in hours', 'Month', 'Year'

With regard to the variables 'Time in hours', 'Month' and 'Year'. These were created by assigning them a code and then filtering the codes:

'Time in hours': the time of the incident was entered in the record with the hour and the minutes, for example; 14:54 or 09:31. So twenty-four codes were created; the first code being 'Midnight to 1': the second being, 1 to 2: the third, 2 to 3 and so on until the twenty-fourth: 23 to Midnight. The records were filtered and the variable 'Time in hours' created.

'Month': the month of the incident was entered in the record with day and month, for example; 21 Jun 08. So twelve codes were created; the first being January and the last being December. The records were filtered and the variable 'Month' created.

'Year': the year of the incident was entered in the record as part of the date, for example; 21 Jun 08. So five codes were created; the first being 2006 and the last being 2010. The records were filtered and the variable 'Year' created.

Variable: 'Accidental or deliberate'

Table 6.3.: Number of records for property types in both datasets

Property type	Number (and percentage) of records in LUData	Number (and percentage) of records in LFRSData
Education	250 (7.9%)	46 (8.3%)
Entertainment and culture	79 (2.5%)	25 (4.5%)
Food and drink	123 (3.9%)	69 (12.5%)
Hotel/motel	21 (0.7%)	9 (1.6%)
Hospitals and medical care	1 (0%)	47 (8.5%)
Industrial manufacturing	2 (0.1%)	153 (27.8%)
Industrial processing	9 (0.3%)	34 (6.2%)
Laboratory/research establishment	24 (0.8%)	1 (0.2%)
Offices and call centres	123 (3.9%)	40 (7.3%)
Retail	6 0.2%)	101 (18.3%)
Sporting venues	114 (3.6%)	7 (1.3%)
Sports pavilion/shower block/changing facility	14 (0.4%)	3 (0.5%)
Student Hall of Residence	2379 (75.6%)	16 (2.9%)

With regard to the variable 'Accidental or deliberate'. This was a new variable created from the 'Cause' variable present in the LUData. Each record was assessed and assigned into one of five categories of incident listed in the IRS Guidance document to create the new variable. Each incident was categorised with suitable reference to British Standard 5839 (2002+2008), as either:

- Accidental: an actual fire that has been set accidentally;

- Deliberate: an actual fire that has been set deliberately;

- False alarm - accidental: false alarms with good intent, in which a person operates a manual call point or otherwise initiates a fire signal in the belief that there is a fire, when no fire actually exists;

- False alarm - faulty equipment: in which the call has resulted from a fault in the system;

- False alarm - malicious: in which a person operates a manual call point or causes a fire detector to initiate a fire signal, whilst knowing that there is no fire;

- False alarm - unknown.

Variable: 'Cause of the incident'

With regard to the variable 'Cause of the incident'. This was a new variable also created from the 'Cause' variable present in the LUData. Each record was assessed and assigned into one of fifteen categories of incident listed in the IRS Guidance document to create a new variable. The fifteen categories are listed in Table 6.4 on the next page.

Table 6.4.: Categories listed for the variable 'Cause of the incident' in both datasets

Variable: The cause of the incident	Number of records in LUData	Number of records in the LFRSData
Accumulation of flammable material	0	25
Bonfire going out of control	0	1
By phone (malicious telephone call)	2	0
Careless handling due to careless disposal	3	18
Careless handling: due to knocking over	0	2
Careless handling: due to sleep or unconsciousness	0	1
Combustible article too close to heat source (or fire)	1	39
Contaminants	765	0
Cooking chip pan/deep fat fryer	0	21
Cooking: other cooking	88	29
External factors (power surge, storm etc.)	16	0
Fault in equipment or appliance	3	98
Faulty fuel supply: electricity	0	67
Faulty fuel supply: petrol product	0	3
Faulty leads to equipment or appliance	0	20
Fire (the nature of the fire is unspecified)	591	0
Heat source and combustibles brought together deliberately	0	101
Human (accidentally/carelessly setting off alarm)	727	0
Natural occurrences (sunlight, friction etc.)	0	4
Negligent use of equipment or appliance (heat source)	4	22
Not applicable	0	3
Other	0	31
Other intentional burning going out of control	5	4
Overheating, unknown cause	11	60
Person too close to heat source (or fire)	0	1
Playing with fire (or heat source)	0	1
System: heat (fire detection system)	1	0
System: other (fire detection system)	425	0
Unknown	497	0

Variable: 'Amount of damage'

With regard to the variable 'Amount of damage'. This was a new variable created to reflect the same variable present in the LFRSData made up of 13 codes. Each record where damage could have taken place was assessed and assigned into one of the codings for the amount of damage to create the new variable. The codings are listed in Table 6.5.

Table 6.5.: Details of coding used in the variable: Amount of damage

Variable: Amount of damage in m^2	Coding	No. of records in the LUData	No. of records in the LFRSData
No damage	0	2459	70
Up to 5	1	680	229
6 to 10	2	6	56
11 to 20	3	0	41
21 to 50	4	0	40
51 to 100	5	0	42
101 to 200	6	0	25
201 to 500	7	0	15
501 to 1000	8	0	14
1001 to 2000	9	0	10
2001 to 5000	10	0	5
5001 to 10,000	11	0	3
Over 10,000	12	0	1

Variable: 'Costing of damage'

With regard to costing of damage, it was thought desirous to infer how much the amount of fire damage in the LUData was costing in financial terms. The location of 75.6% of the fire incidents records were recorded as being in the property type; Student Hall of Residence, so this made it easy to postulate the consequences of a small fire in a student bedroom or common kitchen. Such an incident would involve the replacement of certain electrical and wooden items; cooker, microwave, table, bed, desk and so on, cleaning and re-decoration of the room and the replacement of firefighting media. There would also be the inherent cost of the University staff who dealt with the incident and the fire and rescue service (if they were requested to attend the incident) and any residual costs incurred with the 're-housing' of the student. This was not to denigrate the cost to the student in terms of lost

coursework, destroyed or damaged by heat, smoke or water but the value of that was impossible to evaluate.

A value of £1000 was decided on as the value of a fire that caused up to 5 square metres of damage (Code 1 in Table 6.5) and £2000 for a fire that caused between 6 and 10 square metres of damage (Code 2 in Table 6.5). Some estimated costs can be seen in Table 6.6. These were thought to be reasonable values for the consequences of a fire in students accommodation.

Table 6.6.: Estimated costs resulting from a fire in student accommodation

Details of cost	Estimated cost
Replacement/maintenance of cooker/microwave	£200
Replacement of table/bed/desk	£200
Cleaning and re-decoration of room	£200
Servicing of fire extinguisher	£20
Cost of university staff	£200
Cost of re-housing student	£200
Replacement of miscellaneous items (stationery, clothes etc.)	£200

6.2.3. How many records in the LUdata

The data acquired from Loughborough University are the records for each fire incident on the university campus during the period from 2005 to 2011. However, the years 2005 and 2011 were not complete years so were discarded leaving five complete years from 2006 to 2010. The original data amounted to 3750 records but with the removal of the 2005 and 2011 records, the data was reduced to 3148 records.

Table 6.7.: Number of records in the LUdata

Year	Number of records
2006	611
2007	693
2008	628
2009	649
2010	567
Total	3148

6.3. Results

The charts on the following pages represent the result of analysing and comparing the fire incident data from Loughborough University between January 2006 and December 2010 and fire incident data from Leicestershire Fire and Rescue Service between April 2009 and March 2012.

6.3.1. Comparisons between LUData and LFRSData

6.3.1.1. Comparison of the consistency of data

The two sets of data, LUData and LFRSData, were incongruent, in their acquired states, in terms of the time periods that they covered. The LUData contain records from January 2006 to December 2010 whilst, the LFRSData contain records from April 2009 to March 2012. This means that the data only coincide from April 2009 to December 2010, a period of 18 months. So the question was asked; were the data compatible and in sufficient agreement that they could be held to be credible when LUData was compared against LFRSData.

Two charts were prepared showing the number of fire incidents per month for all the years in both sets of data to look for consistency in the data (see Figure 6.1). The average number of fire incidents for each month was calculated and the cells of the chart annotated to show whether or not the number was equal to, or above or below the average number:

- In the case of the LUData 55% of the records indicated average or above average (denoted by a dark grey coloured cell) and 45% of the records indicated below average (denoted by a white cell).

- In the case of the LFRSData 58.3% of the records indicated average or above average (denoted by a dark grey coloured cell) and 41.7% of the records indicated below average (denoted by a white cell).

This indicated a consistency of data but examination of the distribution of dark grey cells in the two charts also showed consistency because the average number of cells for each year in the LUData calculated to 6.6 and, in the LFRSData, calculated to 7.

114

Lastly, each of the charts indicate a trend of reducing numbers from the earlier to the later years; this also indicates a consistency between the two sets of data.
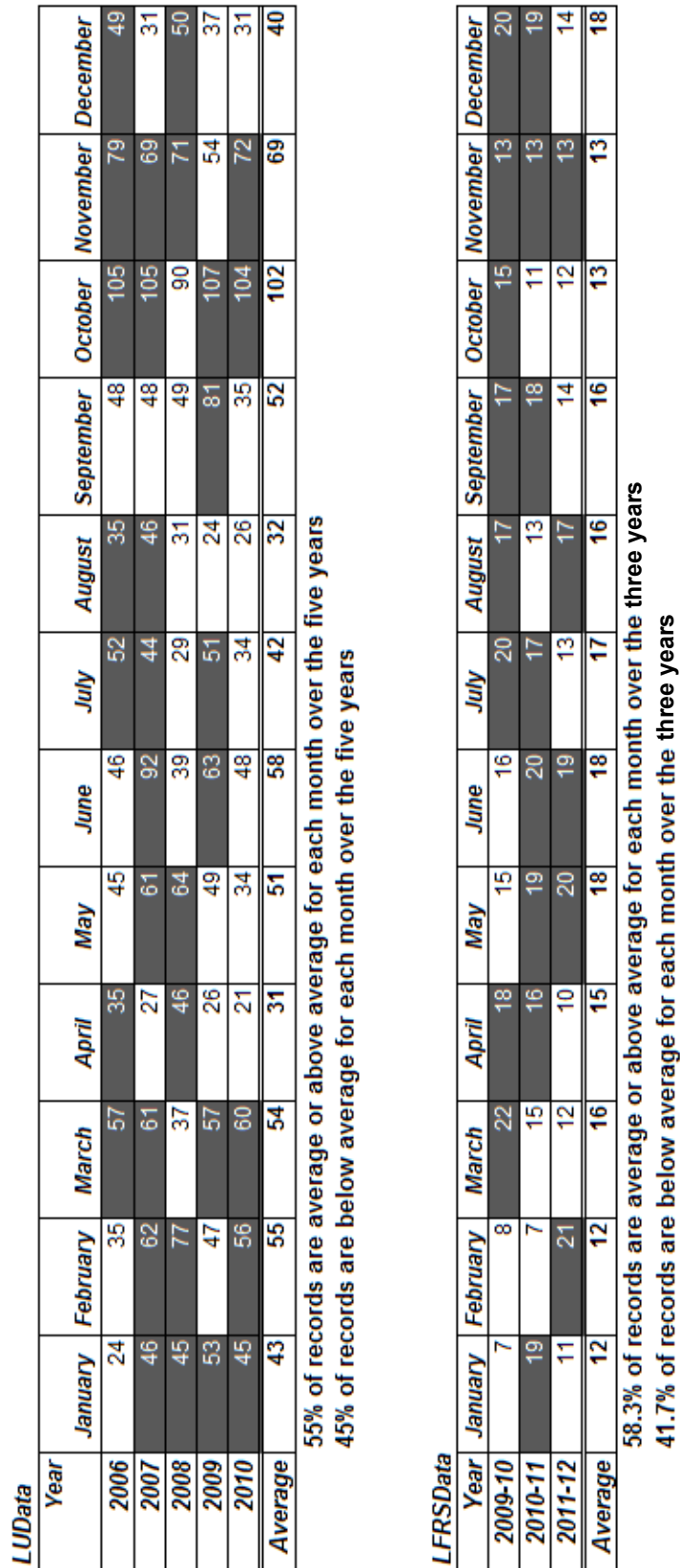
LUData

Year	January	February	March	April	May	June	July	August	September	October	November	December
2006	24	35	57	35	45	46	52	35	48	105	79	49
2007	46	62	61	27	61	92	44	46	48	105	69	31
2008	45	77	37	46	64	39	29	31	49	90	71	50
2009	53	47	57	26	49	63	51	24	81	107	54	37
2010	45	56	60	21	34	48	34	26	35	104	72	31
Average	43	55	54	31	51	58	42	32	52	102	69	40

55% of records are average or above average for each month over the five years
45% of records are below average for each month over the five years

LFRSData

Year	January	February	March	April	May	June	July	August	September	October	November	December
2009-10	7	8	22	18	15	16	20	17	17	15	13	20
2010-11	19	7	15	16	19	20	17	13	18	11	13	19
2011-12	11	21	12	10	20	19	13	17	14	12	13	14
Average	12	12	16	15	18	18	17	16	16	13	13	18

58.3% of records are average or above average for each month over the three years
41.7% of records are below average for each month over the three years

Figure 6.1.: Consistency comparison between the two datasets

6.3.1.2. Comparison of the amount of damage

Figure 6.2 shows a comparison between the two datasets, regarding the amount of recorded damage, the data has been turned into percentages so that the comparison is meaningful. There is no damage above 6 to 10 square metres recorded in the LUData.
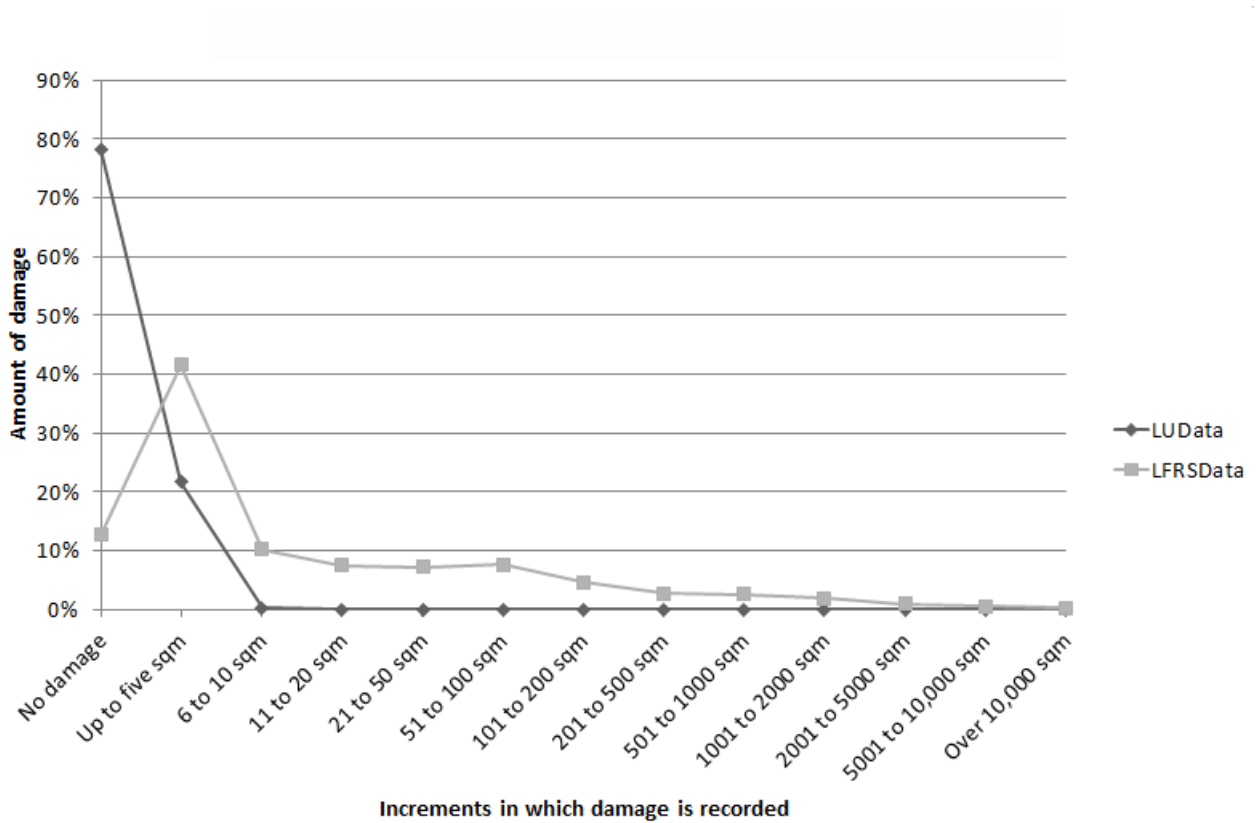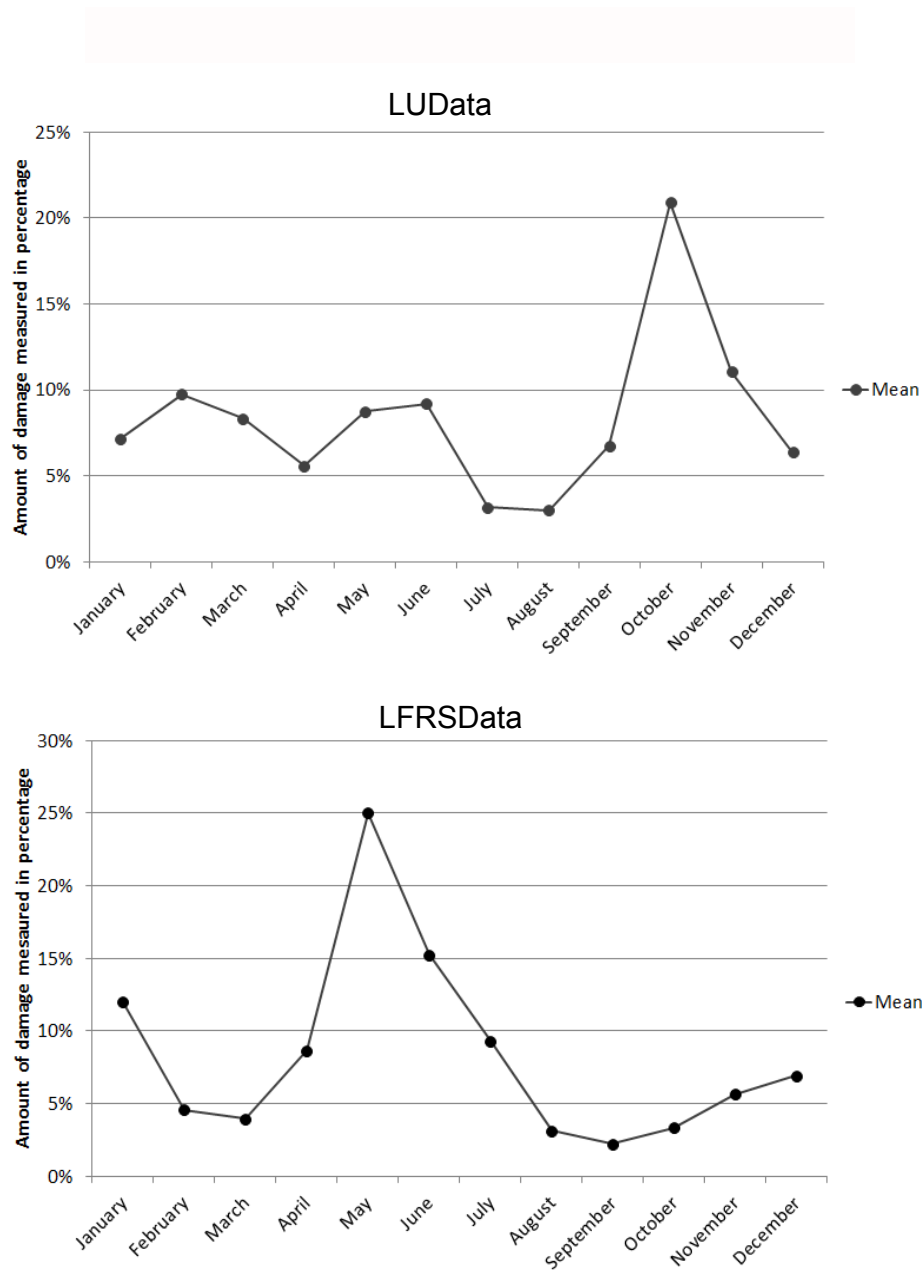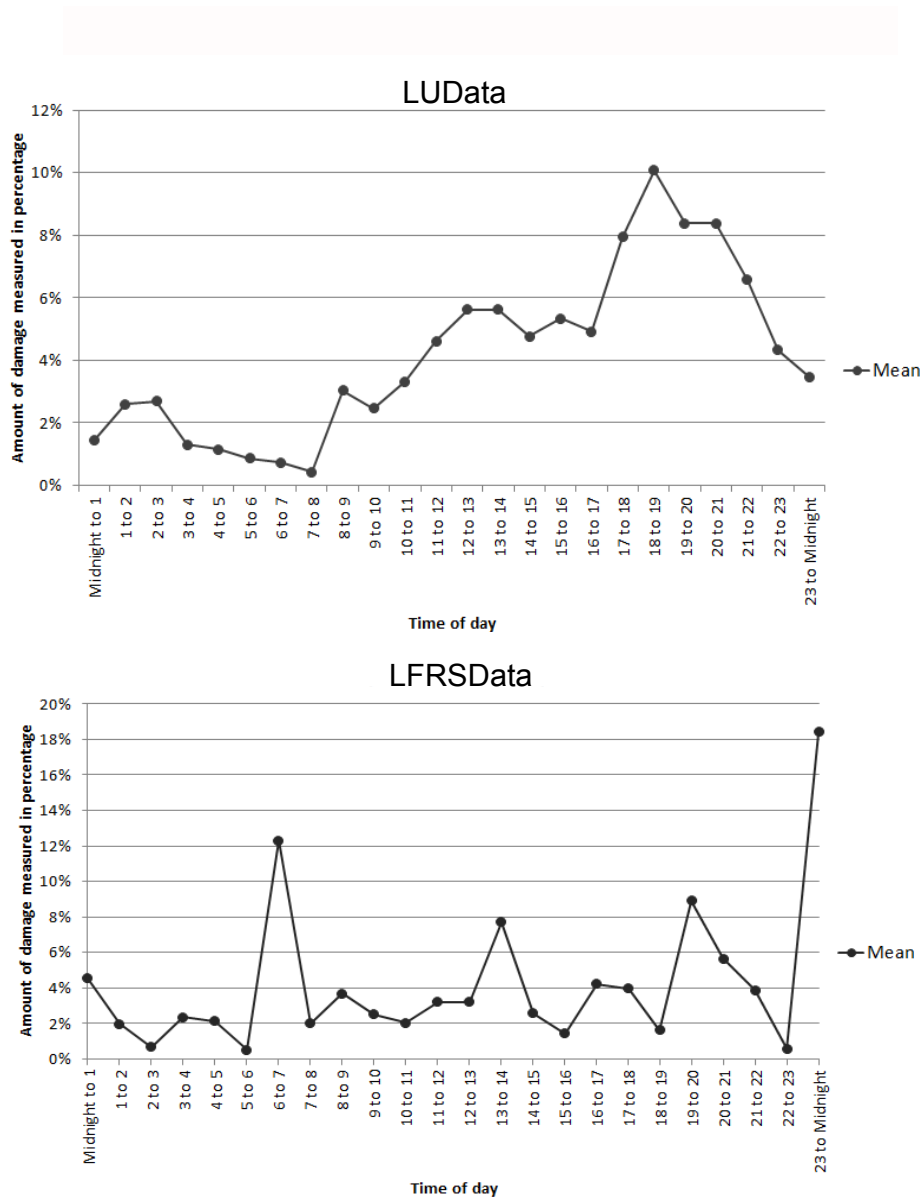

Figure 6.2.: Comparison of the mean amount of damage

6.3.1.3. Comparison of the amount of damage per property type

Figure 6.3 shows a comparison between the two datasets, regarding the mean amount of damage recorded against property types; the amount of damage is shown as a percentage. The largest amount of damage in the LUData is recorded against the property type; Student Hall of Residence. The largest amount of damage in the LFRSData is recorded against two property types; Industrial manufacturing and Industrial processing.
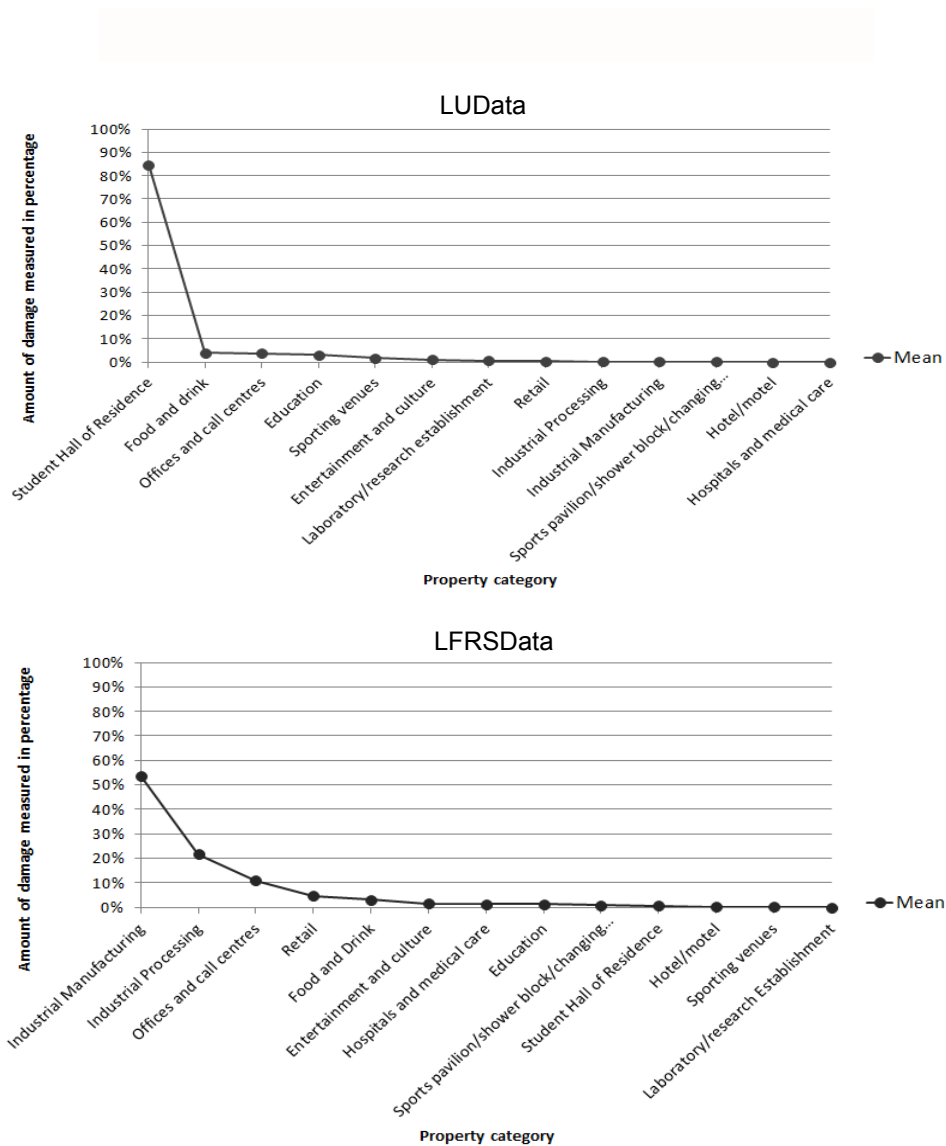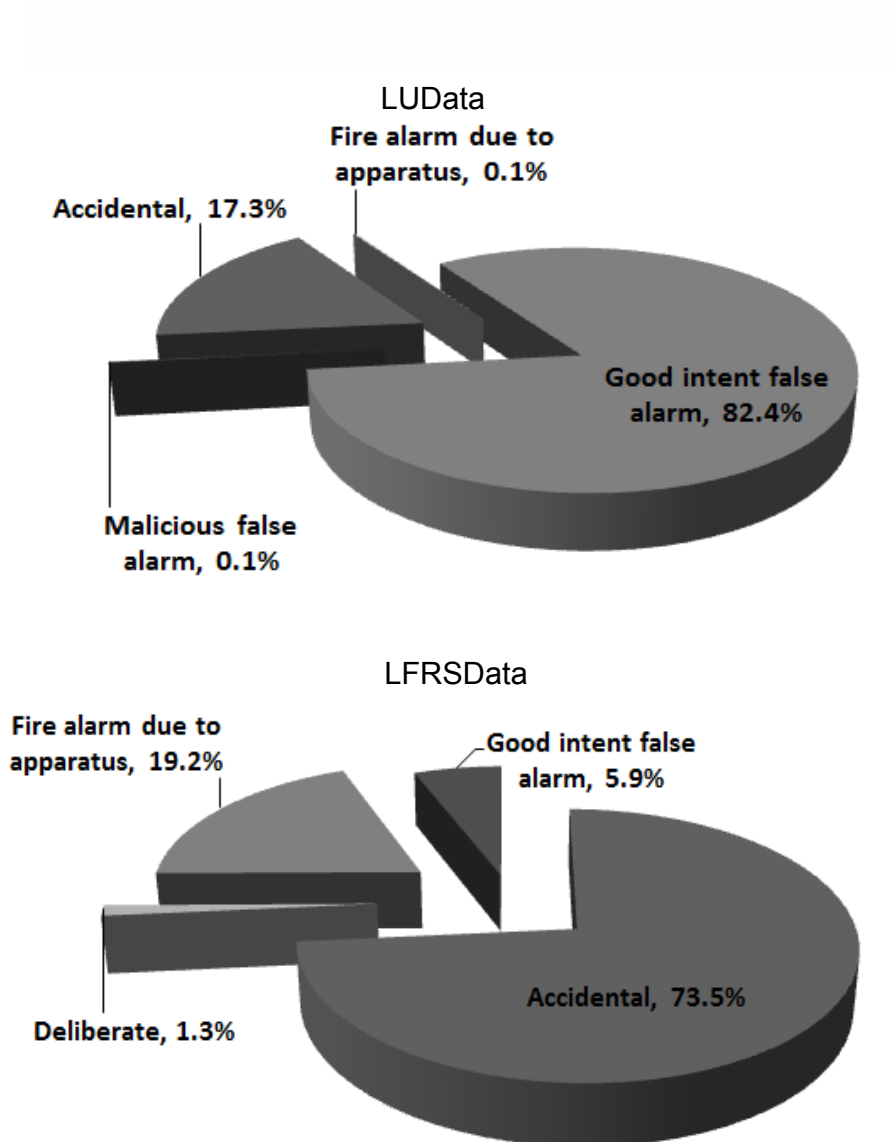

Figure 6.3.: Comparison of the mean amount of damage per property type

6.3.1.4. Comparison of the amount of damage per month

Figure 6.4 shows a comparison between the two datasets, regarding the mean amount of damage recorded against the month; the amount of damage is shown as a percentage. The largest amount of damage in the LUdata occurs in October. The largest amount of damage in the LFRSData occurs in May.

Figure 6.4.: Comparison of the mean amount of damage per month

119

6.3.1.5. Comparison of the amount of damage per time of day

Figure 6.5 shows a comparison between the two datasets, regarding the mean amount of damage recorded against the time of day; the amount of damage is shown as a percentage. The largest amount of damage in the LUData occurs between 16:00 and 22:00. The largest amount in the LFRSData occurs between 23:00 and Midnight but there is a peak of activity between 05:00 and 07:00.

Figure 6.5.: Comparison of the mean amount of damage per time of day

6.3.1.6. Comparison of the amount of damage per incident type

Figure 6.6 shows a comparison between the two datasets, regarding the mean amount of damage recorded against the type of incident; the amount of damage is shown as a percentage. The largest amount of damage in the LUData occurs as a result of 'Good intent false alarm'. The largest amount of damage in the LFRSData occurs as a result of 'Accidental'.

Figure 6.6.: Comparison of the mean amount of damage per incident type

6.3.1.7. Comparison of the amount of damage per incident cause

Figure 6.7 shows a comparison between the two datasets, regarding the mean amount of damage recorded against the cause of the incident; the amount of damage is shown as a percentage. The largest amount of damage in the LUData is caused by 'Fire'. The largest amount of damage in the LFRSData is 'Heat source and combustibles brought together deliberately' and 'Combustible articles too close to heat source (or fire)'.
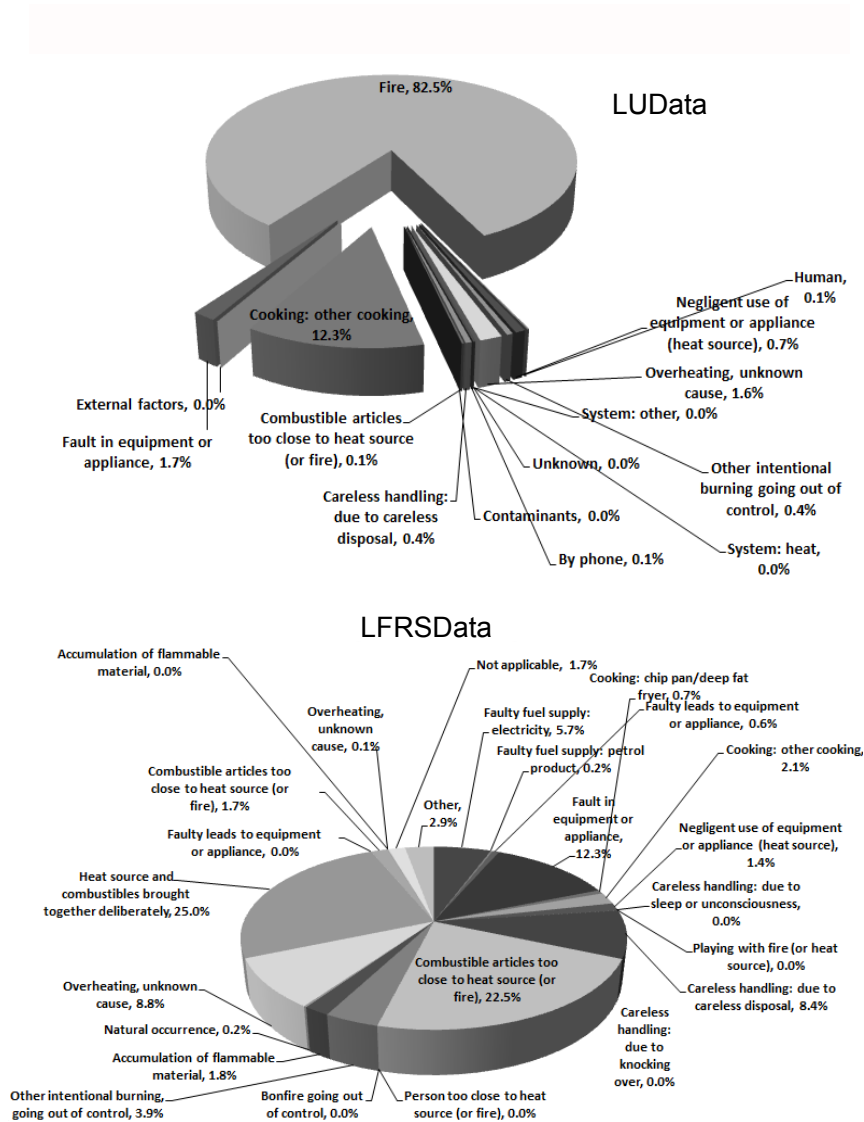
Figure 6.7.: Comparison of the mean amount of damage per incident cause

6.3.2. The amount of damage In the LUData expressed in GBP

6.3.2.1. Amount of damage per property category expressed in GBP

Figure 6.8 shows an estimate of the cost of damage to Loughborough University based on the amount of damage to each property type. The cost has been calculated using the arbitrary sum of £1000 to represent a unit of damage[4]. The largest cost comes from fire damage associated with the property type; Student Hall of Residence. This amounts to about £120,000, averaging £24,000 per year.
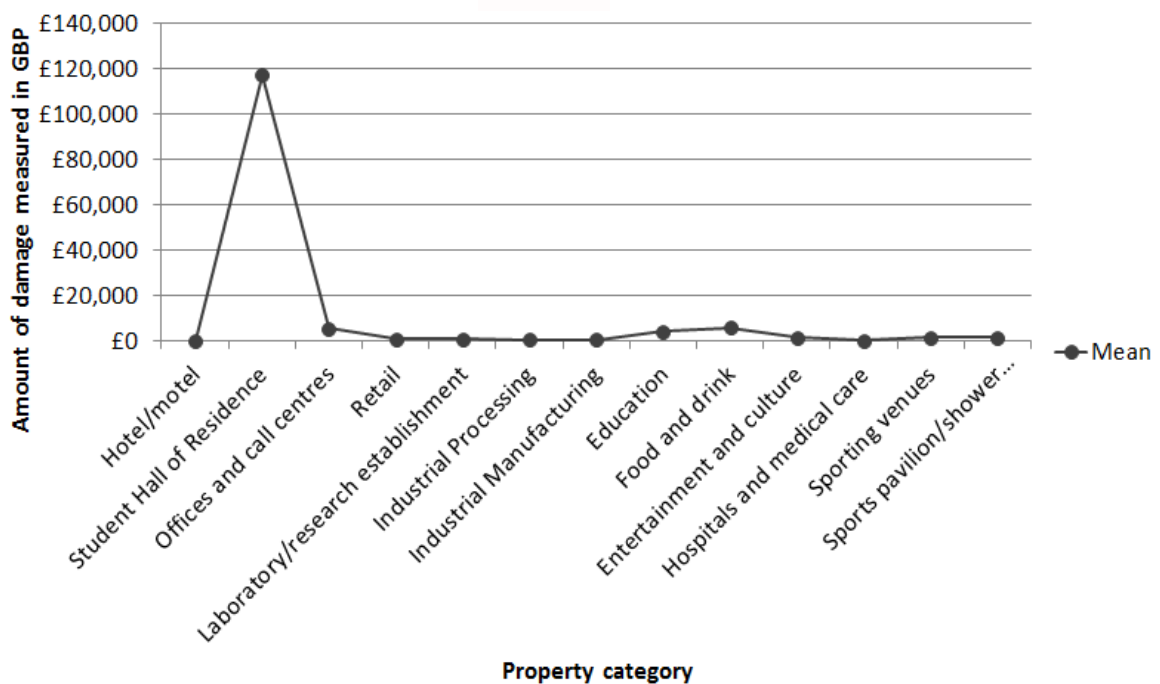
Figure 6.8.: The mean amount of damage per property category expressed in GBP (LUData)

---

[4]To see how the £1000 unit was arrived at see 113

6.3.2.2. Amount of damage per month expressed in GBP

Figure 6.9 shows an estimate of the cost of damage to Loughborough University based on the amount of damage to each property type. The cost has been calculated using the arbitrary sum of £1000 to represent a unit of damage[5]. The largest cost comes from fire damage associated with the months of October and November. This amounts to about £220,000 averaging £44,000 per year.
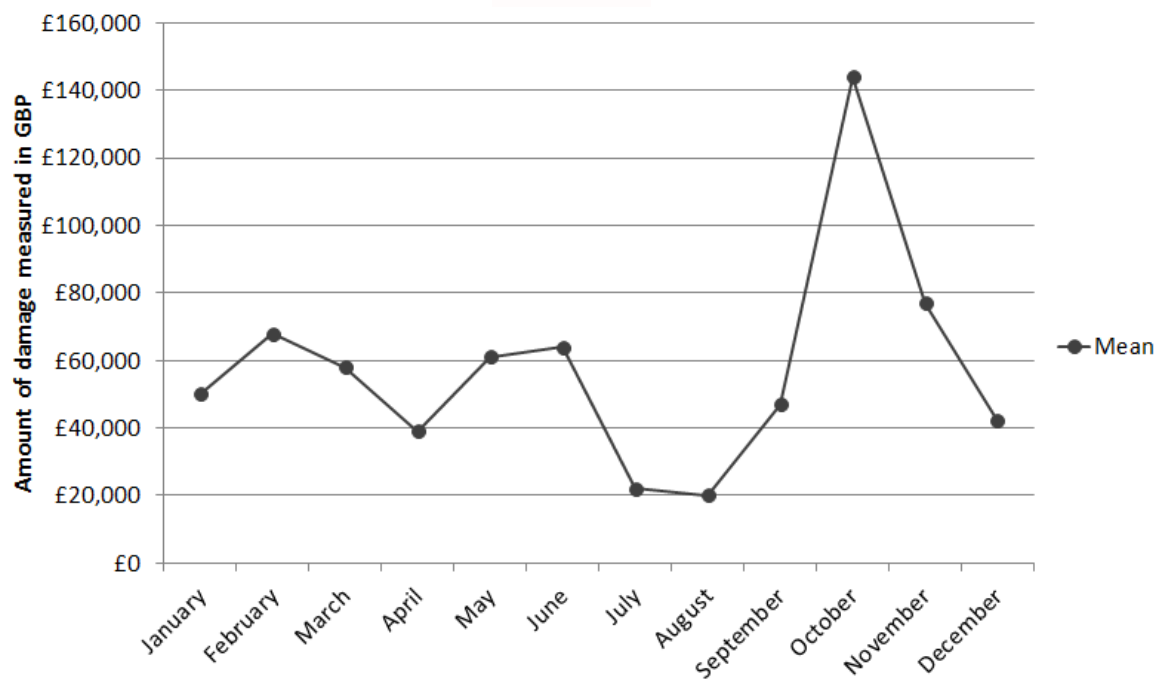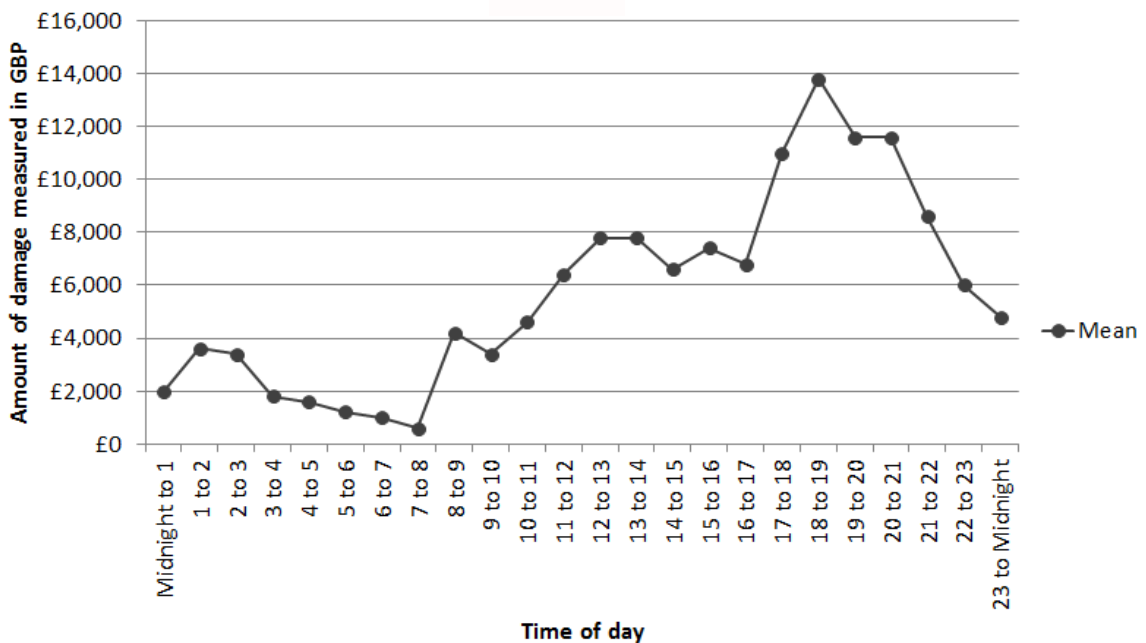

Figure 6.9.: The mean amount of damage per month expressed in GBP (LUData)

---

[5]To see how the £1000 unit was arrived at see 113

6.3.2.3. Amount of damage per time of day expressed in GBP

Figure 6.10 shows an estimate of the cost of damage to Loughborough University based on the amount of damage to each property type. The cost has been calculated using the arbitrary sum of £1000 to represent a unit of damage[6]. The largest cost comes from fire damage associated with the period of time between 16:00 and 22:00. This amounts to about £56,500, averaging £11,300 per year.
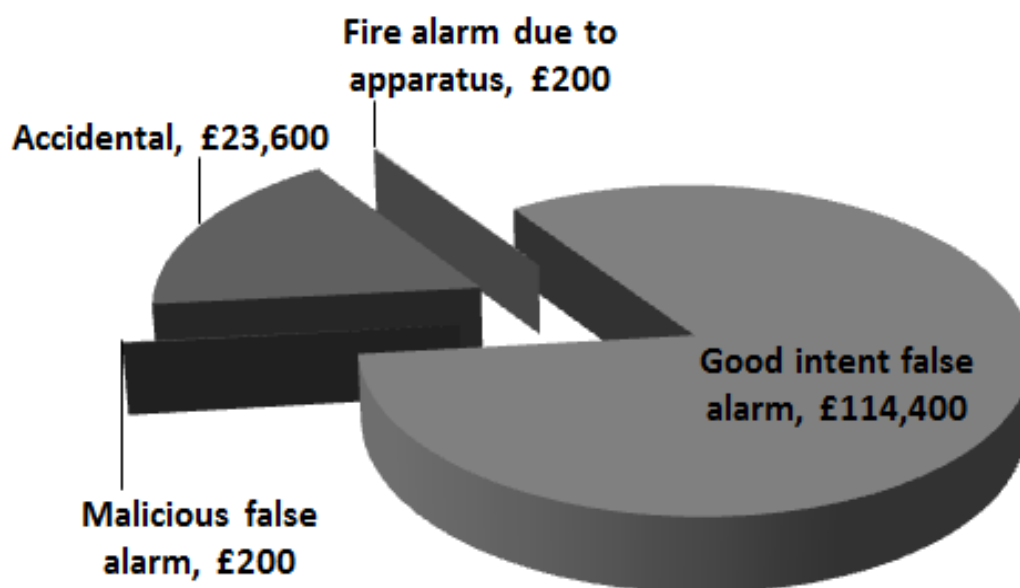

Figure 6.10.: The mean amount of damage per time of day expressed in GBP (LUData)

---

[6]To see how the £1000 unit was arrived at see 113

6.3.2.4. Amount of damage per type of incident expressed in GBP

Figure 6.11 shows an estimate of the cost of damage to Loughborough University based on the amount of damage to each property type. The cost has been calculated using the arbitrary sum of £1000 to represent a unit of damage[7]. The largest cost comes from fire damage associated 'Good intent False alarm'. This amounts to about £114,000, averaging £22,800 per year.
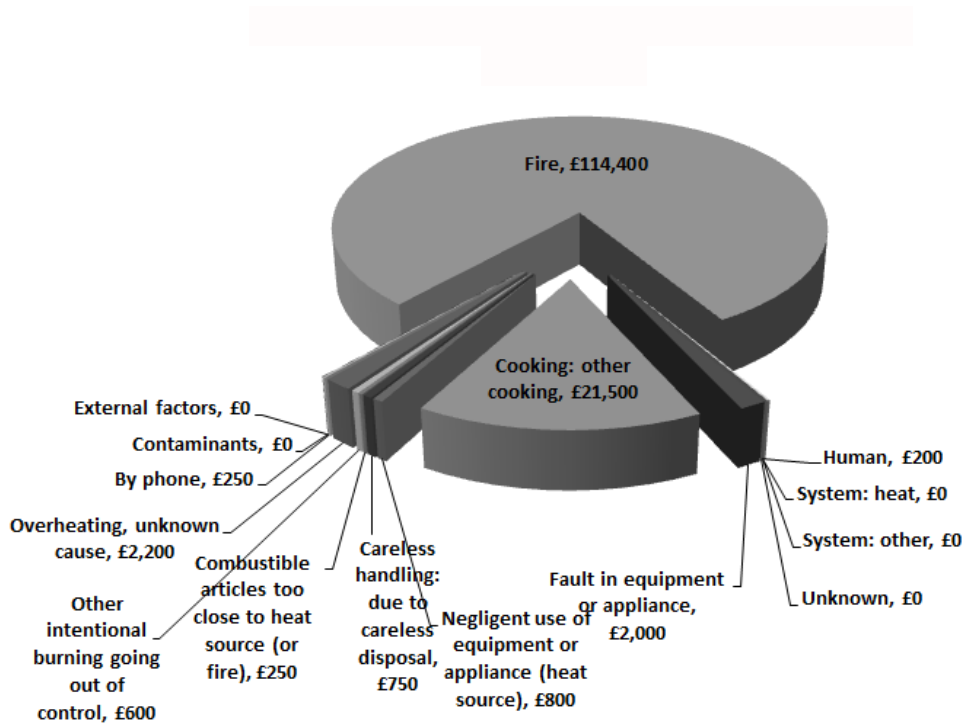

Figure 6.11.: The mean amount of damage per type of incident expressed in GBP (LUData)

---

[7]To see how the £1000 unit was arrived at see 113

6.3.2.5. Amount of damage per cause of incident expressed in GBP

Figure 6.12 shows an estimate of the cost of damage to Loughborough University based on the amount of damage to each property type. The cost has been calculated using the arbitrary sum of £1000 to represent a unit of damage[8]. The largest cost comes from fire damage associated 'Fire'. This amounts to about £114,400, averaging £22,900 per year.

Figure 6.12.: The mean amount of damage per supposed cause expressed in GBP (LUData)

---

[8]To see how the £1000 unit was arrived at see 113

7. Analysis

7.1. The Delphi process

The results of the Delphi process are based on subjective opinion and not supported by statistical evidence. It could be argued that this is no better than the subjective opinion of any person professing an opinion. What gives the opinion of the Delphi panel its edge is the calibre of the panel members and the process through which the opinion was gained.

An effort was made to gather together significant people with experience and influence in the field of fire safety management. The competence and calibre of the panel members is demonstrably high and between them, they have much experience, gained primarily in the UK, in either managing fire safety or regulating others who manage fire safety. The mix of people was thought to reflect the present situation in the UK amongst those who have most influence on the practice of fire safety management.

The panel was made up of either academics with a specialism of the subject, current or past practitioners of the subject or regulators of the UK legislation in England and Wales; the Regulatory Reform (Fire Safety) Order (2005), which is dominated by the subject.

All panel members had been involved in assessing and reporting on the standard of fire safety management in commercial, public and heritage buildings. Almost 90% had assessed and reported on fire safety management in more than 50 buildings. So in an administered process and in relative comfort the panel have:

- considered a list of categories of fire safety management purporting to cover the scope of the subject;
- given their opinion on the suitability and appropriateness of the categories;
- considered their initial responses in the light of the other members' responses;

- had the opportunity to alter their responses without embarrassment and without knowing whose response has influenced them.

It has to be accepted that an individual of the same calibre as the average panel member could easily dispute the results having arrived at a different conclusion. Their conclusion would be based on their unique blend of knowledge and experience but it would not be invested with the same authority. The value of the panel's conclusion lies in the fact that it has been deliberated on and accepted by a peer group of specialists having had the opportunity to alter their individual judgement in the light of the judgement of others. Whether or not it is correct will be answered in the light of experience when sufficient statistical evidence has been collected to either validate or negate the opinion of the panel.

The usefulness of the conclusion is that it can be assumed to be correct because it is an authoritative determination and can be used confidently as a foundation in the process of measurement. It enables the process of determining what categories to focus on, what variables should be exploited and what is the best way to collect them.

7.1.1. Analysis of the Delphi process

An aspiration of this thesis is that the categorisation of the ten categories of fire safety management achieved as a result of the Delphi process, should be accepted as the authoritative categorisation of fire safety management. The categorisation warrants the status of authoritative because of the experience and knowledge of the members of the Delphi panel who deliberated on it, and the rigour with which the process was administered.

The starting point for the panel was the Howarth model of fire safety management devised by Howarth (1999) on page 70. This model was chosen because of its extensive range and its exhaustive categories. The model itself had emerged from a capable and knowledgeable thesis put together by a retired fire officer who had specialised, during his fire service career, as a fire safety officer. He had used the opportunity of study to examine the fire safety standards present in passenger interchanges throughout Europe and had put together a system of measuring the management of fire safety so that some comparison between the passenger interchanges could be made.

It is worth noting that, during the process of peer review for the paper written to promulgate the Delphi process results, one of the peer reviewers questioned the comprehensiveness of the ten categories, asking if there was an eleventh category. This, of course, remains unknown, but the very reason for asking a panel of experienced and knowledgeable people in the field to consider the subject was to reduce this unknown as much as possible.

The results of the Delphi process are given in Chapter 4 on page 72 but the Delphi process threw up a number of issues that had to be settled first. The following subsections throw some light on these issues.

7.1.2. The Regulatory Reform (Fire Safety) Order (2005) (RRFSO)

During the process of administration it appeared, to the administrator (i.e the author of this thesis), that there was a general acceptance, among some panel members, that the Regulatory Reform (Fire Safety) Order (2005) regulated the whole scope of fire safety management. This was disappointing but, perhaps, inevitable because the Regulatory Reform (Fire Safety) Order (2005) has such a large impact on the professional lives on all of the panel and, indeed, in the UK fire industry as a whole.

The components of fire safety management mentioned in the articles of the Regulatory Reform (Fire Safety) Order (2005) do not cover the whole scope of fire safety management as set out in the Howarth model on page 70. For example, the Regulatory Reform (Fire Safety) Order (2005) does not directly regulate, for instance; the organisation of a company with regard to fire safety; the reporting and investigation of fire incidents; the allocation of a fire safety budget; the carrying out of a fire safety audit and so on, all components of the Howarth model. It could be argued that the provision of these components is inferred by the Regulatory Reform (Fire Safety) Order (2005) because they are intrinsic to a good fire safety management system but the argument lacks vigour because there is no offence incurred if, for example, there is no fire safety budget or no audit schedule in place. Whereas, if there is no suitable and sufficient risk assessment in place, there is a definite breach of the regulation. As a result of becoming aware of this and because of the dominance of the legislation in England and Wales, the panel requested that each category should be referenced to the relevant Articles in the Regulatory Reform (Fire Safety) Order

(2005) (see Subsection 4.3.2 on page 74).

The dominance of the legislation also prompted a further question; whether a category that was aligned with the articles in the Regulatory Reform (Fire Safety) Order (2005) qualified that category for special significance. The question was soon settled by the panel, however, who decided that elements of fire safety management which were a statutory duty under UK legislation should be measured commensurately with elements which were not a statutory duty. This was decided on the basis that whether a category assumes special significance or not should be determined by objective evidence and not by legislation or subjective opinion.

7.1.3. Definition of each category

A balance regarding the definition of each category was sought. The wish of the administrator was that each category should not be over-defined because, no matter how authoritative the resultant categorisation was, it would always be a subjective definition of a subjective subject based on the collective knowledge and experience of the panel. It remains the administrator's wish that each category becomes defined by objective (statistical) evidence over time. This made it imperative that the initial definition was sufficient to indicate the breadth of the category but with only enough depth to delineate it from the other categories. The panel determined that the descriptors for each category should be brief and concise rather than comprehensive and this was achieved mostly by use of the phrase *"There should be evidence of ..."*; this grammatical mechanism resolves the components that should be evidenced but not what the evidence should be (see Sub-section 4.3.2 on page 74).

Another important matter resolved by the panel in connection with the definition of the category was the question of whether the meaning, nature and significance of each category should be its relationship with its heading or whether it should be what was contained in its descriptor. The panel determined that the relationship should be with the category heading because objective evidence collated over time may displace what is contained in the descriptor.

7.1.4. Communications and information

The inclusion of a fire warning system under the category heading of 'Communications and information', as included in the Howarth model, was seen as inappropri-

ate by some panel members. The debate centred around the semantics of the word *communications* because some members thought that this category was more about human dialogue and conversation rather than the sounds made by a mechanical system. There was even some reference to a different point of view on this point under Scottish legislation and that reference to a fire warning system was more appropriate under some other heading otherwise it could cause confusion. The suggested heading being the category; 'Emergency plans and fire procedures'. However, after deliberation the panel agreed that the reference to a fire warning system was appropriate under the heading of 'Communications and information'.

7.1.5. Fire prevention

During the process the panel members were asked whether they thought that the concept of *fire prevention* was already included as a function of the category; 'Reporting and investigation of fires. They determined that it was not and that it should not be included because *fire prevention'* was a proactive activity and 'Reporting and investigation*'* were reactive activities. Some members were of the opinion that it was a function of the category 'Risk assessment' because this was a mechanism that evaluated the likelihood of a fire occurring and fire prevention was a form of risk control.

In fact, this point was never settled during the process. The conclusion was that there were two alternatives and further work needs to be done to determine the most appropriate one. Either:

1. that *Fire prevention* should be split up into discrete parts and included in more than one category; or

2. that *Fire prevention* should exist in its own distinct category.

7.1.6. Consensus

There were many important items deliberated on during the process and it was the task of the administrator to decide when a consensus of opinions was evident. However, there is no definition of a consensus in the Delphi method. In general, a consensus can mean a general agreement of opinions, an opinion shared by the majority of participants or a stability of opinion as suggested by Scheibe (1975). In

the case of this Delphi process, a consensus was taken to be the general summation of opinions, in respect of the issue under consideration., These were distilled into one opinion and fed back to the panel for agreement. Absence of objection to this opinion was taken to be confirmation that there was a consensus.

7.1.7. Potential benefits

Measuring fire safety management offers a number of benefits. Types of property or business can be profiled in a way that corresponds with their measurement of fire safety management. The profiles that result in the greatest amount of fire damage could be offered advice and guidance about how to alter their management model so that the threat of fire could be reduced. Improving fire safety management is a solution because it will result in fewer ignitions requiring fewer responses by the fire and rescue service and, by inference, less damage by fire. Fewer responses will also allow the fire and rescue service to focus on their proactive resources to maintain and enhance the improvement in fire safety management. However, a subject such as fire safety management can only be measured accurately if it is distinctly and definitively categorised and the categorisation will only be utilised by fire safety managers and the fire and rescue service if it is supported by relevant, statistical evidence.

7.2. The interviews: Discussion

The interviews were carried out in order to gain a better understanding of the motivation of the participants who have influence on the management of fire safety in England and Wales, particularly on the Loughborough University campus. There were four interviews and they were executed in the order in which they are set out in this thesis. This chronology was deliberate and it allowed the first interviewee, the university fire safety manager, to set the tone against which the other interviews were compared. The author felt that this was important because this one interviewee had the responsibility of solving the day to day practical problems of fire safety management in a large organisation. The only other interviewee who also had day to day responsibility for fire safety management was the district fire officer who had day to day responsibility on three fire stations. This was significant but not on the scale of the hundred or so buildings on the Loughborough University campus.

With regard to the motivation of each of the interviewees and particularly their impact on the Loughborough University Campus:

The university fire safety manager has direct control over the management of fire safety on the university campus so his motivation stems from his professionalism, the incentive of performing well and the accountability to his management hierarchy.

The district fire officer is motivated by the number of emergency responses to the campus whether for actual fires or for false calls. An increase in the number of calls (to actual fires or to false alarms) would prompt him to investigate further in an effort to reduce them.

The senior fire safety officer is motivated by the interpretation and implementation of Government fire safety policy and the administration and enforcement of fire safety legislation throughout Leicestershire. He has no specific affinity with the university campus but in that respect his motivation stems from the way that the university fire safety manager interprets and implements fire safety legislation.

The consultant fire engineer has spent a proportion of his career working for the Fire Protection Association (FPA). This is the body set up to advise the insurance industry on matters to do with all aspects of fire in construction. His opinion was sought because of his experience working with insurers in respect of fire safety. Another advantage was that he was also familiar with the university campus. The motivation of the insurance industry is to ultimately make a profit from the process of transferring the financial risk of loss for a payment. As it transpires in the interview, the insurance industry has very little concern of the quality of fire safety management in any building and so has little influence on the university fire safety manager.

7.2.1. Analysis of the interviews

Question 1 (from Sub-section 5.3.1 on page 85) was designed to explore how each interviewee regarded the use of a fire safety management system in meeting fire regulations.

The university fire safety manager, not surprisingly, used to the rigorous management system of the university, used the regulatory framework as a steer on

what needed to be managed and how it should be managed. This approach prepared him for any occasional inspections by the fire safety officer but did not fully prepare him for the scrutiny of the management system that he is part of. The reason for this is because the regulatory framework does not cover the whole scope of fire safety management. The regulations focus on the conditions to satisfy adequate protection to life and do not cover the conditions necessary for the protection of property and assets or those necessary to protect against business disruption.

The district fire officer, it was interesting to note, focused as he was on the operational readiness of the three fire stations under his control, saw the question about fire safety management as being applicable to the operational readiness of those three fire stations. This is indicative and revealing of the two arms of the fire and rescue service; one arm being the operational reactivity of a fire-fighting force able to deal with a whole range of emergencies that may crop up within an urban environment at any time. The other arm proactively administering the enforcement of fire safety legislation in that same environment. The district fire officer clearly saw that his own role was an operational one and that the role of enforcement of fire safety legislation was a specialist role to be carried out by specialist officers.

The senior fire safety officer was keen to point out that he was working to bring about less regulation on business and commerce in line with the wishes of the current UK Government. He was confident that a competent fire safety officer, carrying out inspections, would not only think of protection to life but would also be thinking of the life of the building and the long-term health of the occupying business even though this was not a requirement of the legislation. He was also keen to point out the role of CFOA in their wish to assist and not hinder business in the UK.

The consultant fire engineer stated that the insurance industry's only interest in compliance with regulations was whether they had any impact on the potential financial risk from the destruction of the property by fire.

Question 2 (from Sub-section 5.3.2 on page 87) was designed explore the views of the interviewees on the limitations of a fire safety management system.

The university fire safety manager was under no illusions that a fire safety man-

agement system that was sufficient to satisfy the regulations was not sufficient to protect the university campus against the impact and consequences of fire. He gave the example of acetylene cylinders which could be found scattered around the university campus. These were used and stored within the relevant regulations but despite this, they contained the potential to disrupt the business continuity of the university for at least twenty-four hours if they became involved in a fire. He knew that wise management of acetylene and other such potential disrupters, was a requirement of a good fire safety management system.

The district fire officer understood that any business with an effective fire safety management system would be more likely to survive a fire incident.

The senior fire safety officer, on entering a building, allows his immediate assessment of the management of fire safety, to influence his dealings with the building occupiers. He sees this as a critical factor of fire safety management and the sign of an experienced fire safety officer. He prepares himself and his inspection team for building inspections by analysing fire incident data to determine the behaviour of fire in previous building fires. Specifically, he looks for the incidents where the fire has spread beyond its room of origin in the building and equates this with poor fire safety management. This is because the fire is most likely to spread when those aspects of fire safety management that should be under control, are not under control. These are things such as a fire door wedged open, or a breach in the compartmentation, or doors and windows left open when a building has been evacuated and so on. These aspects, and others, he recognises as being indicative of poor management of fire safety.

The consultant fire engineer suggests that the level of fire safety management has no bearing on the view taken by the insurance industry. The insurers view is that anything that depends on the involvement of humans is flawed because human error will mean that, at some point, a fire safety management system will fail and a destructive fire will ensue. What an insurer is influenced by is the fail-safe aspect of building materials and building design such as compartmentation.

Question 3 (from Sub-section 5.3.3 on page 88) was designed to explore the re-

136

lationship between the level of fire safety management and the level of fire damage.

All four interviewees were of the opinion that there was a correlation between the level of fire safety management and the amount of fire damage but with some provisos.

The university fire safety manager suggested that the aspect of fire safety management that reduced the amount of fire damage was a good standard of fire detection and close monitoring on those university buildings which, in his judgement, exhibited poor fire safety management.

The district fire officer thought a correlation existed but it was dependent on the type of property involved and whether a deliberate act had been perpetrated, designed to circumvent the fire safety management system in a building.

The senior fire safety officer used the example of a fire-resisting door to illustrate the correlation. If, because of a good standard of fire safety management, the correct fire-rated door was fitted and properly maintained as self-closing, it would carry out its appointed task and confine a fire to a defined area resulting in less fire damage. This was not likely to happen with a poor standard of fire safety management.

The consultant fire engineer also gave an example of the correlation by relating a story involving a university in southern England. This university was dependent on one of its buildings for 60% of its income stream. A fire occurred in the building that he described as a simple fire, because of where the fire occurred and when it occurred. The ignition source was a chemical reaction being supervised by a student, that ignited waste paper in a fume cupboard. The ignition could have been quickly and easily dealt with by a confident person with a modicum of training but instead the fire quickly got out of hand. Then, because of a series of other errors, introduced because of a lack of fire safety planning, caused the responding fire crews to distrust the information they were being told, forcing them to adopt a defensive approach to their firefighting. This approach resulted in the loss of the building and the immediate end to 60% of the university's income stream.

Question 4 (from Sub-section 5.3.4 on page 89) was designed to ascertain the interviewees' views on the current CFOA campaign to reduce unwanted fire signals

and whether they thought the campaign had an impact on the amount of fire damage?

The university fire safety manager thought that the success of the campaign was evident in the records of the university in the number of times that the assistance of the local fire and rescue service was requested. The current policy of the university was a result of the campaign and involved a system of trained fire marshals and security officers who investigated and dealt with fire signals both day and night. The assistance of the fire and rescue service was only requested when an actual fire was confirmed or a false alarm could not be confirmed.

However, this success had also created a problem in that because of the reduced number of times that the local fire crews attended the campus, there was a need to formally invite them on to the site so that they could familiarise themselves with the topography and facilities present on campus. In fact, a partnership between the university and the fire and rescue service had been set up to better manage the problem.

The district fire officer thinks that the campaign is advantageous in that it forces a company or an organisation to organise its attitude towards fire safety. Most likely, this causes a reduction in fire damage brought about by the process of putting extra effort into discovering a fire, training staff to deal with a fire and having the correct extinguishers ready to do so.

The senior fire safety officer also thinks that the campaign has caused a pressure on companies and organisations to prepare to deal with discovering and tackling small fires. The biggest impact has been on the alarm receiving centres (ARC) who are having to deal with the different ways that individual fire and rescue services are choosing to implement the policy. There has been little research on whether the campaign has caused a reduction in fire damage but the main driver of the campaign was to cut down on the movements of fire and rescue vehicles.

The consultant fire engineer also thinks that the campaign is forcing building owners to better manage their fire alarm systems and one effect of this is that building occupiers have more confidence in the effectiveness of their fire warning systems. He thinks that an increase in fire damage is likely to result from the policy because of the delay in calling the fire and rescue service being

built into the system.

Question 5 (from Sub-section 5.3.5 on page 91) was designed to explore the in-
terviewees' thoughts on the potential of a performance metric placed on the
fire and rescue service. The performance metric would evaluate and score
the efforts of companies and organisations to improve their efforts in business
continuity and a reduction in fire damage.

The university fire safety manager thought that such a metric would benefit the
university but would not work unless the fire and rescue service changed their
attitude in giving advice and encouragement to those who asked for it. The
current approach adopted by the fire and rescue service was to avoid giving
an answer and to put the onus back on the occupier who was advised to seek
help elsewhere. He thought that this situation was the result of the fire and
rescue service seeking to avoid liability, at some point in the future, for giving
incorrect advice.

The district fire officer said that there was no link between the fire and rescue
service and the management of a commercial site and that fire safety officers
knew too little about the technological solutions to fire safety problems to
have any influence. In any case, it was his opinion that an occupier of a
modern building would probably prefer to demolish the building following a
fire because it was the cheaper option. Also, the manner in which each fire and
rescue service was divided into geographical areas which were quite different
from each other, it was too difficult for one area to be measured against another
in such a way.

The senior fire safety officer could see the potential of indicating to others the
value of proactive resources in the fire and rescue service.

The consultant fire engineer thought that measurement of this aspect of the fire
and rescue service would encourage and motivate it to focus its resources in
a different, more proactive way. He suggested that the performance could be
measured in terms of monetary loss.

7.2.2. Relevant themes emerging from the interviews

The ten items reported in Chapter 5 on page 92, were brought out in the discussions surrounding the questions in the interviews. They have been gleaned from the transcripts of the interviews in Appendices 2 to 5 and set aside as a separate list. They represent diverse subjects but the author has tried to set them out in order of importance when viewed in the light of the subject of this thesis. For instance, the first five, itemised below, have the capacity to cause more or less fire damage in relation to the way that they are implemented:

- The dynamic risk assessment model (mentioned on page 92) used by the fire and rescue service discourages offensive firefighting unless it is justified. Offensive, rather than defensive firefighting, is where the firefighting is carried out within the hazardous area, for example, within a building that is on fire. This type of firefighting can be justified, and is considered to be normal in a house fire, for instance, where the risk posed to the firefighter is outweighed by the high likelihood that the effort can save lives or in an industrial property where the risks can be easily identified and resolved. However, in cases where there are no lives that can be saved or the risks within the property cannot be readily identified and are considered to be too great, then the firefighting is likely to be defensive firefighting. This is where the firefighters carry out their task from outside the hazardous area. Defensive firefighting inevitably leads to greater fire damage but valuing that damage is difficult as the only objective measure of it is the record in the IRS; that is, the measurement of horizontal area damaged by heat, smoke and water.

- The focus on life safety (mentioned on page 94) in legislation also impacts on the amount of fire damage because it creates an environment where there are no requirements for occupiers to make sure their buildings continue to exist following a fire. The legislation, in effect says that provided that everyone who is at risk can evacuate safely if fire breaks out, then there is no further requirement to make sure the building or business is fit for its purpose the next day. This is likely to lead to more fire damage because, sadly, many building occupiers will only carry out requirements insisted on by legislation.

- Unwanted fire signals (mentioned on page 94) are the subject of the CFOA policy to reduce the movements of fire and rescue vehicles where the call for assistance is likely to be a false call, usually from automatic fire warning

systems. However, in the cases where an actual call is treated as a false call, there is likely to be a delay in the response to the call and is likely to lead to a greater amount of fire damage.

- Competent fire safety management (mentioned on page 95) will either have resources and systems to deal with small fires and where this is not the case will have procedures to call for assistance from the fire and rescue service. This will keep the amount of damage and disruption caused by fires to a minimum and, in any case, kept to what is considered to be acceptable by the competent fire safety management system. The corollary to this is that an incompetent fire safety management will not keep the amount of fire damage or business disruption to a minimum.

- Estimated maximum loss (mentioned on page 96) is the insurer's phrase for the probable amount of loss that is likely if a fire occurs within a building. There is little incentive for the occupier to develop a well performing system for managing fire safety, because the insurer is unlikely to take this into account in the cost of the premiums. If the occupier knows that the fire insurance view is one that envisages the whole building burning down, the occupier is less likely to work towards preventing a fire occurring. The potential is that this could lead to a greater amount of fire damage.

The other items are all relevant to the subject but can be categorised differently from the five items listed above. For instance, the provision of fire safety information (mentioned on page 97) for the use of occupiers of newly constructed or extended buildings is a requirement of Approved Document B (2010) in England and Wales. This information should be the core of the fire safety strategy for a building; the details of fire equipment and systems need to be incorporated into a schedule of testing and maintenance, the design objectives need to kept in focus when alterations or extensions are planned, the evacuation assumptions need to be considered when the occupancy is changed and so on. Yet the requirement is for the provision of the information but there is little guidance on how the information should be utilised which is essential if its benefits are to be realised.

7.2.3. Priorities

As part of the interviews, the interviewees were asked to confirm the main priorities demanded of them by their role (see page 100). There were four distinct approaches to their roles.

The fire safety manager and the district fire officer both confirmed that their main priority was to meet the expectations that they felt were fundamental to their role. In the case of the district fire officer, there were formal performance targets set to assist in his management planning to meet the expectations. However, the details of those expectations were different. In the case of the fire safety manager the details were about preventing fire on the university campus and minimising the damage if fire did occur; in the case of the district fire officer the expectations were about the operational efficiency and effectiveness of the firefighting resources under his control.

This predominance on the reactive side of the fire and rescue service gives the district fire officer a different view of Loughborough University campus from the fire safety manager. The district fire officer looks at the university campus and sees the biggest risk as the risk to the lives of sleeping students and the difficulties involved in rescuing them. The fire safety manager, on the other hand, looks at the university campus and sees the disruption to business caused as a consequence of a fire as an equitable risk. Perhaps, this is because it is a more likely occurrence than a fire casualty in accommodation blocks that he considers are well fire-protected.

The senior fire safety officer saw one of his main priorities as tapping into the capacity in companies, organisations and the general public to be more responsible for their own safety. The other being to make sure that fire regulations are enforced throughout Leicester, Leicestershire and Rutland. This seems quite smart thinking because it is not difficult to see that if he achieves the former then the latter will become that much easier to enforce.

The consultant fire engineer, having been asked, of course, to think in terms of his former experiences working with insurers, was quite certain of the main priority of an insurer; that of running a business. So the priorities are to reduce the amount paid out by reducing the amount of damage and to satisfy the customer so that he stays as a customer.

The four interviewees are all players in the game of fire safety being played on the Loughborough University campus and they all, in some part, have influence on the

standard that is achieved. The standard that is achieved can be regarded as a normal standard simply by considering that:

- the fire safety manager is not under pressure because of abnormal fire losses;

- the district fire officer is not under pressure because his firefighting resources are not attending emergencies on the university campus too regularly in comparison with elsewhere;

- the senior fire safety officer has no pressing need to enforce fire legislation on the managers at Loughborough University;

- the university insurer's are not threatening to increase premiums because the losses through fire on the campus are considered to be too great.

Although very crude, this analysis of the current fire safety standard on Loughborough University represents tolerability in four of the main influencers of it. Therefore it actually represents a measurement of what could be considered as an average or an above average standard of fire safety management.

7.3. Case study: data analysis

The two sets of data, LFRSData and LUData, are dissimilar and have fundamental differences between them. The data sets are different because of the periods of time that they cover. However, the differences are resolvable and the datasets have been manipulated to produce comparable datasets.

Both sets of data record incidents in which a fire-fighting force was mobilised in response to an alarm or signal. In the case of Loughborough University, it is relatively easy to put into context the number of alarm activations in a certain type of property because the total number of that type of property present on the campus is known. This enables the reader to form an opinion regarding the magnitude of the data (see Table 6.2 on page 108 and Table 6.3 on page 109).

For instance; if the records showed that there were five fire incidents in one property type in one year and there were twenty buildings defined as that property type on the campus then the reader may form the opinion that five incidents in twenty buildings is quite a serious affair that would warrant further investigation. The difficulty is revealed in the LFRS data when the records show, for example, that there were fifty

fire incidents in one year with no knowledge of how many instances of that property type are present in the the Leicestershire building stock. The reader cannot form an identical opinion because the information is dissimilar. However, in any case it would be rash to imagine that the Loughborough University campus is a microcosm of Leicestershire County so any comparison between the two should be viewed with caution.

The LFRSData has been collected digitally via prescripted drop-down menus using the guidance in the Incident Recording System (2009) whilst the collection of the LUData has not been collected to a similar prescription.

7.3.1. Quality of records

The quality of the records in the LFRSdata is superior to the quality of the records in the LUData but there is insufficient information to claim that one set of records is more accurate than the other. The LFRSData is subject to much more scrutiny by LFRS itself but also because the data are submitted to Government and there is embarrassment if the data are found to be inaccurate. There is much less scrutiny in the case of the LUData but this gives no reason to believe that the records are any less accurate.

The main disadvantage with regard to the LUData is the format of the variables and the amount of data they contain. Many of the variables do not contain a full record, there is information missing in some of the variables for that record and many of the variables contained the same information but with spelling mistakes and/or slightly different grammar. Data cleansing was necessary for the LUData but not for the LFRSData which overcomes most of the problems by having prescripted phrases in the software used to collate the data.

7.3.1.1. Consistency of data

Figure 6.1 on page 116 gives information regarding the comparison of the two datasets. This shows the number of actual incidents per month for each of the periods in the two datasets. The average number for each month has been calculated and the cell shadings indicate which months have a below average number and which months have an average or above average number. Two items of interest stand out from this table:

- The figures are fairly consistent with, in the LUData, 28 cells below average and 32 cells equal to or above average; whilst in the LFRS data, there are 15 cells below the average figure and 21 cells either equal to or above the average figure. It is difficult to discern any trend to suggest that the average figure is increasing or decreasing in either of the datasets from year to year.

- The average figures are remarkably similar when comparing one dataset against the other. This is remarkable when you consider that one dataset records actual incidents on a university campus and the other records actual incidents for the whole of Leicester, Leicestershire and Rutland!

7.3.1.2. The amount of fire damage

The analysis compares the records in the LUData that record fire damage against the records in the LFRSData that record fire damage with regard to the amount of damage caused because of a fire. The term *amount of fire damage* needs some explanation because there are many consequences of fire that could arguably be identified as fire damage.

With regard to the LFRSData the variable used is that originating from the data collected to answer Question 8.25 on page 83 of the Incident Recording System (2009). The definition of fire damage for this variable is given as*:*

> *"the total horizontal area damaged (by flame and/or heat and/or smoke and/or water etc) in sq.m (at stop)".*

This definition needs some explanation of how it has been interpreted.

Fire damage has been interpreted as damage to the construction and the contents of a horizontal area of a property by heat, smoke and water. There is a time element involved in the definition given as; when the Incident Commander relays the verbal *Stop message* to Fire Control.

The assessment of damage is made by the Incident Commander at the scene of the incident. It is measured in square metres and it is hastily produced as a result of the circumstances in which it is made. The time the assessment is made has been taken as the point in time when the Incident Commander decides that *"no more help is required and that the personnel and appliances already in attendance or requested are sufficient, except for any necessary reliefs"*. This definition has been taken from the Fire Service Drill Book (1985).

With regard to the LUData, the definition of the amount of fire damage inherent in the LFRSData has been applied to the LUData records using the clues provided by the test contained in the records.

7.3.1.3. Amount of damage per property type

There are many more property types in the LFRSData that are not present in the LUData. The property types on the university campus reflect the specialist nature of such an organisation while the property types in the LFRSData reflect the whole range of properties necessary for people living in cities, towns and villages. Nevertheless, thirteen property types can be identified which can be compared against the LFRSData (see on page 118).

With regard to the mean amount of damage for each type of property, there is a Pareto distribution[1] reflected in the LUData regarding the amount of damage in one property type, that of the Student Hall of Residence. About 80% of the damage can be attributed to incidents in this one type of property.

In the LFRSData 85% of the damage is split between three types of property (Industrial manufacturing 53%, Industrial processing 22% and Offices and call centres 10%).

7.3.1.4. Amount of damage per month

Both sets of data can be divided into calendar months and although there are more months in the LUData (60 months) than there are in the LFRSData (36 months), because of the mathematical device of using percentages the two results are comparable.

With regard to the mean amount of damage for each month (see the chart on page 119), there is a peak of damage in the LUData in October (21%) and November (12%). In contrast there is a dip of damage in July (3%) and August (3%).

The LFRSData has three peaks; the biggest in May (25%), a smaller one in June (15%) and the smallest in January (12%). There is also a three-month dip in the LFRSData; August (3%), September (2%) and October (3%).

---

[1] A Pareto distribution demonstrates a power law that states that a majority (about 80%) of the effects come from a minority (about 20%) of the causes. This type of distribution has been identified in examples such as the size of cities, the magnitude of earthquakes, the frequency of forest fires, the distribution of wealth in a country etc.

7.3.1.5. Amount of damage per time of day

With regard to the mean amount of damage for the time of day (see the chart on page 120), most damage occurs in the evening between 17:00 and 22:00 with a peak of damage (10%) occurring between 18:00 and 19:00. The least damage, with an average amount of damage of 2%, occurring between midnight and 11:00.

The LFRSData has four peaks of damage; the highest peak occurring between 23:00 and midnight (18%), next highest between 06:00 and 07:00 (12%), next highest between 19:00 to 20:00 (9%) and the smallest peak of 8% between 13:00 to 14:00. The times of the day when the least damage (below 2%) occurs are spread throughout the day; 02:00 to 03:00, 05:00 to 06:00, 15:00 to 16:00, 18:00 to 19:00 and 22:00 to 23:00. These include three periods when the least amount of damage (0.5%) occurs; between 02:00 to 03:00, 05:00 to 06:00 and 22:00 to 23:00.

7.3.1.6. Amount of damage per type of incident

With regard to the mean amount of damage for each type of incident (see the chart on page 121), both sets of data indicate a Pareto distribution. In the LUData the incident type 'Good intent false alarm' accounts for 82.4% of the damage. In the LFRSData, the incident type 'Accidental' accounts for 73.5% of the damage and if you add the 5.9% of damage for the incident type 'Good intent false alarm', the two incident types account for 79.4% of the damage.

7.3.1.7. Amount of damage per incident cause

With regard to the mean amount of damage for each incident cause (see the chart on page 122), a Pareto distribution is again indicated in the LUData. The incident cause of 'Fire' accounting for 82.5% of the damage with the next largest cause of 12.3% of 'Cooking, other cooking'.

There is no such Pareto distribution in the LFRSData where the top three causes only account 59.8% of the damage. These are 'Heat and source combustibles brought together deliberately' (25%), 'Combustible articles too close to heat source' (22.5%) and 'Fault in equipment or appliance' (12.3%).

7.3.1.8. Profile of most likely source of fire damage

Analysing different characteristics of fire damage; the cause of an incident, the time of day or the month of the year etc. means that a profile of fire damage can be built up around the property of a company or an organisation such as Loughborough University campus. Already, a pattern can be seen to be emerging from the analysis that suggests that the most likely circumstance for fire damage to occur is caused by an incident in the early evening, in October, in a student's quarters. This can be further refined by describing the nature of the incident as a 'false alarm: accidental'. This could mean a smell of burning from an overheated light fitting or some burnt toast in a toaster or food in a pan or hot air from a fan heater or steam from a shower etc. These are all causes recorded in the LUData and expressed as 'false alarm: accidental'.

It may seem unusual and even incorrect that fire damage should be recorded against a false alarm but this is not so, the fact that an incident is a false alarm does not mean to say that there is no fire damage. Incident Recording System (2009) lists; overheating light/fitting; overheating appliance; fire elsewhere (not at location); toaster/toast; other cooking; controlled burning; air conditioning; steam; smoking chimney; reflected light/sun-light; other as possible reasons for recording false alarms made accidentally. All of these (except, possibly, air conditioning) involve damage by either heat or smoke or water and would attract a record in the dataset of the amount of damage.

The fire damage recorded in the LFRSData records the horizontal area affected by flame and/or heat and/or smoke and/or water etc., but there are many difficulties connected with this evaluation and there is not much guidance for the person who makes it. It is a hastily produced evaluation that is lacking in several ways. One way in which it is lacking is that it does not record the importance, worth or value of the fire damage.

There is no measurement of fire damage in the LUData because the university incident recording system is not sufficiently refined to record it. The measurement used in the LUData has been deduced by reference to the recorded text, the guidance in the Incident Recording System (2009) and the awareness that over 80% of the incidents occur within the student's quarters. This has allowed assumptions to be made about the records in the LUData because, for example, in a lot of cases, the ignition will have occurred in a student's study bedroom, kitchen or common room

and it is safe to assume that the fire damage will have been confined to the ranges of 1 to 5 square metres or 6 to 10 square metres.

7.3.1.9. Costing fire damage

In the LFRSData, the fire officer making the assessment of how much fire damage occurs, looks at the effects of heat on the contents and structure of the room or building, the discolouration of the decor for signs of smoke damage and the effect of water on the contents or stock and then physically paces the area to obtain a measurement. This measurement does not, at all, take into account the value of the fire damage in terms of, for instance, how important to an occupier's employment the incident is. How important to the survival of a company the incident is. How important to the wealth of the country or community the incident is. How important to the protection of the environment the incident is. and so forth.

So, with regard to the LUData, taking the 80% of fire damage that occurs in the property type, Student Hall of Residence, the variable code of 1 to 5 square metres could be said to represent a study bedroom. This could be empty and unoccupied but other evidence suggests that this is not the case and it is likely to be occupied. If occupied there will be a bed, a desk, a wardrobe; there will be clothes, computers, mobile phones etc.; there will be books, study papers, writing equipment etc.; there are also the fixtures and fittings such as lighting units, shelving, decor etc. that could all suffer a degree of damage dependent on the temperature reached or the thickness of smoke that evolved.

For the purposes of this research, the cost of replacing damaged contents, purging a room of the smell of smoke and re-decorating has been set at £1000 (see explanation on page 113). This arbitrary sum been used to add more meaning to the results which can be seen on page 123 onwards.

8. Conclusions

8.1. Introduction

The choice of subject for this thesis; the relationship between fire damage and the management of fire safety, was initiated by the experience related in the Preface (see page viii) regarding a fire in a warehouse. The message arising from this particular fire incident is that excessive fire damage may have occurred because of a failing in a component(s) of the fire safety management system that was in place at the time. Therefore, the logical corollary of this circumstance is that a more proportionate amount of fire damage would have been the case given a higher standard of fire safety management. It is this concept that gives rise to the hypothesis embodied in this thesis:

> *Hypothesis: If an acceptable standard of fire safety management is practiced in a company/organisation, then there is likely to be less fire damage when a fire occurs.*

There are some general assumptions contained in the hypothesis, that:

- there is a correlation between the standard of fire safety management and the amount of fire damage;

- there is no measure of the standard of fire safety management available for use by the occupier of a property; and

- there is no measure of fire damage that comprehensively takes into account all of the impact felt on, for example, the community or the environment.

Arising from the hypothesis are some general questions:

- what can be done to counter the misperceptions, probably caused by the lack of objective information, regarding the root causes of fire, particularly fires associated with certain property types or certain categories of building

- how can people be made aware of the long-term consequences of fire when most people's exposure to the damage caused by fire is experienced vicariously

- how can the standard of fire safety management associated with a certain type of property or business be measured

The thesis responds to these general questions by attempting to answer them and it recognises that, in answering them, it needs to follow a methodology of acquiring basic information. The methodology is designed to produce basic information about fire safety and fire damage.

The Delphi process (found in Chapter 4 on page 60) defines and describes what fire safety is by categorising the components necessary in a company or an organisation to manage it correctly. This result can be used to underpin future attempts to measure it by providing objective evidence linked to each component and allowing the evidence to determine the value of each component. To be able to do this with confidence it is necessary to have a credible definition for evidence gatherers to accept and to work with. The categorisation provides a credible definition.

The interviews (found in Chapter 5 on page 82) produce information about the context in which the management and enforcement of fire safety is carried out. They assist in the explanation of how fire safety is managed and enforced using a specific example. The interviews focus on one location, that of the campus of Loughborough University, and they include the three people who exert most influence on the fire safety practiced at that location. These are the manager with a direct responsibility to the location, the fire officer whose responsibility includes operational activities regarding the location and the fire officer whose responsibility includes the enforcement of fire safety legislation at the location. The fourth interviewee has no direct influence but was asked, because of his knowledge and experience, to give the insurer's viewpoint towards fire safety at the location.

The case study (found in Chapter 6 on page 103) continues in using the university campus as a focus and gives some basic information about the amount of fire damage occurring as a result of that use. The amount and type of fire damage on the small geographical area of the university campus is described and compared against the bigger geographical area administered by Leicestershire Fire and Rescue Service. The university campus, although a large site is only a small fraction of the bigger area but the data have been manipulated to allow a like-for-like comparison. Finally, the amount of fire damage occurring on the university campus is costed so that the

financial value of the fire damage can be appreciated.

The methods used in this thesis and described above, go some way to answering the general questions arising from the hypothesis. Acquisition of objective evidence linked to the components of fire safety will assist in clarifying the misperceptions that people have and will make them aware of the root causes of fire damage. Statistical research into the relationships between fire safety and fire damage particularly with regard to property types, can motivate building occupiers to raise the standard of their fire safety strategies, Analysis of the objective evidence and the relationships will also assist in confirming that the hypothesis is factual.

8.2. Strengths and weaknesses of the research

8.2.1. Limitations of the study

The study investigates a complex association. Fire safety management and fire damage are largely subjective subjects because of the lack of objective research and the lack of metrics which make reference to them. Both fire safety management and fire damage conceal complex elements that are in need of simplification.

The results of the Delphi method only add to this subjectivity, they do not objectively define and describe fire safety management they only give another subjective description of it. The value of this, however, is that it is a collective opinion by people experienced and knowledgeable in the field, knowingly taking part in an exercise that can be confirmed or confounded in the future by objective evidence. The advantage this gives to further research is the chance for researchers to concentrate on collecting evidence for those categories thought to have the most impact, thus accelerating the potential benefits.

Analysis of the interviews gives great insight into the different positions held by those involved in practicing and enforcing fire safety management on the Loughborough University campus. It demonstrates that the current regulations being enforced in England and Wales do not cover the whole breadth of fire safety management. It also shows that there are a number of issues such as; the application of dynamic risk assessment, the focus on life safety rather than property protection or business disruption, the campaign to reduce unwanted fire signals and so on that impact on fire safety. Their impact on the management of fire safety or the amount of fire

damage has not been investigated and evaluated in this research but the issues have been recorded and are noted for further research.

Analysis of data collected regularly and rigorously has proven to be effective and reliable in many fields as a predictive tool and is already in use in the field of fire safety. Lunn (2010), for instance, uses data analysis in the production of the Integrated Risk Management Plan to determine performance targets for aspects of fire safety. To do this with credibility, Leicestershire Fire and Rescue Service employ analysts dedicated to making sure the data used for analysis is clean, correct and robust. This gives a high confidence level to the accuracy of the data acquired for use in this research. Unfortunately, this is not so with the data acquired from Loughborough University because the need for scrupulous accuracy has not yet been achieved. Consequently, there is not such a high confidence level in the data acquired from this source.

The measurement for fire damage in the LFRSData acquired for use in this research has an inherent limitation because of the way that the measurement is made and because of the criteria used in its estimation. In addition to this there is a further limitation inherent in the LUData because of the paucity of information in the dataset. This has necessitated the need for further estimates to be made.

The limitation in the LFRSData is built-in to the way that the measurement is collected nationally by the fire and rescue service and is unlikely to change unless there is sufficient pressure to modify it and appropriate metrics with which to measure additional criteria. Given sufficient motivation in the direction that this research offers, there would be an increase in pressure to collect a more detailed measure of fire damage or to divert current data to be analysed in a new way.

8.2.2. Theoretical implications and practical recommendations

8.2.2.1. Delphi process (Chapter 4 on page 60}

The contribution that the Delphi process has made to the research is the categorisation of fire safety management made credible by the knowledge, experience and consensus of the panel members. The panel members were chosen because of their perceived status by the author and this was confirmed by themselves when asked during the process. This makes the results difficult to argue against even though they are only a subjective judgement.

The categorisation also fills a gap for a comprehensive definition of fire safety management. Definitions exist, notably in British Standard 9999 (2008) and in Publicly Available Specification 911 (2007) but they have not been produced to be comprehensive definitions. The categorisation reported in this research complements those definitions but has aspirations for something greater. It aspires to be a taxonomy or classification of the subject based on objective evidence that could be used as a measurement of the management of fire safety.

Acceptance of the categorisation could lead to the next step in a series of steps resulting in the ability to measure fire safety management. If the categorisation is accepted and used as a foundation, then each category could be used as a container to hold objective evidence gleaned from the fire incident database. This is a big step because decisions have to be made about what objective evidence should be associated with each category. The presumption is that much necessary evidence is not currently collected so research must be targeted regarding what evidence is required and how it should be collected.

A lead in deciding what evidence could be collected would be taken by adapting the analysis of a fire incident to follow the analysis of a criminal case. The questions asked by Dern et al (2009) in respect of a criminal case analysis could be easily adapted to the analysis of a fire incident.

Part of the results arrived at by the panel members was an importance rating for each of the ten categories. The purpose of this was to save time in future research. The categories judged as most important by the panel members were so judged because of their subjective perception that they were the most influential. So it makes sense that the most important categories should be the focus of attention before the categories judged the least important. This should allow optimum progress to be made.

8.2.2.2. Interviews (Chapter 5 on page 82)

The contribution that the interviews have made to research are to highlight the differing views of people who are involved in the management and enforcement of fire safety particularly on one site. That there are diverse views is not surprising because of the different priorities brought out during the interviews between the necessity of practicing effective fire safety and the impetus of an enforcing legislation. What is surprising is that of the different aspects to the management of fire

safety only protection of life is reinforced by legislation and of direct interest to the enforcement officers. There is a real need for fire safety practitioners to understand this standpoint and for practical ways in which they can carry out their roles to look after all other aspects of fire safety.

What is also intriguing is the way that different concepts, relevant to fire safety and raised during the interview discussions, work against the protection of property and the continuity of business. These are listed and can be found on page 92 and include dynamic risk assessment, the unwanted fire signals initiative, the concept of estimated maximum loss and so on. They constitute concepts brought in to solve specific problems but which can be detrimental to properties and businesses. The need here is for research into each of the concepts to better understand their impact. The objective would be to give those who practice fire safety tools to ameliorate their effects.

8.2.2.3. Case study (Chapter 6 on page 103)

The contribution of the case study to the research is to analyse fire damage in a framework that will be of use to management planning. The results give a contextual view of fire damage on a university campus that could be used to inform plans drawn up by the management to make the most effective use of university staff. Associating fire damage with the time of day, the time of year, the type of property and so on, gives a useful model that indicates the probability of when or where fire damage is most likely to take place. This could convert into when or where staff should be most vigilant or when and where most precautionary strategies should be carried out.

Comparing the campus results against the larger area administered by Leicestershire Fire and Rescue Service allows an assessment of scale to be carried out. The data have been manipulated so that data are being compared against like data so the frequency of fire damage on the university campus can be compared against the frequency of damage in the larger area. Disparity of results encourages investigations and explanations of why this is so leading to greater understanding and focus on ways to reduce fire damage.

Converting the results into a financial value draws attention to the amount of money fire costs a major university. This should motivate effort to reduce it.

As explained earlier, the data acquired from Loughborough University (LUData) has been cleansed and manipulated to allow the comparisons that have been made against the data acquired from Leicestershire Fire and Rescue Service (LFRSData). To enable easy comparisons commensurate with the analysis model used in this thesis, LUData would have to be collected in the same variables as those in the Incident Recording System (2009). This could be achieved with appropriate training given to university staff who currently collect data.

Data is currently sent by Loughborough University to the University Safety and Health Association (USHA)[1] who collate fire statistics from UK Universities. Data collected includes the frequencies and type of fire alarm activations, fire incidents, cooking-related fires, fire-related injuries and so on. However, it would be beneficial for USHA to collect variables commensurable with those used in Incident Recording System (2009). This synchronicity would produce the capability of benchmarking and measuring the performance of one university against another whilst still being able to analyse the data against the national dataset of the IRS.

8.3. Conclusion

This thesis represents the details of the research documented in it, but it does not fully answer the research questions that it has posed. This is far from an admittance of failure because there is still much to do before fire safety can be regarded as a true science and provide the objective evidence that can be analysed to provide the answers. The research has provided much useful information that will, potentially, make a contribution to combating the destructive consequences of uncontrolled fire but more usefully, it has set out a paradigm in which that contribution could prove to be far more substantial and effective.

The research falls in between two disciplines, the study of fire engineering and the study of management; or the application of science and technology and the application of sociology. This is a partnership already present in the study of human behaviour when faced with the products of combustion in the confinement of a building and has a big influence in the design of buildings in Europe and the USA, particularly. The management of fire safety deals with the occupation of the build-

---

[1]Data currently being collated by USHA will shortly be collated by the Higher Education Statistics Agency (HESA).

ing following construction and exists for the whole of its life. It is subject to much misperception, ignorance and complacency leading to the destruction, loss of trade and damage to communities that is reported daily by the news media. Research into this area is critical to the reversal of this situation.

Management of fire safety is important and its importance lies in reducing the amount of damage and the amount of impact which is the consequence of fire. This research contributes to that aim and opens the way to further research that could profitably benefit commercial companies, the fire and rescue service and the community.

References

A Guide to Reducing the Number of False Alarms from Fire-detection and Fire-alarm Systems, February 2004. Tech. rep., Office of the Deputy Prime Minister, Eland House Bressenden Place London SW1E 5DU, product code 04FPD01976.

A Short Guide to Making your Premises Safe from Fire, 2005. Tech. rep., UK Government and CFOA, product code: 05 FRSD 03546.

Abahlali baseMjondolo Movement SA, 2008. A Big Devil in the Jondolas: The Politics of Shack Fires. Tech. rep., AbMMSA.

Act for rebuilding the City of London, 1666. Charles II:, Monarch. Statutes of the Realm Vol.5: 1628-80 (1819), pp. 603–612, http://www.british-history.ac.uk/report.aspx?compid=47390: Date accessed: 20 September 2012.

Act for rebuilding the town of Warwick and for determining differences touching houses burnt or demolished by reason of the late dreadful fire there, 1694. William III and Mary II, Monarchs. Statutes of the Realm Vols. 6 and 7, Chapter 1.

Adler, M., Ziglio, E., 1996. Gazing into the Oracle: The Delphi Method and its Application to Social Policy and Public Health: The Delphi Method and its Contribution to Decision-Making. No. ISBN: 1853021040. Jessica Kingsley Publishers.

Andrews, W., 1891. Old Church Lore. The Hull Press.

Approved Document B, 2010. Volume 2: Buildings other than Dwelling Houses. Tech. rep., UK Government, 2006 Edition (incorporating 2007 and 2010 amendments) covering England and Wales.

Baker et al, J., 2013. Categorisation of Fire Safety Management: Results of a Delphi Panel. Fire Safety Journal Vol.59, pp.37–46.

Beech, B., 1999. Go the extra mile - use the Delphi Technique. Journal of Nursing Management Vol. 7, pp. 281 to 288.

Best Practice Guide to Fire Safety, Unknown date. Tech. rep., Fire Industry Association, wWW.FIA.UK.COM.

Bird, E., Dockling, S., 1949. Fire in Buildings. Adam and Charles Black, Soho Square, London.

Borsay et al, P., 2002. Provincial Towns in Early Modern England and Ireland. Oxford University Press.

British Standard 5839, 2002+2008. Fire Detection and Fire Alarm Systems for Buildings: Part 1: Code of Practice for System Design, Installation, Commissioning and Maintenance. Tech. rep., British Standards Institute.

British Standard 7974, 2001. Application of Fire Safety Engineering Principles to the Design of Buildings - Code of Practice. Tech. rep., British Standards Institute.

British Standard 9999, 2008. Code of Practice for Fire Safety in the Design, Management and Use of Buildings. Tech. Rep. BS9999, British Standards Institute.

Britten, N., July 1995. Qualitative Interviews in Medical Research. British Medical Journal Vol.311, pp.251–253.

Bucholz, R., Ward, J., 2012. London: A Social and Cultural History: 1550 - 1750. No. ISBN: 978-0-521-89652-8. Cambridge University Press.

Building Act, October 1984. Building act 1984: Chapter 55. Tech. rep., UK Government, act of Parliament.

Building Research Establishment, 1999. BR368 Design Methodologies for Smoke and Heat Exhaust Ventilation. Tech. rep.

Butcher, G., Parnell, A., 1994. Smoke Temperature for Smoke Control Design. Fire Safety Engineering Vol.1 No. 4, pp21 to 23.

Carter et al, N., 1992. How Organisations Measure Success: The Use of Performance Indicators in Government. No. ISBN 0203208668. Taylor and Francis.

Cerda, M., 1981. The Application of Fire Safety to Architectural Design. PhD Thesis, University of Edinburgh.

CFOA Protocol for the Reduction of False Alarms and Unwanted Fire Signals, 2010. Tech. rep., Chief Fire Officers' Association, 9-11 Pebble Close Tamworth B77 4RD.

Chief Fire Officers' Association, 2008. Community Fire Protection: Revised CFOA Fire Safety Guidance Notes and Audit Form: Version 4.1. Tech. rep., cFOA Circular: 2008/1016.

Chow, W.K., L. G., 2002. Fire Safety Facilities Assessment for Karaokes. Facilities Vol.20, Iss.13/14, pp.441–449.

Christian, S., 2003. A Guide to Fire Safety Engineering. No. ISBN 0580418960. Printer-Pims Digital.

Civil Contingencies Act, 2004. Tech. rep., UK Government, Applicable in England, Northern Ireland, Scotland and Wales.

Code of Practice: Best Practice for Summoning a Fire Response via Fire Alarm Monitoring Organisations, 2010. Tech. rep., Chief Fire Officers' Association, 9-11 Pebble Close Tamworth B77 4RD, This document represents Appendix B to the CFOA Protocol for the Reduction of False Alarms and Unwanted Fire Signals.

Coffey, P., 2008. Report of the Independent Examination of the Stardust Victims Committee's Case for a Re-opened Inquiry into the Stardust Fire Disaster. Tech. rep., Irish Government.

Competency Criteria for Fire Risk Assessors, 2011. Tech. rep., Fire Risk Assessment Competency Council, version 1.

Cullen, W., 1990. The Public Inquiry into the Piper Alpha Disaster. Tech. rep., Department of Energy, published by HMSO.

Dalkey, N., 1969. The Delphi Method: An Experimental Study of Group Opinion. The Rand Corporation.

Denscombe, N., 2010. The Good Research Guide for Small-scale Social Research Projects, Fourth Edition Edition. Open University Press.

Dern et al, H., 2009. The Fire Behind the Smoke. Criminal Justice and Behaviour vol.36, pp.1085–1090.

Design Guide for the Fire Protection of Buildings, 2003. Essential Principles. Tech. rep., Fire Protection Association.

du Plessis, E., Human, S., 2007. The Art of the Delphi Technique: Highlighting its Scientific Merit. Health SA Gesondheid Vol.12 No. 4, pp.13 to 24.

Fennell, D., 1988. Investigation into the King's Cross Underground Fire. Tech. rep., Department of Transport.

Fire and Rescue Manual: Volume 2: Fire Service Operations, 2008. Incident Command: Third Edition. Tech. Rep. ISBN 978 0 11 341321 8, The Stationery Office: London.

Fire and Rescue Services Act, 2004. Tech. rep., UK Government, Applicable in England, Scotland and Wales.

Fire Precautions Act, 1971. Fire Precautions Act 1971. Tech. rep., Government, rescinded in 2005.

Fire Protection Association, 2008. Approved Document B: Fire Safety (Volume 2) - Buildings other than Dwelling houses Incorporating Insurers' Requirements for Property Protection. Tech. rep., FPA.

Fire Service Drill Book, 1985. Home Office (Fire Department): UK Government, Sixth Edition Edition, first published in 1949.

Fire Statistics United Kingdom, 2008. Tech. rep., UK Government.

Firth, P., 2005. Four Minutes to Hell: The Story of the Bradford City Fire. Parrs Wood Press.
URL http://books.google.co.uk/books?id=S3gWAAAACAAJ

Grice, A., 2009. Fire Risk: Fire Safety Law and Its Practical Application. No. ISBN 978 185418603 4. Thorogood Publishing.

Grosshandler et al, W., 2005. Report of the Technical Investigation of The Station Nightclub Fire. Tech. rep., National Institute of Standards and Technology (NIST).

Groundwater Regulations, 1998. SI No.2746. Tech. rep., UK Government, Applicable in England and Wales.

Guide to Fire Precautions in Existing Places of Entertainment and Like Premises, 1990. Tech. rep., UK Government.

Gyle-Thompson v Wall Street (Properties) Ltd 1 WLR 123 [1974] 1 ALL ER 295, 1974.

Hannaford, S., Stephens, J., 2004. Case in Point: Party Walls. No. ISBN 1 84219 152 7. RICS Business Servicces Ltd.

Hansell, G., 1992. Heat and Mass Transfer Processes Affecting Smoke Contol in Atrium Buildings. PhD Thesis, Southbank University.

Hazardous Waste (England and Wales) Regulations, 2005. Tech. rep., UK Government.

References

HC Hansard, 1945. Written question from Member of Parliament Alfred Bossom to Home Secretary James Chuter Ede on Equipment Standardisation. House of Commons Debate 22 November 1945.

HC Hansard, 1960. Statement by Mr David Renton, Joint Under Secretary of State for the Home Department. House of Commons Debate 24 June 1960.

HC Hansard, 1961. Question by Mrs Braddock about fire precautions in department stores. House of Commons Debate 30 March 1961.

HC Hansard, 1970. Statement by Mr Richard Sharples, Minister of State for the Home Office. House of Commons Debate: 20 November 1970.

HL Hansard, 1971. Statement by the Minister of State, Home Office (Lord Windlesham). House of Lords Debate: 18 March 1971.

Holroyd, S. R., 1970. Departmental Committee on the Fire Service. Tech. rep., UK Government, sir Ronald Holroyd was commissioned on 2 February 1967.

Holtzhausen, S., 2001. Triangulation as a Powerful Tool to Strengthen the Qualitative Research Design: The Resource-based Learning Career Preparation Programme (RBLCPP) as a Case Study. In: Higher Education Close Up Conference 2. Lancaster University, 16-18 July (http://www.leeds.ac.uk/educol/documents/00001759.htm) (accessed 26 July 2013).

Howarth, D., 1999. Fire Safety Management at Passenger Interchanges. Mphil thesis, University of Bradford.

Howarth, D., Kara-Zaitri, C., 1999. Fire safety Management at Passenger Terminals. Disaster Prevention and Management Volume 8 (ISSN 0965-3562), 362–369.

Incident Recording System, September 2009. Questions and Lists: Version 1.4. Tech. Rep. ISBN: 978-1-4098-1864-9, UK Government: Department for Communities and Local Government, Communities and Local Government Publications.

Jick, T., December 1979. Mixing Qualitative and Quantitative Methods: Triangulation in Action. Administrative Science Quarterly Vol.24, pp.602–611.

Kvale, S., 1996. Interviews: An Introduction into Qualitative Research Interviewing. Sage, Chapter 7: The interview situation.

Lang, J., 1956. Rebuilding St. Paul's after the Great Fire of London. Oxford University Press.

Ley, A., 2000. A History of Building Control in England and Wales 1840-1990. RICS Business Services Limited.

Lunn, S., 2010. Leicestershire Fire and Rescue Service: Community Safety Strategy: 2010 - 2013. Published in-house.

Malhotra, H., December 1986. Fire Safety in Buildings. BRE Press (ISBN 0 85125 235 4).

Malhotra, H., 1991. The Role of the Fire Safety Engineer. Fire Safety Journal vol.17, pp. 129–134.

Marchant, E., 1988. Methodological Problems Associated with the Use of the Delphi Technique - Some Comments. Fire Technology: Technical Notes Vol.24, No.1, pp.59–62.

Marchant et al, E., 1982. Fire Safety Evaluation (Points) Scheme for Patient Areas within Hospitals. Tech. rep., Department of Fire Safety Engineering, University of Edinburgh, a report on its origins and development sponsored by the DHSS.

National Aeronautics and Space Administration (NASA), November 2012. From Rockets to Ruins: The PEPCON Ammonium Perchlorate Plant Explosion. NASA Safety Centre: System Failure Case Study Vol.6: Issue 9.

Nelson, H., 1982. An Approach to Enhancing the Value of Professional Judgement in the Derivation of Performance Criteria. In: Proceedings of the 3rd ASTM/CIB/RILEM Symposium on the Performance Concept in Building. In Lisbon-March 29-31 - April 1-2, 1982.

Okoli, C., Pawlowski, S., March 2004. The Delphi Method as a Research Tool: An Example, Design Considerations and Applications. Information and Management Vol. 42, pp. 15–29.

Party Wall etc. Act, 1996. Tech. Rep. Chapter 40, (UK Government).

Phillips, I., circa 2010. Summerland Fire Disaster. Unpublished book.

Popplewell, J., 1985. Committee of Inquiry into Crowd Safety and Control at Sports Grounds Interim Report. Tech. rep., UK Government.

Post-war Building Studies: No.20, 1946. Fire Grading of Buildings: Part 1: General Principles and Structural Precautions. Tech. rep., UK Government, joint Committee of the Building Research Board of the Department of Scientific& Industrial Research and of the Fire Offices' Committee.

References

Post-war Building Studies: No.29, 1952. Fire Grading of Buildings: Part ii: Fire-fighting Equipment: Part iii: Personal Safety: Part iv: Chimneys and Flues. Tech. rep., UK Government, joint Committee of the Building Research Board of the Department of Scientific& Industrial Research and of the Fire Offices' Committee.

Powell, C., 2003. The Delphi Technique: Myths and Realities. Journal of Advanced Nursing Vol. 41, pp. 376 to 382.

Publicly Available Specification 911, 2007. Fire Strategies - Guidance and Framework for their Formulation. Tech. rep., British Standards Institute.

Puybaraud, M., May 2001. A Model of the Role of Management in Construction Fire Safety Failure Scenarios. PhD Thesis, Department of Building Engineering & Surveying, Heriot-Watt University.

Ramachandran, G., 1998. The Economics of Fire Protection. No. ISBN 0-419-20780-5. Taylor and Francis.

Ramachandran, G., 1999. Fire Safety Management and Risk Assessment. Facilities 17, 363 to 376.

Regulatory Enforcement and Sanctions Act, 2009. Primary Authority Guidance. Tech. rep., Local Better Regulation Office (LBRO): UK Government, Regulatory Enforcement and Sanctions Act 2008.

Regulatory Reform (Fire Safety) Order, 2005. Her Majesty's Stationery Office, UK Government: applicable in England and Wales only.

Report to Insurers: RI11, 2012. Fire and Rescue Service Response to Calls Originating from Automatic Fire Alarm Systems. Tech. rep., Fire Protection Association, version 1.

Robinson, H., Baker, J., February 2006. Retail Price. Fire Prevention and Fire Engineer's Journal, pp. 12–14.

Routley, J., 1988. Fire and Explosions at Rocket Fuel Plant Henderson, Nevada. Tech. Rep. Report 021, Federal Emergency Management Agency.

Rowe, G., Wright, G., 2001. Expert Opinions in Forecasting: The Role of the Delphi Technique. Principles in Forecasting: Kluwer Academic Publishers, pp. 126 to 144.

Roy, D., 1997. The Cost of Fires: A Review of the Information Available. Tech. Rep. ISBN 1 85893 932 1, UK Government: Home Office.

References

Safe as Houses, 1998. Safe as Houses: The Report of the Community Fire Safety Task Force. Tech. rep., UK Government.

Saint-Germain, C., 1518. Doctor and Student, 1874th Edition. Lonang Institute, published online in 2006 at http://www.lonang.com/exlibris/stgermain/sgm-000.htm.

Salter et al, C., 2011. Fire Engineering Practise: A UK Practitioners View. In: International Conference on Building Resilience, Heritance Kandalama, Sri Lanka.

Sanderson, I., 2007. The Validity and Applicability of Fire Models Used to Predict the Production of Smoke Within the Built Environment. PhD Thesis, Glasgow Caledonian University.

Santos-Reyes, J., Beard, A., 2002. Assessing Safety Management Systems. Journal of Loss Prevention in the Process Industries Vol.15, pp.77–95.
URL http://books.google.co.uk/books?id=vD7mSAAACAAJ

Scheibe, M. e. a., 1975. Experiments in Delphi Methodology. The Delphi Method Techniques and Applications, Linstone, H. A. and Turoff, M. (Eds.), Addison-Wesley, pp. 257–281.

Shields, T., 1986. Fire safety evaluation of dwellings. Fire Safety Journal 10 (1), 29 – 36.
URL http://www.sciencedirect.com/science/article/B6V37-482B2S2-44/2/a493b9a1b4f8dff6b1179a87f4cc896f

Steiner, N., May 1999. Lessons from the Investigation and Analysis of Real Fires. PhD Thesis, South Bank University.

Stollard, P., Abrahams, J., 1999. Fire from First Principles: A Design Guide to Building Fire Safety, third edition Edition. E & FN Spon.

The Offshore Installations (Safety Case) Regulations, 1992. Statutory Instrument No. 2885: Health and Safety. UK Government, Applicable in England, Scotland and Wales.

Thomas, G., 2011. A Typology for the Case Study in Social Science following a Review of Definition, Discourse, and Structure. Qualitative Inquiry Vol.17(6), pp.511–521.

Tillander, K., July 2004. Utilisation of Statistics to Assess Fire Risks in Buildings. PhD Thesis, Espoo 2004, VTT Publications 537, 224p + app 37p.

Todd, C., circa 2010. Selecting a Competent Fire Risk Assessor, drafted for the IFE Fire Risk Assessors' and Auditors' Register Professional Review Panel.

Todd, C., Ltd, A., 2012. PAS79 Fire Risk Assessment Guidance and a Recommended Methodology. Tech. rep., British Standards Institution.

UK Government, 2010-2011. Fire Statistics: Great Britain: 2010-2011. Tech. rep.

US Government, 1986. Investigation of the Challenger Accident. Tech. Rep. House Report 99 1016, Committee on Science and Technology: House of Representatives: Ninety-ninth Congress: Second Session, as known as the Rogers Commission Report.

Valenzuela, D., Shrivastava, P., 2011. Interview as a Method for Qualitative Research. Presentation, source: http://xa.yimg.com/kq/groups/24019306/564129146/name/ Interview+as+a+Method+for+QR.pdf.

Wallington, N., 2005. Firemen at War: the Work of London's Firefighters in the Second World War. Jeremy Mills Publishing Limited.

Water Industry Act, 1999. Tech. Rep. Chapter 9, UK Government, Applicable in England and Wales.

Water Resources Act, 1991. Tech. Rep. Chapter 57, UK Government, Applicable in England and Wales.

Wilkinson, P., 2013. An Investigation into Resilient Fire Engineering Building Design. EngD Thesis, Centre for Innovative and Collaborative Construction Engineering: Loughborough University.

Yin, R., 2008. Case Study Research: Design and Methods. No. ISBN 978-1412960991. SAGE Publications Inc., Fourth Edition.

A. Appendix 1: Example of the letter sent to the interviewees

Dear (name deleted),

I am a research student in the School of Civil and Building Engineering at Loughborough University. The subject of my research is the management of fire safety and I am interested in how its principles are applied in the management of fire safety on the Loughborough University Campus.

As part of my research, I would like to interview you in your role as University Fire Officer. I have included some questions that would form the basis for discussion so that, if you agree to be interviewed, you will have some notion of the areas I am interested in:

Question 1 How does the management of fire safety assist Loughborough University (or any company or organisation) to meet the requirements of regulation and the scrutiny of regulatory inspections?

Question 2 How does the management of fire safety assist in the protection of University property or the continuity of University business?

Question 3 Do you think that a good standard of fire safety management reduces the likelihood of fire damage and, if so, does this suggest there is a parallel between the standard of fire safety management and the amount of fire damage?

Question 4 What are the benefits of the current fire and rescue service campaign to reduce unwanted fire signals? The benefits for the fire and rescue service are that it reduces the number of false calls they receive with a corresponding saving of time, effort and money. What are the benefits of the campaign with regard to Loughborough University (or any company or organisation)?

Question 5 Do you think it would be beneficial to measure the operational performance of the fire and rescue service with a performance metric that evaluates the efforts of companies and organisations that demonstrate an improvement in business continuity or a reduction in the amount of fire damage?

I envisage that an interview may take up to an hour of your time and I would be grateful if the interview could take place at your location, perhaps a meeting room, if that is possible? I would prefer to record the interview so that I might transcribe the discussion afterwards but I realise that you may not find this acceptable so, in this event, I would have to make written notes. Please let me know if you have an objection to the recording of the interview?

I have some dates for a potential meeting before the Christmas Break, I would be grateful if you could express a preference or state whether you prefer to wait until the New Year:

Week beginning 26 November; either Monday 26, Tuesday 27, Thursday 29 or Friday 30.

Week beginning 3 December; either Thursday 6 or Friday 7 (am only).

Week beginning 10 December; either Monday 10 (pm only), Tuesday 11, Thursday 13 or Friday 14.

Week beginning 17 December; either Monday 17, Tuesday 18, Thursday 20 or Friday 21.

I do not require a formal reply to this letter but I would be grateful of an e-mail or a telephone call signaling your acceptance to be interviewed and confirmation of a date. You will find my mobile telephone number and e-mail address above.

B. Appendix 2: Transcript of interview with Loughborough University Fire Safety Officer

Loughborough University

11 December 2012

1 Author: What is your full title?

2 Loughborough University Fire Safety Officer: Fire Safety Officer for Loughborough
3 University Campus.

4 A: How long have you been in that role?

5 LUFSO: My role here at the University is into its eighth year, in the new year, and
6 prior to that, twenty-eight years in the (name of organisation removed); which is a
7 similar background to the fire and rescue service.

8 A: You are part of the Health and Safety Department of Loughborough University?

9 LUFSO:Yes.

10 A: I wanted to interview yourself. I am going to interview (name removed), who
11 is the District Manager for Charnwood or North West Leicestershire or whatever?
12 I'm trying to arrange an interview with (name removed). I think you know (name
13 removed). He is probably the most experienced fire safety officer, at the moment in
14 Leicestershire. I thought about interviewing (name removed), who is the Head of
15 Fire Engineering for the FPA[1].

16 I tried to formulate the questions I sent you by looking from your viewpoint and all
17 the other viewpoints and formulating questions that would be consistent amongst
18 the interviewees.

---

[1]FPA is an acronym for the Fire protection Association. An independent source of information
and advice relating to all aspects of fire safety, risk management and loss prevention.

19 I also have a list of items, which I shall come to later, because I want to find out

20 whether they are relevant to you and whether they are inclusive and how you would

21 rate them in importance.

22 We will start off with the questions first.

23 LUFSO:OK.

24 A: It is all about fire safety management, as you already know. My thesis is all

25 about fire safety management.

26 The first question was; how does the management of fire safety assist a company

27 or an organisation, in this case Loughborough University, to meet the requirements

28 of regulation and the scrutiny of regulatory inspections? So it is really about your

29 relationship with the regulatory authority which is, in this case, Leicestershire Fire

30 and Rescue Service.

31 LUFSO:Yes, the fire and rescue service at Leicester who have done nineteen build-

32 ings, so far.

33 A: How does your management role, or your role as; is it supervisory of the frame-

34 work of fire safety management?

35 LUFSO:Basically, I am the competent person that carries out the fire risk assess-

36 ments and I identify any shortfalls. I raise those shortfalls on what we call 'action

37 trackers'. If its a minimal task, I raise what's called a 'green ticket' and say; look,

38 I've just done a fire risk assessment or audit of so and so building. Three of the

39 doors are not closing correctly, can you get them put right? It goes into the system

40 and it is picked up.

41 A: Do you accept that a fire risk assessment is about the management of fire safety

42 in a building?

43 LUFSO:No. Fire risk assessment is an audit of a building at that time to see

44 whether you are hitting or; it is a benchmark to see whether you are benching

45 at the requirements that you should be meeting with the current Standards and

46 Guidance documents available to you. The management of it is to maintain at that

47 level, to keep it at that level. So the Universities management of the system is a

48 little bit, kind of, awkward to manage in respect that the fire alarm systems, the

49 emergency lighting systems which are all subject to routine service and maintenance

50 inspections by outside, external engineers who are accredited engineers. I have found

51 a few pitfalls in some of their work, because we are relying on them to say that we

are compliant. I'm ticking the risk assessment to say it is compliant because I don't audit them or check them. I just figure that they've got a certificate and we've had an inspection and it has met the criteria. But I go into the building, I have found shortfalls and I snag that against the department within the Facilities Management who oversee that and say that this is not good. We are paying these and we are not getting best value for money.

A: You are not just a fire risk assessor ...

LUFSO: I'm not just a fire risk assessor?

A: ... because, I have just witnessed that you give advice to people who approach you with plans in their hands. That is not fire risk assessment. That is fire safety engineering.

LUFSO:I give advice, yes. I say where it should be a compartment line, should this door be FD thirty or sixty minutes fire resistance? I use common sense that if its a staircase it needs to be in a thirty or a sixty depending on its design strategy. I try and put the compartment through the building wherever I can.

A: Your fire risk assessment ...

LUFSO:I assess for all that. Have we got compartmentalisation. Have we got...

A: ... when you do a fire risk assessment. What you are doing is auditing whether that building is being managed properly.

LUFSO:Yes, meeting a standard.

A: So you are auditing fire safety management.

LUFSO:Yes, but this is now about shortfalls such as emergency lighting. Going into buildings and saying, what the University do at the moment here is have a monthly inspection, which is a walk-through, basically. Then every year they do a three-hour burn-off.

What I have said is; how do I know that the emergency lighting which is installed in this building is adequate to meet the current needs from a means of escape and also the other sections that are covered in British Standards as regards safely shutting down machinery etc?

A: Which is a valid question ...

LUFSO:Absolutely. And they can't answer it because what they are not doing a Lux value and we haven't got floor plans that clearly show me where all the emergency

84 lighting is so I could look on the 2D plan and say there is sufficient lighting there.
85 And again, I have gone into buildings in the hours of darkness, myself, put the
86 building into emergency light situation and proven the fact that there is not; either
87 there isn't any or it is not adequate. So again there are lots of pitfalls.

88 A: How does that enable the University to meet the statutory requirements?

89 LUFSO:All it does it enables me to fire up an e-mail with the risk assessment to
90 say that it is non-compliant. It goes into the action-tracker and I give it, initially,
91 a period of time to get it put right. Unless it's absolutely life-threatening. Which,
92 fortunately for us, we've never come across that shortfall, we're not meeting the
93 standards, good guidance, and I give them a time to assess that and, if they have
94 not done it, I give them a 'red code' and it goes red.

95 A: So you manage the ...

96 LUFSO:I kind of, don't manage, I'm a kind of prod. I'm prodding them all the
97 time.

98 A: ... you've put a framework in position and you try and use that framework?

99 LUFSO:Yes, but it sometimes takes a long time because, as you know with the Uni-
100 versity; they're currently and constantly changing the use of the building, the layout
101 of the building, they're upgrading the building, they're even considering demolish-
102 ing the building. And with all these different sets in place there is a reluctance,   10 minutes
103 sometimes, to do some of this work and I have to be forceful, sometimes, by saying
104 that you are non-compliant with the regulations now.

105 A prime example was that we had a fire alarm system that was a 240 volt system.
106 Not compliant; its been non-compliant for years. So, basically, you say to them;
107 you need to do something about it because its non-compliant because, if you don't,
108 and something goes wrong, you are just going to kick yourself. Because you just do
109 diligence in the whole thing. So the management side of it is sometimes an annoyance
110 that you can't be confident and say; there's the FRA[2] and I know everything is okay
111 and I go around the corner and no it's not. Someone has gone in there and done
112 some work and, hey ho, we're in a mess again.

113 A: Let's go on to Question 2. How does the management of fire safety assist in the
114 protection of property or the continuity of University business?

---

[2]FRA is an acronym for Fire Risk Assessment. The audit of property required under the Regu-
latory Reform (Fire Safety) Order 2005.

₁₁₅ LUFSO:It's this ... (break in transmission) ... most of it but it has to be continually ₁₁₆ audited by myself to say it is meeting the current standards.

₁₁₇ A: A fire risk assessment is for the protection of life ...

₁₁₈ LUFSO: Absolutely.

₁₁₉ A: ... it's not for the protection or, not necessarily, for the protection of of property. ₁₂₀ This is only by default, really.

₁₂₁ LUFSO: Absolutely but in the fire risk assessment I do life and assets. I encapsulate ₁₂₂ both because, in my opinion ...

₁₂₃ A: So you have an enhanced fire risk assessment ...

₁₂₄ LUFSO:Yes or comprehensive, as I would call it.

₁₂₅ A: ... enhanced so far as the regulations are concerned.

₁₂₆ LUFSO: Yes. I've covered the life but I'm also going for the University's assets. A lot ₁₂₇ of the things that I do recommend from an asset protection point of view is that they ₁₂₈ remove the flammable substances, gases and materials out of the buildings which ₁₂₉ will enable the fire service to be more, kind of, confident in, possibly, penetrating ₁₃₀ the building to extinguish the fire in the area of origin or compartment rather than ₁₃₁ contain the fire from the outside because of this risk factor against firefighters. So, ₁₃₂ yes, I drive that in, if I can.

₁₃₃ A: Is that on your own volition, or is that ...

₁₃₄ LUFSO:Yes, I think it is because when I came here, initially there were lots of life ₁₃₅ safety issues. There were Halls of Residence that were not to the current levels of ₁₃₆ L2. They were just, basically, well there were no M systems but there were L4s[3] ₁₃₇ which was just not acceptable.

₁₃₈ A: Do you think that property protection and continuity of business should be part ₁₃₉ of ...

₁₄₀ LUFSO:Absolutely. Because it's business continuity. Other than that you have to ₁₄₁ have a very, very good business continuity plan that will allow you to lose a building ₁₄₂ but you have a system in place that will allow you to pick up the next day and ₁₄₃ operate again. With the University and the size of our buildings that, to me, is not ₁₄₄ do-able. If you lost the Chemistry building, you're not going to pick that up and

---

[3]L2 and L4 are references to types of fire alarm system found in British Standard 5839.

run with it somewhere else and you are not going to have a Chemistry building sat there as a mothball in the event of; because that is just not cost-effective. So, as I see it, we have to bolt it down as much as possible so that there is little or no risk of losing a building.

A: There was a fire recently in the Wolfson building?

LUFSO:Yes, but it was contained to an office. It gutted the office with smoke damage to the offices adjacent and a bit of smoke damage to the corridors and false ceilings, but that was it.

It was quite an expensive bill because of the clean-up of the stink of smoke. That is the biggest issue with fires. It is the smoke damage rather than the fire damage that is the cost and the disruption because it goes further than the fire. The fire, itself, is just that room. So gut it, take everything out, fix what's damaged and re-paint and decorate. The smoke damage has gone quite a way down, the smell and things like that ...

A: There would also be files and work in that room.

LUFSO:Yes, all the lost records. Here is a picture of it. I did a report on it which I can send you if it's of any help to you.

A: I wasn't on the campus at the time but I read about it in my daily horizon scan. It popped up in the horizon scan.

So presumably the fire brigade attended that?

LUFSO:Yes.

A: ... and they will be ... (break in transmission)

LUFSO:That's the office and that's the cause; one of those (of a soft drink removed) fridges.

A: Was it?

LUFSO: That's a video. I do a running commentary because I try to tell them where the fire started.

A: Will you have anything off the fire brigade for that?

LUFSO: No, they won't give it to me. I asked them and they said, no, that's our report. I argued with him (the fire officer). It was (name removed), at the time, whom I know quite well and he said, yes, I think this is all caused through, there's

176 a water pipe just above it, so that's caused through heavy rain and water has come
177 through. I said, no (name removed), it's that, mate. No, no, no.

178 (Name removed), I'm not a fire inspector but, look at it? There's a piece of equip-
179 ment that has basically gone and, if you look underneath, it's completely charred
180 away at the shelf above it. It's not water contamination that's caused that and it
181 would not cause it to break into fire, it would just short it out. We have trip systems
182 here so it's not that. This piece of equipment has failed functionally. overheated and
183 caught fire and then it has tripped the power out. Not water contamination which
184 would just trip the power out. This is a new building. The fuse rating systems are
185 so designed that they pick up on an earth leakage very quickly.

186 A: So, in respect of that, what would you like from the fire service?

187 LUFSO: Well, I would like to see their report. What they assumed and everything.
188 But it's kind of 'secret service' sometimes. I rang Control (Fire Control) and got
189 the time-lines so I got the exact; when did you get the call? What time did you
190 despatch? What time did you arrive? They give you all that an I've got all that in
191 my report. So I know the time line is correct but ...

192 A: So there is some information coming through?

193 LUFSO: Yes, but the difference of opinion of source of fire; I think I am right. But
194 I'm not a fire investigation expert and he was adamant that it was water. So I said;
195 well you put what you want on your report but I'm telling you, it isn't water.

196 A: Question three. Do you think that a good standard of fire safety management
197 reduces the likelihood of fire damage and, if so, do you think there is a parallel
198 between the standard of fire safety management and the amount of fire damage?

199 LUFSO: Absolutely.

200 A: Is there a correlation between the two?

201 LUFSO: Fire management, first of all, most definitely. We manage our fire alarm
202 systems very well. We investigate every signal, virtually, which normally will turn
203 out to be false; through the occupancy mainly of students, 98% of them. But if you
204 have a good standard of fire safety management in place, you are reducing the risk
205 already because the risk isn't there.

206 I would say one of our risks that is still not easily manageable is that, if you go
207 into a lot of our old buildings, probably in the building that you work in, and there

175

208 are portable heaters dotted here, there and everywhere and they really should not
209 be there because the University is saying, we provide adequate fixed heating. Now,
210 I know that can become very debatable but the problem we have is the portable
211 heaters are, kind of, pushed back to the department or school, to manage and some
212 schools manage it very well; everything is labeled, it's functioning, it's PAT[4] tested
213 and they've took on our guidance that, if you do need a heater, is an oil-filled
214 radiator heater not a convector heater or a radiant bar heater or a halogen heater.
215 Other areas, you go in and its a free-for-all especially where there are a lot of PHDs[5].
216 They just bring it in and you don't know where it is coming from? It could be from
217 a car-boot sale, out of a skip. Those are the ones that we aren't managing and those
218 are all of the ignition sources sitting there waiting to go, bang! (Ironic laughter).

219 A: Thinking about fire damage and thinking about this office in the Wolfson building.
220 The fire, you said, or most, or the majority of the fire damage was contained in the
221 office.

222 LUFSO: Well the fire damage was contained, other than the smoke.

223 A: Smoke damage went elsewhere?

224 LUFSO: Went into the two offices, definitely, but it also breached into the corridor
225 a bit and some other offices over the cracks in the compartment between the offices
226 which don't need to be fire compartments in their own entirety.

227 A: What I'm trying to get at here is; what role did fire safety management play in
228 reducing the amount of damage? Fire starts; the building ...

229 LUFSO: Having a fire alarm system to a standard of L2 which is interfaced to
230 the University Gatehouse which triggered an investigation signal, immediately the
231 detection system had gone into an alarm. Which had a response of two security
232 officers because it was in the out-of-hours; this happened at five in the morning,   20 minutes
233 and within five minutes of the initial signal, the fire and rescue service were on site.
234 Sorry, within ten minutes.

235 A: So, thinking about your last fire risk assessment of the Wolfson Building, what
236 score would you give out of ten for the fire safety management in the Wolfson School?

237 LUFSO: In the Wolfson School? Nine out of ten. It's one of the best school's
238 buildings that is managed, internally, by the School themselves, all the PAT testing,

---

[4] Portable appliance testing (PAT) is the term used to describe the examination of electrical appliances and equipment to ensure they are safe to use.
[5] PHD is the term used to describe students studying for the qualification of Doctor of Philosophy.

176

239 everything on a register. You can't move in there without their departmental safety
240 officer jumping on you. Very, very proactive. That is, in my opinion, the creme-de-
241 la-creme of the University buildings as regards fire safety management.

242 A: So it's the best place to have a fire?

243 LUFSO: It was.

244 A: If you have to have a fire, that's the best place to have one (ironic laughter).

245 LUFSO: Now, if that had happened in 'S' Building, there is a totally different fire
246 safety management culture.

247 A: I think you have answered that question. There is a correlation between a good
248 standard of fire safety management and the amount of damage?

249 LUFSO: Yes.

250 A: OK, next question. There is a current fire service campaign to reduce unwanted
251 calls, which you are aware of?

252 LUFSO: Yes.

253 A: The benefits to the fire and rescue service are that it reduces the number of false
254 calls they receive, with a corresponding saving of time and money; for them. Does
255 it also lead to a reduction in the amount of fire damage?

256 Is there a correlation between them, cutting down the number of unwanted alarms,
257 however they do and, I think that, certainly the London Fire Brigade is looking at
258 bringing in, or finalising a system of fining. They have the ability and are threatening
259 to do it. But does all the work they do to cut down on the number of unwanted fire
260 calls reduce the amount of fire damage overall? In your opinion, does it do anything
261 to the amount of fire damage?

262 LUFSO: All it has done is to put more of an ownership onto the end-user or the
263 owner of the building to ensure that they have got a suitable system that is not
264 constantly going into fault and causing complacency within the building. So it is
265 making you manage the system far better, so it's improved that. Rather than just
266 someone say, I've got a fire alarm system; job done; tick box; move on. Yes, but its
267 always going into fault; not my problem, the fire service deal with that.

268 So it's dealt with that very good and the University is a prime example. I came here
269 seven years ago and we were calling the fire service, on average, eight times a week to
270 false alarms. Very quickly, I picked up on that and said we have got to do something

177

about that and we have also got to meet, at the time then, the design constraints of CFOA[6] and also the regulatory format that was incubating and ready to come into play. Very quickly we got teams of people trained up to become fire marshals; we got security 24/7, belts and braces, investigating signals and very quickly, we reduced the fire service attendance from eight a week to now, they are ringing us to come on site to say, can we come and have a look around? Basically, moved it out other than genuine fires, they are only getting called to genuine fires. So we've managed it, so it has improved that and it has made us make sure that our systems are working to the design aspect, in other words, they only alarm when there is an issue.

What we can't manage at the moment and it's a very hard one to manage, false alarms generated in the Halls of Residence as the culture is continually changing. You can't keep that culture in place. As soon as you get the occupancy for 2012 understanding the importance and respect; 2013, new fresher intake; we're back to square one again. So it's a constant battle that we are improving the fire alarm systems in major refurbs to reduce the sensitivity of the detector heads.

A: So the benefits of the fire brigade's campaign then to reduce unwanted calls ...

LUFSO: ... has made this University, along with other establishments, look at their systems to ensure that they do function in the requirements that they are designed to rather than generate unwanted false alarms themselves.

A: So would you say that the University functions better?

LUFSO: Yes.

A: So there is a direct benefit for the University from that campaign?

LUFSO: There is, definitely. Working together with the fire service, last year, we were appointed an award. Literally, out of the whole of Leicestershire, we stood out as the ambassadors at that time. Now we've moved forward with the local station. It is working well for Loughborough (University).

A: That's good.

Next question, then. The fire brigade used to have performance indicators, national performance indicators supervised by Government which this Government has now taken away but most fire brigades, so far as I am aware, have kept some of them

---

[6]CFOA is an acronym for the Chief Fire Officer's Association. The professional voice and supporting organisation for the leaders of UK fire and rescue services.

302 and introduced some of their own. So that they can say to the public, this is your
303 fire brigade, we are performing brilliantly and here is the proof for it. That is how
304 they use them.

305 In your opinion, do you think it would be beneficial to measure the performance of
306 the fire brigade with a performance measure that evaluates the efforts of Loughbor-
307 ough University to demonstrate; if you can demonstrate an improvement in your
308 property protection or business continuity because of the efforts of the fire brigade
309 or do you think there would be. Hmm, I'm not putting this right. A performance
310 measure that says that you have; the fire brigade has assisted you to improve your
311 property protection and business continuity ...

312 LUFSO: ... if that was available, yes, but I don't know how the fire brigade would
313 be able to assist us, though because I don't always find them as a hive of assurance
314 or guidance because whenever I have asked them for guidance or information, I've
315 been given; it's up to your risk assessment. That is not a help to me.

316 A: A lot of people think that is unsatisfactory.

317 LUFSO: I would say, if you had an injury and there was an ambulance over the
318 road, where would you go for that injury, initially? You would go to the ambulance
319 people because you would think that that person in that vehicle is an ambassador
320 of what that badge says. So the same thing to me is; if I've got a fire issue and I've
321 got a fire authority on my doorstep whom I can contact then who is the best person
322 to contact for advice and guidance? That department; but that department, and I
323 think it's all to do with litigation, will not guide you because they are frightened
324 that if you take their word for it and it's not quite right, there is a litigation claim
325 against them. It is just ridiculous! And that is how bad it has got.

326 A: That's the area that I'm focusing in on because ...

327 LUFSO: Yes, and I think the weakest point of the fire and rescue service is that they
328 cannot advise and guide people to make a better fire safety environment. They can
329 be quite ruthless and come in and give you incorrect improvement notices which this
330 University was unfortunate enough to occur through the inadequacy of an inspecting
331 officer at the time. Which is wrong because that just puts backs up. That breaches
332 a brick wall not jelled (??), it just pushes a brick wall that; you're saying this and
333 we're doing that; don't agree with you. It's a challenge.

334 A: It's difficult to get back at them.

335 LUFSO: Absolutely, yes. Well they, kind of, say well it's our opinion and I could
336 say that it's my opinion is I like red doors but you said blue. It's an opinion. An
337 opinion is not stand-able in court.

338 So I'm disappointed and I have this all the time whenever I've rung up; all I want
339 to do, like I've done with you, I have got my own opinion in my head but I'm not so
340 confident, I just go, yes, that's right, and write it. I want to throw it across someone
341 else and get their opinion. People like yourself, in a non-obligated role that the
342 fire protection officers employed by the fire service, have been great at giving their
343 opinions, their views and we've, kind of, batted it out and possibly realised that,
344 no, my opinion is not quite right, you know, I've picked up some more information
345 and reviewed it. But the fire service just won't help you on that and I just find that
346 very disappointing; very unhelpful.

347 A: I think my logic is that if there is a correlation between the standard of fire safety
348 management and the amount of fire damage, nationally and not just on the campus, 30 minutes
349 nationally, then focusing on fire safety management would reduce the amount of
350 damage. So if there is a correlation there then focusing on fire safety management is
351 a good thing. Now I don't see why the fire brigade shouldn't concentrate, or focus
352 on the fire safety management of places like Loughborough University and to give
353 advice and to do the things, initiatives that would assist. They have already proved
354 they can do this by focusing on fire deaths in accidental dwelling fires, reducing by
355 roughly half, the amount of fire deaths of people in their own homes, because they've
356 took the trouble to focus on it and done something about it. They could also take
357 the trouble to focus on fire safety management because community fire safety, or
358 focusing on fire deaths isn't statutory, they don't have to do it. So why aren't they;
359 because at the moment, the fire deaths is going down but ...

360 LUFSO: ... property fires is going up, isn't it?

361 A: ... property fires are going up; or the amount of damage is going up.

362 LUFSO: Because, to a degree, fire crews aren't, as they were years ago, going in
363 there and fighting the fire at its origin. They are just sitting out there because of
364 the risk assessments and parameters that have been placed upon them to commit
365 crews in, aren't they? That's how I see it, they; which is correct because I was in
366 the (name of organisation removed) and it was 'gung ho', go on. Get in there! And
367 in you went.

368 A: It's interesting you say that because that has already been put to me but I don't

180

369 see any evidence of that?

370 LUFSO: Well I do in ...

371 A: I want to quiz these fire brigade officers; where is the evidence? You're saying it
372 but where is the evidence that is saying ...

373 LUFSO: Well it's the kind of feedback that I get. When I first put this past; as
374 you know I do these fire safety information packs in the hazardous buildings.When
375 I first put this past the fire safety forum that I used to go to at HQ[7]. The second
376 in command use to chair it, I forget his name but he is still there, the guy under
377 (name removed) ...

378 A: (Name removed)?40 minutes

379 LUFSO: (Name removed), that's it. (Name removed) used to chair it and, basically,
380 they were kind of saying that no matter how much information you put on, they
381 will decide at the time and if they think there is a risk, they won't go in. They
382 are not going to put fire crews in; and I appreciate that because you can replace
383 property, you can't replace a life. And I know they have a format that even when
384 there are lives there; are the lives saveable? If the lives aren't saveable they are
385 not committing crews even when there's people in there, because a block of flats
386 is going to collapse on top of them. And this has really been enhanced further by
387 the unfortunate deaths of fire fighters in the last recent two or three years. So I
388 kind of get the feeling that unless they really are 100% sure they aren't going to
389 put anyone at risk and they aren't going to penetrate your building they are just
390 going to contain them. And so it is down to us to have as best as possible fire safety
391 management and defence in place to contain these fires.

392 A: I haven't seen the evidence that says that it is these big warehouses that are
393 burning down that is causing this rising fire damage. I don't know where that
394 evidence is?

395 LUFSO: I don't know. It is just that I have picked it up ...

396 A: You've said it and other people have said it.

397 LUFSO: Yes, I say that I have just picked it up, you know, it's the initial OiC[8];
398 there's a lot of pressure put on his shoulders, or her shoulders, that makes that

---

[7]HQ stands for Headquarters and refers to the administration centre of the fire and rescue service.
[8]OiC ian acronym for Officer in Charge.

399 choice; am I deploying crews or not? Unless there are lives at stake it's, kind of,
400 step back, whoa, hang on a minute! It's just a building full of contents. So what?

401 A: That might be the reason ...

402 LUFSO: Yes, and it's the health and safety blame culture that has driven the fire
403 service to be so defensive.

404 A: That is definitely true, yes.

405 LUFSO: They are not going to commit as they would have done years ago. They
406 are very defensive.

407 A prime example; I went to a talk up in (name removed) University where they
408 discussed the recent fires in Chemistry buildings in universities and (name removed)
409 University was absolutely madness! Basically, the origin of the fire was in a fume
410 cabinet which was a sixty-minute, fire-resisting fume cabinet in its own design. And,
411 basically, the actual source of the ignition was; the student had had some kind of
412 absorbent paper and spilt a bit of flammable substance, put the absorbent paper
413 and soaked it up. Put it into the waste bin inside the flam cabinet but, for some
414 reason, there must have been a chemical reaction with something else in there and it
415 caught fire. The student wasn't trained in fire-fighting equipment or, the person not
416 the student, wasn't trained in fire-fighting equipment and was unsure whether to
417 use one or not and decided just to shut the door and set the alarm off. Very quickly
418 the fire crews came to the scene and as soon as they realised, or was informed, it
419 was a fume cabinet, they were not prepared to penetrate anybody into that building
420 until they knew what the contents in this cabinet was. That took twenty minutes to
421 establish and in between that time they called out; the Hazmat, the DIM Vehicle;
422 and they closed off half of, not (name of city removed); (name of city removed)
423 because (name of city removed) is a kind of awkward place to get through and the
424 Universities are in the centre. Because of what they did, they closed off and shut
425 down (name of city removed), or a quarter of (name of city removed). Which, when
426 they eventually got to prove it was nothing, the fire had extinguished itself inside
427 the cabinet through lack of oxygen. That was it. The whole thing went ballistically
428 mad over nothing, in one respect.

429 You know, rather than saying, well here is the information, here is what is in the
430 building; like I have got, you are not going to consider just taking crews in there to
431 see and establish it back to the fire zone. As I got it, it was just a 'stay-back' that

432 was all the time, they were staying back. No-one was going into that building until
433 they got that information. Which, kind of, whoa crikey...

434 A: So I get from what you are saying that, your opinion is, the fire brigade don't
435 really help with advice on property protection or business continuity?

436 LUFSO: They certainly don't help when you've got a query and I've rung up, they
437 don't really help, kind of, very tentatively skip around it so you can't, in any way,
438 say that you said we could do this and the majority of the time, the majority of the
439 answers I've got; well it's your risk assessment. At the end of the day, it's your risk
440 assessment, at the end of the day. It's you who have got to satisfy yourself, it's your
441 risk assessment. And I'm thinking; I'm quite aware it's my risk assessment but I'm
442 just wanting to run something past you, get a view or get a guidance on it and I
443 just, don't get it!

444 A: OK.

445 LUFSO: Yes, not helpful.

446 A: I don't intend to; I mean I intend to use this information in my thesis but I'm
447 certainly not going to try to embarrass you.

448 LUFSO: No, (author's name), I don't mind at all. To me it's not personal, it's just
449 my views are that things could be better and I think that what you might do, might
450 improve it. Hopefully, if someone reads it at the right level.

451 A: I hope so too.

452 I've got some points here which are the general viewpoint of yourself, in your role.
453 Firstly, to meet the requirements of regulations?

454 LUFSO: Yes.

455 A: To be prepared for the scrutiny of those regulations by the fire brigade?

456 LUFSO: Yes.

457 A: To get the best performance that you can from the fire safety strategy in any
458 building?

459 LUFSO: Yes.

460 A: To reduce the number of times that the alarm goes off?

461 LUFSO: Yes.

462 A: To co-operate with the people who manage each of the buildings?

463 LUFSO: ... and advise. I would advise and co-operate, really. Sometimes, if I just
464 co-operated with them, my co-operation is more like advice about; you need to be
465 doing this to stop that. Rather than just co-operating with them. It's like the
466 Chemistry building. I can't co-operate with that it's ...

467 A: Point taken. Would you be able to put those in some sort of priority order? Or
468 would you think that they are all the same?

469 LUFSO: Well, your priority of the RRO[9] is to meet the requirements so, if this is
470 under the RRO or whatever, then it has to be your first priority because you have
471 got to meet that, initially.

472 A: This is under your role as Fire Safety Manager for Loughborough University
473 and what you've already said is that, yes, you'll deal with the life safety but you'll
474 also deal with property protection and business continuity; even though they aren't
475 regulatory requirements.

476 LUFSO: Yes, can I put a mark on this? I think that still needs to be 1 because
477 that is my benchmark and that is what I'm going to try and meet. I think, then
478 it's to get the best performance from the fire strategy. Then the need to reduce the
479 number of false alarm actuations because, not so much on the fire and rescue service
480 because we are managing them ourselves, but it's still a burden that we can still get
481 complacency. And we can affect business continuity so I need to reduce that. I'm   40 minutes
482 prepared, then that. So that is my order, I think.

483 A: Is anything missing from that list? Anything glaring? I'm sure there are little
484 bits? Anything glaring, anything big?

485 LUFSO: No, I don't think so, (author's name). No. Not off the cuff, I can't see. I
486 meet the requirements of the fire assessment. Get the best performance from the fire
487 safety strategy and management of the building, is that one. Because if we've got
488 that in place and that's already ticking all the boxes, we've pretty well harnessed it.

489 A: The fire safety strategy I've took from that PAS 911[10]. Which really deals with
490 the management of means of escape, the management of; there are five different
491 things ...

492 LUFSO: Yes, this is what (name of company removed) were working on that with

---

[9]RRO is a term used to refer to the Regulatory Reform (Fire Safety) Order 2005.
[10]*'PAS911: Fire Strategies - Guidance and Framework for their Formulation'* published by the Publicly Available Specification 911 (2007)

493 their PAS 7[11] to get your best fire safety management.

494 A: The fire safety strategy encompasses the whole of the management of fire safety
495 within a building.

496 LUFSO: You've always got to be prepared for scrutiny, not just from the fire and
497 rescue service but we can get scrutinised from Facilities Management because it is
498 cost and I get scrutinised from the departments. Why? So I'm challenged at every
499 angle. (Name removed) will say you need to do something here. Why? Show me
500 where? Show me where it says? So I'm always scrutinised and, by the time I'm
501 scrutinised by the fire and rescue service, I've done that, gone down the avenue,
502 found out what nook and cranny I have to produce to say, this is why you need
503 to have; maybe this is one about signs. Because the Facilities Management, the
504 architectural side, don't want any safety signs on any building. They hate that
505 because it kills their vision and I say; don't care, you have got to have it. So where
506 does it say I have to have it? So I surfed and surfed and surfed but, unfortunately, it
507 didn't say you have to have a 'fire action notice' by every manual call-point. What
508 I did surf and find was that you need to have a management system in place where
509 you can be sure that all your staff know what to do in the event of. I said, because
510 we don't have that, we're a 'floating population', you have to have this until you're
511 sure you've got that. And I used that as a lever to go in. So I did a lot of research
512 on that myself, looking at all the Guidance Documents for it.

513 A: It's interesting what you said about a fire alarm system, a 240 volt fire alarm
514 system because it's not that the fire alarm system is wrong because it is 240 volts
515 and it doesn't meet the current British Standard. Does it actually meet the needs
516 of the fire risk assessment, is the question?

517 LUFSO: Well, is there a suitable and sufficient, possibly means possibly of warning,
518 but it is not reliable. Because for that 240 volt, there is no back-up ...

519 A: What you are doing, I guess, is trying to standardise because it makes your job
520 easier ...

521 LUFSO: Well, you bring yourself right up to this peak, well, you are looking for the
522 peak of perfection, aren't you? Now to get that you need a big open cheque book
523 so let's get there.

524 A: If your standard says that you have to have a routine notice by every call-point. If

---

[11]PAS7 refers to an, as yet, unpublished document giving advice on fire safety management.

your standard says that, the architectural department are questioning your standard so you have to go back to; well it doesn't actually say that, that's the standard that I'm putting in. That's where you have to compromise.

LUFSO: It's the University guidance, the University fire strategy we have. A lot of it is built on Building Regulations. A prime example we've had just recently had a challenge with one of them where, basically, where they changed the design from a sixty occupancy and increased it to seventy-two but hadn't changed the doors and not put an extra door in. I said you are in breach of Building Regulations. No we are not. Yes you are. It says here look, in here. Yes, but it's only a ... I don't care if it it's twelve people or two people, it's a building regulation. I've not written it.

A: But when it's occupied, it's not, is it? Because it's down to the fire risk assessment as soon as it's occupied. It may not have been built to ...

LUFSO: Yes, but what I'm saying is, my argument was; the inspector hadn't snagged it. He was just, and that's wrong, he should not put his blinkers on, he should snag that. And I said. I've no objection against it as long as you show me evidence of how you have mitigated against it. And this is my big argument and they were saying, that's for you to do the risk assessment. I said, it's not for me to do the risk assessment, you've designed the building and involved the building inspector. You know, if you're letting things go, how can I design a risk assessment on it? You've already made this, kind of, questionable, what else are you passing? If you're passing that, what else are you passing I don't know about, I haven't seen? So I caused a bit of a fuss.

A: No, your job isn't easy.

LUFSO: It is not, here! but, as I say, it is not just me. I am not on my own, it's a University kind of issue. It's an ethos that most universities up until 2006, never gave a stuff about fire safety. Then as soon as the RRO came in, they kind of panicked a bit. Some counties were very quick to jump on universities. Leicestershire was slow on the uptake, they never came in here till 2011. Other than a few little jobs that, kind of, drew their attention, which was the Towers. They challenged me over, you know, we've been here nineteen times this year and you aren't managing. I just challenged back, well you need to look at your paperwork a bit better than that. I said because that Towers is one building on this complex and if you want me to calculate the number of detectors I've got, your CFOA Guidance, I don't even register on your box where it says I need to be interviewed by you.

⁵⁵⁹ You pick on the building, I said, we can go down town and do that, can't we? I can't
⁵⁶⁰ accept it but I appreciate what you are saying and I want to do something about
⁵⁶¹ it and I will use you as my lever to get something done. But you're wrong in how
⁵⁶² you have come challenging and saying we have got to do this and I challenged them
⁵⁶³ against the Hollywell Park because that is a double-knock system and they said,
⁵⁶⁴ because we had had a few false calls to it, we called them out on first and second
⁵⁶⁵ knock, sorry, we called them out on second knock and both second knocks had been
⁵⁶⁶ faults, you know, nothing. And they said you need to prove your signal and I said,
⁵⁶⁷ no, not while I have a system that's first and second knock so you're telling me now
⁵⁶⁸ that I have to question a person who has hit a manual call-point who has discovered
⁵⁶⁹ a fire, I've got to go and investigate it now? Is that what you are telling me? And
⁵⁷⁰ they kind of sit back at that and I say, put that all in writing and I'll do as you tell
⁵⁷¹ me but I said, no, I'm not prepared to do that. This is a double-knock system that,
⁵⁷² in my opinion, if two devices have come in and said there is something not right,
⁵⁷³ we have to assume there is possibly a fire; rather than delay it even further and
⁵⁷⁴ investigate it and put an extra five minutes on that already properly established fire
⁵⁷⁵ before we even get you here. I can't accept that from an asset protection point of
⁵⁷⁶ view. And they said, well, you know, we are not happy about that. I said, well, let's
⁵⁷⁷ compromise then; I'll challenge it during normal working hours on Monday to Friday
⁵⁷⁸ when I've got staff within the building and I've got, you know, plenty of people, eyes
⁵⁷⁹ and ears discovering fire but out of hours, no, I'll call you. So they agreed on that.
⁵⁸⁰ But had they have probably bullied us we would have been challenging that one in
⁵⁸¹ the middle of the night, you know, right down the other end of the campus.

⁵⁸² So. I don't know. I find that, sometimes it's; the book says. Yes, well, look at the
⁵⁸³ bigger world! Or look at the bigger picture! But I've had other inspecting officers
⁵⁸⁴ who have been really great. One guy, I think, (name removed) somebody, came and
⁵⁸⁵ did Butler Court. You could see he was, like, yes this is fine. I'm happy with this.
⁵⁸⁶ I've got no problems.

⁵⁸⁷ I've always been a person, if you are doing a life safety issue, you have just to say to
⁵⁸⁸ yourself; would you sleep here or would you not sleep here? Now, if you're saying,
⁵⁸⁹ yes, sleep here. Yes, alright. there are a few things that are not quite right but I'd
⁵⁹⁰ sleep here, you know what I mean? It's safe. Alright there are improvements that
⁵⁹¹ every fire seal should have no paint on it, but that's Utopia, isn't it?

⁵⁹² My argument was; well, I can appreciate your fire seals being a very important factor

if I've got no alarm system. But I've got an alarm system that's sniffing every nook and cranny that it just cannot, and, I said there's no dead-end conditions. I really can't buy into your fire seals; this was this last fire officer; I can't buy into it. I said, you are reading from the text-book which clearly says all compartments ...

A: There are some good fire service officers. Don't rate everybody by this one (laughs).

LUFSO: Yes, but this other guy, (name removed), who came, we've got similar things, and he just went, yes, that's fine because he could see there were other control measures in place. The only thing, the fire seal, the smoke seal would do for the University is to stop smoke damage or limit, sorry, not limit the smoke damage so well if it's got paint on it because it can't seal as well. But it would be minimal. you know, I'll get a cleaner in and clean it off but it would just not put anyone at risk. That's what I argued with him about but he wouldn't buy it.

A: (Name removed), thanks for your time.

LUFSO: No, you are very welcome, (author's name). I mean, (name removed) said that, if you could, she would like to see something of this later on, if you can, to demonstrate; because there is something we have to do where she has to say where, when we work with other people in the University. I said, well I'm working with (author's name); he works out of (name removed) so I'll just update her on this.   50 minutes

C. Appendix 3: Transcript of interview with Fire Service District Manager

Leicestershire Fire and Rescue Service

17 December 2012

612 Author: (Name removed). How many years have you had in the fire brigade?

613 Fire Service District Manager: Nineteen.

614 A: Just a little bit of background. This particular research that I am doing is into
615 fire safety management. I have access to the University's statistics, fire incident
616 records; I have access to your fire incident data, Leicestershire's, from 2009 to this
617 April, just gone. What I'm doing, I'm looking at that and what I'm trying to find is
618 a way to forecast fire safety management. To profile a property or an organisation
619 by which you could identify, because of certain parameters; things to do with fire
620 safety management, that they are more at risk than another one. Thereby, you
621 could, if you chose to do so, target fire safety management with these profiles of
622 organisations or properties that exhibit these characteristics. In the knowledge that
623 you will be driving down the amount of fire damage. Just as you have, in exactly
624 the same way that you have done with fire deaths in accidental dwellings and driven
625 down the number of: its a profile of a property rather than a profile of a person.
626 That is my aim, that's the aim of my research.

627 So, I'm trying to use the data that I have access to and interviews such as this, with
628 yourself and relevant people in the process, to try and find some new knowledge that
629 we can; that I can offer to the fire brigade or the fire brigade can see and choose to
630 take up or whatever. That's the background.

631 So I sent you these questions which we'll go through, that's going to be the basis for
632 the interview but I've also put down; I've also sat and thought and I've tried to see

189

the world from your viewpoint as a District Fire Manager, fire and rescue service manager, and I've put down some points and at the end of the interview. What I would like to do is to go through those points and I'm going to ask you if you can put them in order of importance.

FSDM: Okay.

A: So, we'll start off with the first one. This is Question 1: How does the management of fire safety assist a company or an organisation, you could perhaps think of the University, to meet the requirements of regulation and the scrutiny of regulatory inspection from the fire and rescue service. How does the management of fire safety assist the company in its requirements and liaising or preparing for an inspector to come on site to do an inspection?

FSDM: I think the first thing; obviously my role requires me to manage on the three properties that I'm responsible for and the key element, obviously, is to reduce; A, the potential for fire and the injuries or any fatalities that may be a consequence of it but it also provides a safer workplace for those that work there from a general day to day perspective. Also, it reduces the amount of time that I have to put when an audit occurs from the regulatory agency, i.e. ourselves, if we turn up to do an audit, I know where everything is. If everything is in order when they roll up, it's basically delivering the material to them. It's very succinct, it doesn't take a great deal of time if you have your house in order and that's you.

A: Do you look at it just from a life safety point of view, though? Because the requirements are all about life safety, aren't they, and it's only by default that it's property protection?

FSDM: But, of course, the other aspect is clearly business continuity. If my property was involved in fire here, the embarrassment factor, first and foremost for me, is the fire service having fires in their properties would be national news, I'm sure and, clearly, although we don't make a process or deliver because we would obviously still deliver the fire and rescue service but from an alternative means but I have to invoke those alternative means and it does put a strain on the service, in that respect. If I was a University, a building is no longer available to teach then I'm looking at financial cost, disruption to the student's experience, which are all negative factors which will affect the University.

A: Do you think that fire safety management then achieves that?

FSDM: If you do it correctly, it will.

A: But if you think about yourself in the role as fire safety manager here or the Fire Safety Officer at the University; in principle, exactly the same but two vastly different ...

FSDM: Vastly different, I would suggest, on the value from the Uni's perspective. They have a lot of young students that are frequenting their properties whereas the number of staff that work here are all fire safety trained from the moment they join; so it is embedded to their psyche which wouldn't be the same from a student's perspective.

But the regulation aspect again, as the question states; how should the management of fire safety assist? It should make them slicker in terms of operation to enable them to be open more consistently throughout the year because they are not getting prohibition orders or; you can't use that area of the building because you've done something with it to, you know, develop it not in accordance with fire safety legislation. And that is upheaval that businesses just wouldn't want, ultimately. So, obviously, by managing it well you reduce that.

A: Okay. While you were talking I'm reflecting on the conversation with (the University Fire Safety Officer) last week. He has certain issues with; his view of life is that, perhaps, the fire brigade concentrate too much on life safety and not property protection or asset protection as (name removed) calls it. He is focused, I think; his focus is certainly on life safety but it is also on asset protection. I think he has two main focuses actually; one is asset protection because of business continuity because he gets his **** kicked if a building is unusable but, also; the points just gone.

FSDM: We've had this conversation with (the University Fire Safety Officer).

A: Oh, right. You know (name removed).

FSDM: Yes, I've had a fair amount to do with (name removed) in the past and I know his viewpoint is; weight of attack, for example; if there is nobody in the property and it is on fire, there are a few bits and bobs in there that, you know, you may be aware of through information, would you go in and put the fire out? And, as you know yourself, depending on the risks that are present and the perception of the manager who is present from our service, they may decide that actually, no, I'm not going to go in just yet because, there is no life risk. So, you know, the principle of; we will risk our lives in a highly calculated fashion, we will risk our lives a little for saveable life and not so much for saveable property and not at all for things that are already lost. That ethos is pretty well embedded in the service. So for

us to worry about saving property is completely different to saving a life. The risk that you put or that you expose yourself to or are happy to accept are completely different. And I have a phrase that says; I don't mind if anybody remembers me for losing a building but I'm never going to be remembered for losing a life. That's a pretty robust and well-embedded phrase

A: I totally understand that.

(The University Fire Safety Officer's) other focus is on cutting down the number of times he calls you to the University and, certainly the figures show that he does quite well. You know, it is something like five times; this was the year from, I don't know, 2009 to 2010? Something like that but twelve months-worth of data. He called you; he called the fire and rescue service five times but the alarm went off, in one of the buildings in the University, something like, 450 times. And those 445 times, the University staff dealt with the incident themselves. Which I think is tremendous. Because I want to come on to, a bit later on, about unwanted fire signals which is something that taxes me. From my point of view, he seems to be doing quite well, does (The University Fire Safety Officer).

FSDM: I can't dispute the figures and I think it ties in with the unwanted fire signal policy where, of course now, what we would do if we received a call from the alarm-handling company is ask them, well is there a fire at that property? The idea is that within a window, that they come back to us and declare; there either is or there isn't and until such time that they advise us then we don't send the resources. Obviously 10 minutes with the University having a security system that is set up where they respond to the property to then clarify if there is or there isn't a fire. We, obviously, don't roll out so much because, invariably, there aren't so many calls which are genuine fires, they are through other means. So although the number of activations that they have detected are still; I don't know whether they are consistent or not because I don't know what their figures are. But the fact that we don't mobilise anything like as much as we used to because of that extra barrier to ask to clarify and it's only outside of normal working office hours and the actual building is a life risk; like a hotel where we would normally go as per normal. In fact, in the day if it was a hotel, i.e. Burleigh Court[1], if there was a fire alarm that was operated there, we would roll as per normal because it is a life risk. But if it was a lab block or something like that, we wouldn't necessarily respond.

---

[1]Burleigh Court is a Hotel and Conference Centre on the Loughborough University Campus.

Which is another good point because if we don't go to calls so quickly, I think it puts the emphasis on the occupier then to make sure that their house is in order on the value that we know that the fire engines are not going to come straight away so we want to make sure that if there is an alert that we know quickly. There either is or isn't a fire and then their own staff can take actions because that is again part of their risk assessment. And, if they require then mechanical devices to be fitted for fire protective measures to mitigate building losses and production losses, then that's an appetite that the occupier needs to have. Which, again, goes back to your management of fire safety, isn't it? How much do they want to invest in it so that they can deliver.

A: It all boils; in my mind, it all boils down to the ignition. It is control of that ignition. If you have processes that use an ignition, it is controlled. If you have no processes that use an ignition and you have lots of flammable material, it is the control of any ignition, you know, through arson, through cigarettes, through whatever? That's what fire safety management; that's the essence of fire safety management is the control of that ignition.

So, I think you have probably answered the second question; how does the management of fire safety assist in the protection of property or the continuity of business? I think we've probably answered that so I'll skip to the third one.

Do you think that a good standard of fire safety management reduces the likelihood of fire damage and, if so, do you think there is a parallel between the standard of fire safety management and the amount of fire damage?

FSDM: I think the first part of that question is that, generally; if you have a good standard of fire safety management then it will reduce the likelihood of fire damage providing that the cause of the fire isn't a deliberate act where the fire safety aspects have been mitigated by their actions. So, i.e. if I work in a loading-bay area where there is a high fire-loading but the fire protection aspects in there are really good, you know, no smoking, no naked lights, good compartmentation and so on; if I want to create damage, pin the doors open and set fire to something then, clearly, the losses are going to be greater. So I think it's only controlled by the human factor of whether there is a correlation between good fire safety and the losses. If it's a deliberate act then, clearly, it will be different and if you look at (company name removed), which I know that you were involved with many moons ago, you know, massive losses and you'd say that their fire protection was probably reasonable for

193

the time but, on face value, the size of building like that that you would think it would be good. But, of course, because of factors that occurred; total loss of a huge warehouse and, you know, multi-million pounds.

A: Can I tell you my reflective considerations on (company name removed)?

FSDM: Sure.

A: Because, it never came out, because there is no evidence for it. You know, the fire investigation is to find evidence of what caused the ignition. The insurance companies who were working there, there were three or four insurance companies and, really, I was just looking over their shoulders to see what they were doing because they were investigating the fire. They were all concentrating on the site management and the deficiencies in the site management and the sprinkler ring main. And, I believe that's what the settlement was all about; it was all the fault of the site management and, you know, they have to pay but what was paid, I don't know? It never came to court, I think it was all settled out of court.

It's probably still going on for all I know. But, my own opinion is that the fire safety management was at fault because the duty manager at (company name removed) knew that the sprinkler system was inoperative, he perhaps didn't understand why but he knew it was inoperative because he was told and; as did all the other duty managers on the site in the twenty-eight occupancies but they did nothing about it. Now that's a fire safety management fault.

FSDM: Absolutely.

A: And, if they had have done something about it; I don't know what they could have done but certainly they could have done a risk assessment, they could have assessed the risk, assessed it as high, as it was and, I don't know; could have had people standing there with fire extinguishers or whatever, you know, till the fault was rectified.

FSDM: And, I think that is based on this appetite of profit through your operation against the safety and security of your property which is clearly an aspect there that; we all know in this massive shed that there's no water going to be deployed instantly there is a fire. That's okay because we need to make money, we need to carry on working, we need to make the profits and that influence clearly outweighs any safety aspect at that site at that time because you would have liked them to have said; hang on a second, if there is a fire and there is no water we are going to

lose all of this. That's going to be a massive problem for us and if we're going to lose far more money than we are going to make by carrying on. So, should we just not shut for a week and get somebody back and make sure the sprinklers work and …

A: That's right.

FSDM: … that's the management aspect of it, isn't it, fundamentally? Going back to that question, if you have a good standard of fire safety management then, clearly, it will reduce the likelihood of fire damage, regardless of the cause, by the very nature that you have, you know, mechanisms in place and good management in relation to your training and your observance of your staff and it will reduce losses.

A: So, do you think there's a parallel between the particular standard of fire safety management; whether it's good or bad, and the amount of damage that would ensue if a fire occurred or an ignition occurred?

FSDM: Well, there has to be. They are linked, aren't they? The; I think that it's a difficult one to quantify based on the type of property involved.

A: It's something I would like to quantify with the data but, really, I'm just after your opinion.

FSDM: (Long pause) Yes. The standard of fire safety management and the amount of fire damage; there has to be a parallel.

A: There's a, sort of, direct relationship between the two, don't you think?

FSDM: Yes, they're inextricably linked. The better your fire safety management, the less damage that you're ever going to lose and, if I go back to another example would be a high-bay warehouse with sprinklers that operate and staff that are trained and have extinguishers on site and anything else. Where a deliberately ignited fire in a palletised system within the rack which was, three o'clock in the morning, activated sprinklers which suppressed the fire. And, although the alarm system didn't work, it was spotted by staff, it was extinguished as well by ten extinguishers and the losses were limited to £1000. Which was the value, roughly, of the; probably wasn't £1000 to the company but it would have been for me and you if we had gone and paid over the counter for it. So, a nominal £1000 fee in terms of product, clearly, time of people not being able to work due to the call and the post-investigation and so on, but it just shows you that their good fire safety measures reduced the damage.

A: It doesn't happen by luck, does it? It can't happen by luck?

834 FSDM: No, it's not a chance thing.

835 A: That's what (company name removed); really, the duty manager; he was just
836 trusting to luck, wasn't he?

837 FSDM: Absolutely. So that, in that respect, no. And, if you had, you know, other
838 systems in place where (pause), well, there's another site that's just opened up,
839 that we're aware of, in (place name removed). It's (comapny name removed). It's
840 colossal, huge but the engineering solutions are such that, no matter what happens
841 in there from a fire perspective, it would be alerted very quickly and there are
842 sprinklers and, for the number of people that work there, which is low, this thing's
843 all automated, picking, fetching and carrying. It will probably look after itself before
844 we get there some twenty minutes later.

845 A: Providing everything's maintained by fire safety management and works

846 FSDM: Providing everything's maintained. It works. Absolutely.

847 So, today it will work great, brand new and it's been commissioned and it's fantastic.
848 It's three years down the line, is the question, is it still as good? Have the sprinklers   20 minutes
849 been checked? Is the pipework still free of, you know, corrosion, blockages and so
850 on? And that's the interesting facet.

851 A: It's the engineering solutions, the fire safety engineering solutions that are doing
852 away with the old compartmentation, the things that didn't need maintaining, ex-
853 cept the doors and that. You know, that have always existed and you didn't need to
854 bother about them, they contained the fire. Now, because of the restrictions of that,
855 we have these fire-engineered solutions in place which rely on fire safety management
856 and we don't have, you know, we're not upkeeping the management side of it.

857 FSDM: And that goes back to the profits versus the time that you can't use the
858 site, doesn't it? For the testing and maintenance.

859 A: Let's talk about unwanted fire signals. What are the benefits to the current
860 fire and rescue service to reduce unwanted fire signals. As I see it, the benefits to
861 the fire and rescue service are that it reduces the number of false calls they receive
862 with a corresponding saving of time and money. Does it also lead to a reduction
863 in the amount of fire damage? Or is there a correlation, a relationship between the
864 unwanted fire signals campaign, you know, the CFOA campaign that's been ongoing
865 for quite a few years with all the, you know, the press exclamation and whatever,
866 are the fire brigade going to do this or whatever? And all the commercial companies

867 and people like the, you know, these associations of companies who are suddenly

868 having to say; the fire brigade won't attend, you know, and what do we do instead?

869 FSDM: I think there are a number of benefits. I think the first one for an organisation

870 is for them, first and foremost, and again, through our engagement with them when

871 we do attend and is to sort themselves out. Certainly through my career, you've

872 been to the same place time and time again and its because an engineer hasn't

873 contacted whoever, to say that the alarm's offline while we do this drilling work or

874 it's the kitchen steam again that has activated the one outside the corridor and it's

875 just been left and we've come away and you'd go again the week after and it would

876 just be continual ..

877 A: ... the same detector time after time after time.

878 FSDM: Absolutely. But, of course, what we are saying now is, look there is a bit

879 of pressure from you under the Regulatory Reform Order that you haven't got the

880 right assessment because it's still happening, we're still coming out. So that's one

881 attack and, of course, when we don't go any more because of this issue of wanting

882 to find out if there's a fire or not? It puts the emphasis on the occupier to actually;

883 (A) clarify, quickly, if there is a fire or not but also if there is, what are we going to

884 do? The fire brigade have still not left yet till we tell them there's definitely a fire.

885 So, perhaps, we should do a bit more staff training, have the relevant extinguishers

886 available because, again, part of the RRO[2] suggests that you shouldn't staff (??) by

887 extinguishers to get out, you should actually get, you know, train your staff to go

888 back and put it out to reduce the losses you're going to entail if you left it.

889 So, I think it's a two-pronged approach.

890 A: So that the likely result then would be a reduction in fire damage because of

891 the characteristics you've just mentioned. But, was that ever the intention, do you

892 think? You know, the motivation was; am I right in my saying that the motivation

893 was to reduce the amount of time and effort that the fire brigade put into it?

894 FSDM: Oh, I think, is that primarily, that is the reason for it. If you look at it

895 again, I'm pulling figures out of the air; the number of AFAs[3] that we attend far

896 outweigh the number of confirmed fires. And, of course, the impact to the fire and

897 rescue service in that respect is that we've not got the time then to do important

898 training, risk information gathering as well as community safety work because we're

[2]RRO refers to the Regulatory Reform (Fire Safety) Order 2005.
[3]AFA is an acronym for Automatic Fire Alarm.

forever nipping up and down to wherever to say, sorry but you need to fill this form in because there's no fire and it's caused by steam, wrong detector, faulty system, you know, accidental breakage of a call-point which you don't really need anyway and all these sorts of things.

The driver was for us but, I think, the knock-on effect was that, you know, businesses can look at it from the viewpoint of improving their own management. And also enhancing their own systems in terms of staff and training.

A: I'm not aware that that policy has been reviewed. Are you aware?

FSDM: Do you meant the CFOA[4] effect of it or locally within Leicestershire?

A: Oh no, the CFOA driver, really, because the brigade's have just picked up on; the fire and rescue service's have just picked up on the CFOA driver, haven't they?

FSDM: I think, historically, a lot of things can be driven centrally and we pick them up and we never let go of anything. I think that was systematic of the fire service, wasn't it? You know, we've been doing this for years and we never have; well why? Why now? Because we are going to get to a point where UFSs[5] will, hopefully, get to a level that you think, well actually, that's, we can tolerate that. You might get one or two occupants that have problems throughout the year but, on the whole, we tolerate it. Because the flip side is, we're doing so much work in terms of filling forms, collating data, sending them letters to say that you've not complied. You've had three calls, for example, this month and we just need to remind you of your responsibilities and, if it continues we then send an FP Officer around to do an audit to make sure that things are all in place. But that's generating our own work on the value of trying to reduce the number of calls that they have. So you have to hit a level where you say; I'm actually happy now. Because we need to save the resources in terms of letter-writing and sending officers out to do audits because we are at a point where we are happy and we can tolerate those levels. Because nothing is ever going to stop. You're always going to get something occurring. It's just knowing when that cut-off is? That might not be a decision that I am able to make.

A: No. I find this toleration of things quite interesting. Because, when I joined the fire brigade, in the (name of location removed), we had forty-five deaths per year, on average. And people said that's the natural thing, you know, you can't do

---

[4]CFOA is an acronym for Chief Fire Officer's Association. The professional voice and supporting organisation for the leaders of UK fire and rescue services.
[5]UFS is an acronym for Unwanted Fire Signals.

anything about it, it's just the natural figure. But then we started to do something about it and decided they weren't all; some you could do something about because they were accidental, others you couldn't because they were deliberate, you know, so that reduced the figures and it's reduced to; I don't know what the figure is now but it's probably 50% of that, it's probably twenty per year now in the (name of location removed). And I'm aware that the fire deaths is going down and it has for the past ten to fifteen years because of the efforts of community fire safety and so on; whereas the fire damage is going up and it's still going up. No that's, you know, we tolerate the number of deaths or, it was tolerated then but suddenly it wasn't tolerated so we did something about it, but the fire damage, you know, we tolerated it then and it's now here and we're still tolerating it. I find that quite intriguing, the way, you know, the toleration. How and why we do that, I don't quite know?

FSDM: I think, for me, where I'm at at the minute, or where we are as a society at the moment, is that; there will be a number of different property types across the district in the county that you would still want to respond to. To an AFA in hospitals are clearly one example and hotels would be another one, for me. And the number of calls that we receive to such premises, you know, you would argue, yes, we can tolerate that because you expect to go. If the hospital across the road here had a call now you'd want to go because of the very nature of the profile of the staff and the patients that are in there. But, in terms of 'Mr. Engineering' around the corner that you've been to, probably, thirty or forty times over the last three years, you get to a point where; I don't want to keep coming to you, because it's the same reason every time. It's what you do, it's your process. You need to sort yourself out and change your, you know, your behaviour so that we don't come because we're going to ignore your system. And I know that some counties are doing that, aren't they, some industrial properties that have AFAs completely, they're not responding to or they're going to charge if they do respond. But I wouldn't want to go down that route, first and foremost.

A: But that's just the way of managing the situation, really, isn't it?

FSDM: Yes, but that figure to tolerate, I would suggest, is where we are at. I would be happy to tolerate a certain number of AFAs from certain properties but, you're right, I wouldn't want to tolerate a number of AFAs to other types of properties. It would be something I would want to reduce.

A: I'm aware of your arguments with (the University Fire Safety Officer) are really

964 on detail.

965 FSDM: Of course they are, yes.

966 A: You're actually traveling precisely in the same direction and there are only the
967 little details that, because of the character that (name removed) is, you're actually
968 doing a fantastic thing and you're both holding hands, walking into the sunset.

969 FSDM: It starts with trying to influence, because you said that it's about property
970 influence in terms of losses but a lot of that is because of the people that are in the
971 properties. They've got to be influenced.

972 If you look at secondary fires, you know, the small deliberate stuff that you get; we're
973 at a point now where, unbelievably, it's really, really low, and I'd love to tolerate
974 those levels for the rest of my career because they are so low. To the point where I   30 minutes
975 think I have two in a month in an area the size of Charnwood which is huge. You
976 know, to only have two deliberate fires which are small, we're only talking a bit of
977 rubbish or a bit of litter or a waste bin in a park. That's fundamentally fantastic and
978 the reasons behind that, of why they are so low, I really don't know. I'd like to guess,
979 well, the weather clearly may be an issue, it's been wet a lot lately maybe people
980 are staying indoors and not going out but I also think that through the school's
981 programme that we've been doing for many a year, it's embedded into young people
982 now that there are dangers with fires and you need to, you know, be careful. I'd
983 like to think that people that are now of working age have had this input and it's
984 stays with them. They've had reminders along the way with national campaigns
985 and local ones and they are actually far more fire-savvy than they ever used to
986 be; which, when you put them into the work environment, hopefully, reduces the
987 impact that fires have on the businesses but the impact of fires within their working
988 environment, full stop. I think, it's not scientifically proven but I'm sure that that's
989 an influence.

990 A: No, I'm just thinking of the times that my children pick me up on things (laughs).

991 I guess you're aware of the number of fire deaths, in the area that you administer,
992 within the last twelve months.

993 FSDM: Yes.

994 A: You've just mentioned that you are aware of the number of deliberate fires within
995 that area.

996 FSDM: I am, yes.

A: Are you aware of the amount of fire damage or the economics of fire damage within the area you administer?

FSDM: I'm totally unaware of that and, for the very nature that it doesn't form part of our key service indicators where, clearly, we're measurable on fire deaths and the number of incidents we attend. Probably because they are reasonable targets for you to measure performance. But I'm not entirely sure how the fire losses would be; (A), collated and; (B), put into some sort of format that would target, you know, if I was to sit here for next year's figures to say, (author's name), that I'm looking to restrict fire losses to £1.4 million; I would have no idea where I would be plucking that figure from?

A: Which brings me into my last question.

Do you think it would be beneficial to measure the operational performance of the fire and rescue service with a performance metric that evaluates the efforts of companies and organisations, such as Loughborough University, that can demonstrate an improvement in business continuity or reduction of fire damage?

Now that pre-supposes that you can measure the amount of reduction; sorry, the amount of improvement in business continuity or reduction of fire damage and that you would be able, somehow, to relate that to the performance of a fire and rescue service. (Pause) Do you think that the concept is good?

FSDM: But would that performance measure for the fire and rescue service? Sorry, I can't see where there is a link with our performance in relation to the management of a site, for example. If you were to compare Charnwood District with North-West Leicestershire, for example, which is similar in size, for argument's sake. Certainly, there are some similarities in terms of crime-rate and things like that. But for me to state that we've had better savings in terms of fire losses than North-west Leicestershire would be difficult to rationalise because their geographical make-up and their risks that they have are really different to ours. They have a raft of high-bay warehousing where there's lots and lots of stock whereas we get quite a lot; there's still quite a few small engineering companies and there's a few bits of warehousing and so on. So to have a fire in North-west Leicestershire in a high-bay warehouse could immediately result in far greater losses or lower ones, because we spoke about (comany name removed) having little losses, you know, because it was well-managed than it would be for a multi-occ place in Loughborough, for example. And I'd really struggle to understand how our performance is monitored

in that respect because, by the very nature of the fire-protective measures that are fitted, if that contains the fire like we said about the pallet, so it's local to a one-palett of stock, that's fantastic but we've done nothing to assist that. It's been the occupant, the actual owner of the property, through their own fire-engineering or their perception of what is good management at their site; they've done it themselves and we've had no influence whatsoever.

A: Well, we do have influence, don't we? Because we look at the plans, we inspect the plans of new premises, we inspect the fire safety solutions for...

FDSM: We do inspect but we're less influential, I would suggest, than we used to be and the (company name removed) property up the road; we've gone there and said that, it's fantastic, it's huge but there are things that we would like fitting like a protected stairwell which you haven't supplied for us; and they said, well, no you're not having it becasue we spent all this money on all these other technologically-advanced systems, we think this is suitable. So, we're not involved. We are involved with them, don't get me wrong but we haven't positively influenced them at all.

A: When the plan is passed with, you know, whatever fire safety solution is included, you know, and that should be, sort of, in consultation with all the interested parties, it dissolves down into the fire safety strategy to maintain that solution. And the fire safety strategy; fire safety management is about maintaining that fire safety strategy. So, in; if you think about it in a dwelling, you've identified the profile of people most at risk and you've used all these different agencies to form partnerships so that you can reach these people; give them advice, give them smoke alarms, give them, you know, make them have fire risk assessments and so on, and reduced the number of deaths because of that. Then couldn't a similar view be taken on properties that, like high-bay warehouses, that, you know, if they do catch fire, the whole thing burns down. And I know there are other factors because I know they're designed, these days so that if they burn down they can just be; they don't want you to save them...

FSDM: No, they don't. They'd just rather bulldoze it and start again.

A: They just want to bulldoze it and start again. Which isn't good for; well, it isn't good for the environment but it might be good for their profits. It isn't good for the environment and it isn't good for the people who work there. It would be far better to prevent that fire in the first place, is my opinion. And the fire brigade, I think, could have some; in the way that you've tackled yourself with accidental fires in

dwellings, you could also tackle yourself with fire safety management in properties that have got the potential of the biggest loss or the most frequent loss or whatever?

FSDM: I don't dispute what you say but I think; my opinion, at the minute, would be the fact that within that domestic property where we are trying to both influence the person who lives there as well as make the property safer, the net result is, we're saving life. Within an organisation where people are awake, mainly, whilst they're at work, we're not that bothered if you lose your property at the moment, are we? Because we're on about the life risk again. As long as my little green indicator says that we've had no non-domestic casualties or fire fatalities then I'm, or this organisation, at the moment is achieving well. The fact that we've lost fourteen premises or put half of Loughborough out of work on the value of it, isn't our fault and it's not something that we're marked up on.

A: This is my argument about toleration, really. Why it intrigues me, because we tolerate this; I think it's something like £8.5 billion per year at the moment in fire costs. You know, no indication of how many jobs that are lost or the devastation to people's lives or whatever? You know, we just tolerate all (laughs) that but we only; we deal with something that we don't think society will tolerate and that's the number of fire deaths.

FSDM: Does that figure; because, obviously, from an insurance perspective most premises will have insurance that will cover that and, you know, there are some organisations that don't have insurance or fire cover because it's just cheaper to accept the fact that; well, we've lost the building, by the time we build another one then it's cheaper than having a premium so that, you know, there are a number of factors that people work to. Whereas, and again, that's for the business aspect to look at, that's their business, they're making their profit and you crack on. But Mr Soap and his property with his family, we don't want you involved in fire so we are going to just, you know, concentrate our efforts on you. And that's where we are at the moment. I don't see any shift in that respect.

A: No (laughing). I can't see any shift, either.

FSDM: The shift that we have, I think, with the non-commercial properties is just knowing that we know a bit about that property and, if we perceive it to be a threat to the firefighters attending, the staff that are in it; the environment comes, you know, down that level as does the societal issue of people being unemployed, you know, out of work and so on.

40 minutes

A: The environmental legislation isn't very effective, is it? Because there is, you know, there are responsibilities on you for the environment but they're not enforced at all, are they?

FSDM: No. Not. We've done some work on the effects that we can make at a fire in terms of; if we take direct action, obviously, it affects the environment in a greater way than a fire on it's own would have done. And, obviously, we could be culpable for that.

Probably, about two or three years ago, we started looking at that in some intensity but I'm not aware of anything that has ever come back yet and bit us in the backside. And again, from an environmental perspective, without it being a fire involved, you don't hear that many issues where people are being prosecuted for it. Or, I certainly don't at my level.

A: The amount of pollution that (company name removed) caused, you know, you would think, in the cold light of day, there'd be some sanction that environmental legislation could do?

FSDM: Unfortunately, what happens there, again there'll be, and there is a raft of insurance policies that cover environmental damage for your property and it's just more of your profit going to another insurance policy. And you'll, you know, influence that by changing the way that you work, You'll alter your margins, might not get your sprinklers serviced so often? (laughs ironically) So, it's a local management issue, isn't it for each property?

A: It is, it is. Thank you for that, (name removed), that's good.

Just to finish off then, I've got this list here of, one, two, three, four, five points and I've termed them, the general viewpoint of a fire service officer. I'll just go through them and I'll let you read them so that you can; because what I wanted to do is to put them in their order of importance. So the general viewpoint of someone in your position is to police the requirements of regulations, reduce the number of calls for assistance, measure the operational performance of a local; of this station or it'll be your area. Respond to calls with the correct response and to reduce the number of unwanted fire signals. Now you may disagree with some of those you may say that that's not conclusive or comprehensive? Which is great but, I think, what I'm really looking for is an order of importance.

FSDM: Sure. I would suggest for me as a District Manager, the most important one continues to be to reduce the number of calls, regardless of what its for, in the

district. If you look at my chart on the wall, (author's name), you'll see a raft of key performance indicators and the main ones are; the number of fires, secondarys, RTCs[6] we attend, how many other emergencies have we been to? False alarm calls, which you'll see is low, in green. So that raft there is all about the number of incidents we go to. That's the number of injuries and deaths from fire, RTC. This is whether we're assessed as a high-performing fire and rescue service i.e. the number of properties attended more than once for false calls. You can see where the list is coming?

A: I can, yes

FSDM: That's the percentage of incidents attended in accordance with our times and then I've got the level of staff availability and the availability of my appliances. So, they're the key elements for me which, if you go through your list; reducing the number of calls would be my priority. Reducing the ...

A: If you think they're equal ...

FSDM: They're all fairly equal, as I said before. The number of calls is one aspect which ties in with reducing the number of unwanted because they're, obviously, inextricably linked. Responding to calls with the correct response is something that we are measured on but I think it falls below the operational performance of the stations; i.e. the attendance times, the number of riders and the availability of that lorry. So I would say those two; do you want me to mark on the paper?

A: Yes, please.

FSDM: I think that they're clearly number 1, as that is as well. We need to make sure that that happens. Responding to the calls with the correct response; is that in terms of the PDA[7] so that the right number of lorries have turned out?

A: The right number of lorries and the right types of lorries and the right types of people.

FSDM: (Pause) Yes. That's probably a bit of a 'gimme' from a Control perspective as opposed to my, sort of, monitoring. That's Control's element that does that, albeit we know, we do review risks on a timely basis to make sure that the PDA is proportionate. So, certainly for Category 3 risks and Category 1 risks, not even

---

[6]RTC is an acronym for Road Traffic Collision.

[7]PDA refers to the Pre-Determined Attendance; the calculated number and type of fire appliances that should be sent to the incident.

Category 1? That we, just by attending, you'd know in the big work done by the guys, we've gone in with this many pumps and we didn't need it. Bearing in mind we are generic. We have a two-pump PDA for every building.

A: It also includes, you know, if your first attendance goes in there and finds the, you know, the whole thing was a fire safety management disaster, then it also includes asking fire safety inspectors to come along.

FSDM: Yes. That's not something that we record. It would be an expectation of the crews attending, to be fair. Did we deal with the incident correctly, I think, is an issue which would be listed. And to police the requirements of the regulations, for me, is not necessarily high on my agenda because our FP Team[8] will obviously undertake those results, albeit, I'm clearly conscious of anything that isn't in accordance; , because of the impact that it may have on the safety of our guys turning up as well as those that are, obviously, in the property. And also from the fact that if we do mobilise to the site, the guys here have on their tip-out sheet the fact that there is a prohibition on and it is for this reason. So that if they turn up and they find that it's been breached, they can obviously inform the FP Officer. So they can take their action in that respect. So, I'm going to join; I'm going to cheat. I'm going to say that they're equally 2s. (laughter)

There's no one to six or one to five, look, they're all obviously important aspects but in terms of the Regulations of both, it's for the occupant to police their own procedure; sorry, fire safety measures. In fairness, they've got to manage it themselves, should I say, from a policing perspective, we would obviously go in from an audit point of view. Again, I say, in a timely fashion we would go if we felt there was a need. i.e. the number of UFSs attended, for example, and the number of calls we've attended for other reasons. But, in terms of a time-line, it's not that straight-cut because you may have national influences which just take, you know, waste recycling's suddenly a problem because we've had a number of incidents around the county or around the country. We may then focus on that. Public houses may be an issue at the minute due to lots of issues within the licensing trade that the training and the fire protective measures is, you know, low order. Because it's about trying to get people through the doors and selling beer. That might be a priority that they have at the minute because, it's clearly, you know, it's a difficult time for them so, auditing licensing or licensed premises, should I say, may be more important than

---

[8]Fire Prevention Team.

1196 they were maybe four or five years ago. We used to go ourselves, didn't we, many

1197 years ago? Not for the beer but to go and make sure that, you know, lighting was

1198 working, the old 'during performance' inspections.

1199 A: DP Inspections.

1200 FSDM: They fell off the cliff.

1201 A: Do we not do those any more?

1202 FSDM: No. Not for many a year.

1203 A: (Name removed), you've been great and I appreciate, I really appreciate your

1204 time because I know how busy you must be.

48   minutes

48 seconds

Clarified by e-mail on 18 December 2012 (the day after the interview):

Author: If I described your service/career as more oriented towards operational fire and rescue activities than fire safety engineering and regulatory activities, would this be a fair statement?

FSDM: You are correct with your assumptions to a degree although my remit covers all activity within Charnwood, I obviously cannot monitor all elements of work we do. My performance is measured by the operational output of my crews and the number of incidents we attend, so naturally that is my focus.

D. Appendix 4: Transcript of interview with Group Manager Fire Prevention and Protection

Leicestershire Fire and Rescue Service

15 January 2013

1205 Author: What is your full title?

1206 GMFPP: Group Manager Fire Protection but I'm currently Group Manager Fire
1207 Protection and CSSG. So it's Prevention and Protection, side of things

1208 Author: Okay. So, experience. How many years have you in the fire brigade?

1209 GMFPP: 26 years.

1210 Author: How many of those have you been working with fire safety, specifically?

1211 GMFPP: Oh, er, probably fourteen, fifteen at most.

1212 Author: Fourteen or fifteen?

1213 GMFPP: Yes. A lot of it seems to have been in FP.

1214 Author: So, I have already done two interviews so I've got; I'm informed about
1215 how (name removed), the fire safety manager at Loughborough University views his
1216 role. I'm aware of how (name removed), who is the local District Manager; I know
1217 you know that but I'm trying to put it into context. That is the reason I have
1218 interviewed (name removed), he is the local fire service officer who is responsible for
1219 Loughborough University. Yourself, in context, you are giving the county-wide view
1220 of an inspecting officer and then (name removed) will give the viewpoint from the
1221 insurance industry. So, I've already been informed of how (name removed) sees his
1222 role and how (name removed) sees his role; so I'm interested in how you see your
1223 role.

I don't want to put you on the spot or anything, that's not my intention and although this will be transcribed, it will be anonymised. So your name won't be referred to; your position will but not your name. And, of course, this will then be an Appendix in the thesis that goes forward for my Master's degree. That's put it into context.

So, it's about fire safety management and I'm; I think I've stumbled on this because I'm impressed by the way (name removed) manages fire safety on the University Campus. He's got, I don't know, Two hundred buildings? A big site. I have the fire incident records; fire incident data for five years; five-year's worth. So I've been looking through that and I've seen the number of incidents; the number of times that the fire alarm goes off, the number of times that that's an actual fire and the number of times that he calls for assistance from the fire brigade to come and assist him to deal with a fire. The figures; when I first looked at them, they looked ridiculous, I didn't believe them to be honest, because the number of times he calls the fire brigade or the fire brigade get called to the site is so few, considering the number of times that an alarm goes off.

So I'm quite impressed at the way he does his job so what I would like to do is principalise the way he does his job to see if that could be extended into; you know, principles that could be applied to other industries, perhaps the fire brigade could take them up, you know, with a strategy of tackling fire safety management or whatever? That's the thrust of what I'm trying to do. But it's come from the fact that I'm impressed by the way (name removed) does his job.

Now I don't know whether you know (name removed)? He can be quite abrasive at times. He is very, you know, he knows what he wants and he will try and get it and he is a very practical man and he thinks practically rather than, you know, intellectually. Which is really, as far as the University is concerned, he is a really good employee. So I don't know what your opinion of him is but that's the reason, I'm quite impressed with what he does.

So, the questions that I'm going to put to you, I've put to both (name removed) and (name removed) and I shall put them to (name removed) as well; to try and get a consistency in the interviews. So the first question then is; How does the management of fire safety assist a company or an organisation and, I would be obliged if you would think, University Campus in the context of Leicestershire. How does the management of fire safety assist a company or an organisation to meet the requirements of regulation and the scrutiny of regulatory inspections? How does

that process...

GMFPP: Well, for a start, it makes my job an awful lot easier doesn't it? Because you've got the practical hands-on approach in relation; like you've just said; (name removed) tends to be quite practically based. And so, if there's an issue or a problem, he will contact us. He does liaise with our guys quite regularly and I think that; the practical approach, that's, going around and making sure that the fire doors are, you know, as they should be; basically the fire safety provisions there and it's operating as it should be. It helps massively because what we can do, effectively, as inspectors and regulators is, if we're looking at one of the buildings, we can walk in; we know we don't need to go into significant detail because we can see instantly that that maintenance is being; the building is being looked after and maintained in the way it should be. So, from our perspective, from a fire service or regulators perspective, it makes it a lot easier.

I think, generally, I mean, University aside, there's a different focus to fire, the way that fire service's operate and carry out regulation now is different to what it was, certainly, two to three years ago and that's really being pushed by the Government, at the moment. Is that working in partnership, is that working with business, trying to make sure that we make things easier.

Author: But you're concentrating on fire; life safety rather than property protection? Because that's what the law demands. Is there any consideration of property protection.

GMFPP: Yes, there is. There is, particularly, like I say, because of the push the the Government have at the moment in relation to working with business, working in partnership and trying to achieve a sufficient and satisfactory level of fire safety, without going to gold standard, if you like? But part of that, really, is the push on; is trying to push that. If you do this right, if you spend ten minutes of your time looking at the fire safety issues then you could save yourself an awful lot of time in the long run. Because if you do, you know, there's the whole business continuity side of it and, obviously, things like the fire doors, the fire safety provisions and whatever, if; yes, primarily, we're concerned with life safety, but if they're in there working, obviously they're going to have quite an impact. Certainly when we draw up our inspection programme, that's one of the things that features; is how many fires have we had in certain types of premises where it's spread beyond the room of origin. So, yes, it does, you know, automatically defaults to property protection as

1292 well as the life safety side of things. And it's certainly become much more of a focus
1293 more recently.

1294 Author: When you do an audit? The audit, sort of; property protection isn't a focus
1295 of the audit, it's life safety that's the focus of the audit ...

1296 GMFPP: Yes, life safety is the focus of the audit.

1297 Author: ... property protection is just by default.

1298 GMFPP: Yes, almost, yes.

1299 Author: So there's no actual positive consideration of it?

1300 GMFPP: I think any good inspector would be considering that side of it as well. I
1301 think we're slightly; (pause) I think the officers that we have now have got a wider   10 minutes
1302 perspective and a wider view of the whole fire safety side of it, and it will come
1303 into things like arson prevention; advice on that side of things; advice on security
1304 but without compromising life safety; and, like I said, the real crux and the real
1305 push at the moment, is that business; it's getting business operating, getting it up
1306 and operating as safe as we can do without it spending thousands and thousands
1307 on unnecessary fire precautions. So, it seems; I suppose it could be seen as slightly
1308 contradictory, we're not going for the gold standard, we're going for the; which is
1309 what we always did, (author's name), isn't it? If you actually look back to the
1310 old Fire Precautions Act, when we were doing that. You specified the minimum
1311 required standard, not the gold standard and that's where the focus was. Well
1312 that's effectively what we're trying to go back to now but we're trying to be more
1313 proactive in the way that we undertake the inspection work because we went through
1314 a series; you're probably fully aware of this but when the Workplace Regs replaced
1315 the Fire Precautions Act, and then subsequently, the Fire safety Order replaced the
1316 Workplace Regs, there was this period where it was a case of, just tell them they
1317 don't comply and that seemed to be the general view nationally. Don't give them
1318 any information, don't give them any guidance, just say, that doesn't, you know,
1319 your risk assessment isn't suitable and sufficient because of A, B and C. And the
1320 approach has completely changed, completely changed.

1321 There is now a push, for example, and I know; stop me if I'm wandering off with
1322 this but CFOA, you know, CFOA currently, rather than the department; now what
1323 was the directorate? The Enforcement Working Group is now the Business Safety
1324 Group. So they've acknowledged, there's been this acknowledgement that they've

got to embrace the changes that Government are pushing and so that's reflected in the change of title. And there's a real push at the moment to support business to grow; and that's, obviously, being pushed through CFOA via local Government but we're getting influence from the Better Regulation Delivery Office via the Department for Business Innovation and Skills. So there's two angles that we're getting approaches from, at the moment, that are trying to push this; and we're actually quite lucky; as Leicestershire, we are, probably, the front runner in relation to working in partnership with the regulators. We've got the Better Business for All; well, it was set up, blimey, about two years ago now to bring regulators together and look at how we can work in partnership; how we work together; how we can reduce the burdens to business and, on the back of that, we have a steering group that's been set up and we've set up a regulatory services partnership group as well. So there's lots going on in relation to trying to bring things together, make things simpler.

But, going back to your original point (laughs), yes, the focus is the life safety but the property side of it does fall into part, we are giving more advice on that side of it and trying to ensure that we don't end up with, you know, a small fire developing and taking a whole business out of operation.

Author: So you are taking account of the two thrusts, then? You are taking account of the thrust from the Better Regulation and Business Innovation. You know they're; I mean, they're presumably concerned about the number of businesses that go out of business because of things such as fire, emergencies, such as fire that they go on that they could deal with if they tried?

GMFPP: Yes. The primary focus is to reduce regulatory burdens; that is what their primary focus is; that's the push from Government so; but, I think, almost by default, it, sort of, it still slots into that because it is, it's assisting business to grow, it's making life simpler and giving you advice and assistance to help that should, sort of, hopefully make sure that, you know, we don't end up in a fire situation and losing a business; because, as you know, the majority of businesses just won't recover from a major fire.

Author: Well (laughs). I mean I know that statistic that 80% of businesses, if they suffer a fire, they won't be in business next year but I don't know where that's come from and I can't find out where that's come from; and I know that one of the businesses that had the biggest fire that Leicestershire's ever had, (company name removed), where it wiped out half of it's business stock, its clothing stock, is still in

business. So I'm not sure about that statistic at all!

GMFPP: I don't know; we've had the one recently just down the road, haven't we? (name of location removed)?

Author: Oh, (company name removed)?

GMFPP: I don't know; it would be interesting to see how, you know, how that pans out and where they stand at the end of; whether, you know, whether it can continue to operate in the same vein or whether the business ends up folding? Be an interesting one to keep an eye on, really?

Author: Yes, because it wiped out, more or less, the whole of the business. I read something about, they were hoping to save the servers so some of the information would have been saved. But; okay. Good answer (laughter).

My second question, then, which I think you have already covered to a certain extent; how does the management of fire safety assist in the protection of property or the continuity of business. I think, probably, you've already referred to that. It's …

GMFPP: I mean, I think fire safety management is crucial to anything, isn't it? It's the management of fire safety that is the crucial factor. Because, if you're not managing it, your fire safety provision is never going to be; it will deteriorate overtime. You know you're leaving yourself wide open. So that is a crucial factor, the management; and I think you can probably walk into most buildings, in reality, talk to whoever is responsible for fire safety; you can normally, pretty quickly establish that they've got a good fire safety management system, in which case, you really shouldn't be spending too much time focusing on, you know, wandering round and inspecting every cubby-hole and every; you really should be taking a step back and really, accepting that they the management side of things is well covered. And, as such, the rest should slot into place.

Author: What you are saying is that you walk into a place, you take in the atmosphere and you make an assessment as to how you are going to deal with that company.

GMFPP: Yes, you do and it's that liaison, that initial liaison with the Responsible Person that will give you a good indication as to whether, you know, whether it's something we really need to go to town with or whether it's something that you're

1391 satisfied with the management system is in being and is a solid, sound system and
1392 there's very little to worry about.

1393 Author: There is guidance on that, I've read guidance on that; CFOA; as to how
1394 you're dealt with by the company is, to a certain extent, prescribes how you should
1395 deal with the company. I need to look that up again.

1396 GMFPP: Yes, but I think, to be honest, (author's name), that's fairly standard
1397 stuff. We did that anyway when we were inspectors. We did that; it was something
1398 that you just automatically did. If you'd got somebody who was positive and could,
1399 pretty much, show you the detail, no, not so much the detail but the overall plan
1400 and some of the detail, you normally got a pretty good idea that you needn't spend
1401 a great deal of time on it. I think that one of the issues, it's funny this, because I've
1402 been out with all the inspectors over the past twelve months on various inspections
1403 and it's nice to see that they adapt to suit the scenario or situation that they are in.
1404 And they very much do that; their approach would be very much different from going
1405 to a very plush sort of office building which we don't look at a great deal, in fairness,
1406 anyway, to, maybe, a little factory unit which has been selected randomly from the
1407 database. But, it's interesting to see the approach of the different inspectors because,
1408 I mean, I've been in with one; and there is some education on the inspectors side,
1409 as well in relation to this, if we're walking in we can see straight away that, pretty
1410 much, things are as they should be. The liaison with the Responsible Person is;
1411 you're getting good feedback from that; they're able to demonstrate some very good
1412 examples of what they're doing; should we really be wandering around spending
1413 time when we could, effectively, be using our time elsewhere? And, it's one of those
1414 things; it's trying to get people; because I think maybe, me sitting on their shoulder
1415 is; they're approaching what they are doing slightly differently because they want
1416 to make it; you know, they want to make sure that they're demonstrating that they
1417 can conduct a thorough inspection.

1418 Author: What are the criteria that bring you there in the first place?

1419 GMFPP: It's simply about me keeping up to speed with what the inspectors are
1420 doing.

1421 Author: Well, what I was thinking about is how do you prioritise. Do you, pre-
1422 sumably, prioritise on the life safety basis because you follow the matrix in the
1423 guidance?

1424 GMFPP: Yes we do. That forms part of how we do it because we don't stick solidly

to that. Because, otherwise, we're going back to the same buildings over and over and over again and I've got a limited resource. What I need to do is make sure that we look at the bigger picture in relation to this. I've got; there's a; I've got a draft of some guidance around putting together an inspection programme. Which, I'm more than happy to e-mail through to you, if you want. You know, to have a look at it, But it's not just life safety it is; because if you look at the stats where we have the problems, so we look at the stats for, maybe, the last three years; where have we had the problems, where are the issues, where have we had, as I said before, where have we had a fire that's spread beyond the room of origin? What type of premises? So we identify, you know, where we need to focus out attention and it is about focusing our attention, these days, we haven't got; we've got; I've got eleven, twelve inspectors currently, which will soon be reduced to eleven inspectors. So I need to make sure that best use is being made of those inspectors and that they are going to the right place.

20 minutes

But we get an awful lot more referrals than we've ever had before; or concerns coming in from partners and from the operational personnel. There is a much better link now with Ops than there ever has been before. So they come across a problem, they fire it through to us and we pick it up and deal with it. So...

Author: They're better informed then?

GMFPP: Yes, very much so.

Author: And more motivated, I suppose?

GMFPP: Yes. The whole way, and I know I'm drifting off again so just pull me back; the whole way the department works now is, we're more mobile based. So, officers; once we've decided what the type of premises that we want to focus our attention on, are; we'll randomly generate inspections based on when they were last inspected and whatever, and we'll divide them up between officers. The officers tend to be geographically located, you know, we try and locate the inspections geographically around where they live, their home address. So that we're making best use of transport arrangements and we're making best use of time. Now we can't always achieve that as you appreciate. We've got some people in the city, we've got some people who live right out on the edges of the county. But wherever possible, we try and, you know, do that to make best use.

So yes, I suppose going back to the point why I'm going and sitting on the shoulders of the inspectors. It's really because we've got this mobile set up. We're not all in

the office. It's not, certainly not like (name of fire station removed) was when you used to work there and we seemed to have stacks and stacks of people up on the top floor there. We're just not, you know; it's very rare to see one of the inspectors actually in the office now.

Author: Just a point about the twelve inspectors you've got. Are they all serving firefighters ...

GMFPP: They're all, well ...

Author: ... or have you got graduates who have come in?

GMFPP: No. We've not (name removed), who's done the fire engineering degree and the Masters. We've got (name removed) at the moment who is in his last year of his degree course.

Author: Up at Preston?

GMFPP: Yes. There's a request come in via (name removed) to slot somebody else on which, at the moment, there's a little bit of resistance about. So (name removed) currently doing a little bit of work around the justifications and what have you that surround that? But we're predominantly Watch Managers who are, either promoted in or maybe, they've transferred across. And we've got two fire control operators or ex-fire control operators who've, basically, been moved into the department when we had the re-structure around Fire Control and, obviously, knew what was going to happen with the Regional Fire Control. So we've ended up with two Green-book inspectors out of that as well. So, and they are, probably, two years into being there so that they're at the point now where they're actually going to start delivering, you know, some good results, hopefully.

So yes. There's a mixture and the only graduates, as such, are those that go through the degree, you know, go through the process up at Lancashire, there and end up with a degree course out of it. So, there are no others. Certainly I haven't; I'm not a ...

Author: That was the thinking, I mean it's no guarantee that a firefighter coming up from the watches into fire safety is going to be any better than a graduate off a degree course.

GMFPP: Well. I've got a viewpoint on this which I'm quite happy to share with you and it's based around my experience of work we've done around the other regulators. Now, I'm talking regulators right across the board; Health and Safety

Executive, Environment Agency. local Environmental Health, Housing; there's a huge number of regulators that we've got working together. We carried out a; we, basically, carried out a; it was like a training session but it was really based around; I say there must have be around twelve, thirteen, fourteen regulators all represented at (name of venue removed). We used the boxes there, up on the top floor, and you actually went from box to box to box to box and you got some input from everybody. So, it could have been, you know, it could have been Environment Agency; it could have been Her Majesty's Revenue and Customs, Health and Safety. So you got an appreciation of how each one operates but the approach; well, there's been some work done locally about the approach of regulators and how regulators, sort of, carry out their work, and certainly, some of our guys have been out with the other regulators to see how they operate and the one thing that comes back is, they can be quite, sort of, almost officious, at times, in the way they go about it. And I; the way that the fire safety guys go about it; now I can speak from experience because I've been out with them and I've seen the approach that's used and all the rest of it, and I think that we're ahead of the game as far as taking firefighters and actually getting them to do the inspection work; and the reason that I say that is because the way they approach people.; and as firefighters and as Crew Managers and Watch Managers, they've been confronted with pretty horrible situations, you know, along the way; and the way that they deal with those panic situations, the way they try and calm the situation down, they adapt to suit the situation they're faced with; I think carries over into that other side of regulation. So I think that the way; if you take a firefighter that's been in those scenarios then you put them in; really there's nothing going to faze them to be confronted with; and they're more relaxed about the way that they carry out their inspection work and their regulatory work; and I think, I've made this point more recently at an event that I attended and there was general agreement that there were two things that worked in our favour. One was that, the approach by the individuals and the second was that we're in a uniform. A uniform makes a huge difference.

So yes, whilst we could; we've already, sort of, laid the ground. The Green book inspectors coming in and there's nothing to say that in the future we won't be pulling graduates or people from other areas in to conduct inspection work. But I do think, at the moment, we have a slight advantage in the way we operate, the perception of us, I suppose?

Author: From my experience looking at other brigades it seems as if the fire safety

217

¹⁵²⁷ departments are made up of exactly the same attitude as you seem to have, is that
¹⁵²⁸ there's nothing substantially wrong with graduates coming in but you have to retain
¹⁵²⁹ this core of experienced officers who can deal with the, you know, the prohibitions,
¹⁵³⁰ prosecutions and so on. Because they have to be dealt with, you know, quite; it's
¹⁵³¹ not easy to deal with prosecutions and you need a certain amount of experience and
¹⁵³² aplomb and, you know, gravitas to deal with those things.

¹⁵³³ GMFPP: I think it's also really advantageous to have that basic knowledge of fire-
¹⁵³⁴ fighting techniques and the way that we go about carrying out firefighting operations
¹⁵³⁵ because if you've got that background, you know; a really simple example, (author's
¹⁵³⁶ name removed), you know, that we can always, sort of, say is about the half-hour
¹⁵³⁷ fire-door on the basement and the half-hour fire-door on the ground floor. And that,
¹⁵³⁸ when you're sitting in a meeting with Building Control and fire engineers and all the
¹⁵³⁹ rest of it, and they're saying, no, no, no, we're just going to put one one-hour fire
¹⁵⁴⁰ door on the, you know, at the basement level there or whatever? You just think. Let
¹⁵⁴¹ me explain. You have to go back and explain why we want the two half-hour doors
¹⁵⁴² rather than the one, you know, the single one-hour door. And arguing the toss with,
¹⁵⁴³ not so much architects but certainly fire engineers; there's another good example, if
¹⁵⁴⁴ I take a fire engineer that I; we had a debate around what was satisfactory and what
¹⁵⁴⁵ was not? This fire engineer was ex-fire service so had a really good understanding,
¹⁵⁴⁶ an appreciation but his argument was based around ventilation requirements on a
¹⁵⁴⁷ protected; on a firefighting shaft. And, the point that he made and quite right, I had
¹⁵⁴⁸ to concede in the end. I could not argue against what he'd put forward was the fact
¹⁵⁴⁹ that he says, I can meet your ventilation requirements in this existing building but
¹⁵⁵⁰ to do that, I'm going to have to cut the lobby down in size. Now there's no specified
¹⁵⁵¹ size around that lobby so I'm going to cut it down to whatever it ended up being? I
¹⁵⁵² can't remember the dimensions. He says, alternatively, I can give you the full lobby
¹⁵⁵³ so that you can lay out hose and you can base operations around there but your
¹⁵⁵⁴ ventilation won't be quite so good. Which one am I going to opt for? I'm always
¹⁵⁵⁵ going to go for give me something I can use to carry out firefighting operations. So,   30 minutes
¹⁵⁵⁶ a really good example of someone who's come in that was a fire engineer that had
¹⁵⁵⁷ got a basic knowledge of firefighting techniques and the way we go about things.

¹⁵⁵⁸ Author: What's missing from that, and you'll probably agree with this, is how the
¹⁵⁵⁹ occupant is going to use it anyway? That's what is missing from that debate. I've
¹⁵⁶⁰ always felt that is an inadequacy of these arguments that I have had with architects
¹⁵⁶¹ and Building Control. What's missing is the; the person who is going to occupy it

is going to prop the doors open because he can't use the space anyway.

GMFPP: Yes, absolutely. No, you're too right but a lot of fire safety legislation is great, you know, for the built environment when we're putting certain things on doors or certain ventilation requirements. Buy you know that within twelve months, if the fire safety management isn't good, there's going to be windows, you know, secured closed that are there for ventilation or something else is going to be done that compromises fire safety. And that is one of my biggest concerns, really, about the whole fire-engineered solutions and whatever else. Fantastic on paper and they look great, you know, but ultimately, you have to think ten years down the line. Are those that are sitting in that building there, you know, realistically, are they going to have the knowledge? You'd like to think so but I tend to think that they will have completely forgotten by; (name of company removed) is a great example; we're lucky, we have a great management team down there...

Author: Sorry, where was that?

GMFPP: (Name of company removed). A great example of where we compromise, we bend, we try and, you know, come up with alternative solutions and they're fantastic; they're based on limiting the mall space or something to that effect. And you know that there's creep over time. Try and see if we can get a bit more here or there. What was that smoke curtain put in for in the first place? Nobody knows and nobodies willing to go right back and look at the initial application to justify it. So the next thing we get, you know, we'll take it down and you've compromised the whole fire-engineered solution.

Author: Yes, I know exactly what you are on about.

Do you think that a good standard of fire safety management reduces the likelihood of fire damage and, if so, do you think there's a parallel between the standard of fire safety management and the amount of fire damage?

GMFPP: A very difficult one to answer? I certainly think that the fire safety management ...

Author: It's purely your opinion. I've not given you any data to go on.

GMFPP: No, I do. I think that's a fair point because, as we pointed out right at the start, if a fire door closes and does what it is supposed to do then, obviously, you're going to contain any fire in a given area. So, I think there's direct correlation

1594 there. Yes, between the fire safety management and the containment of any fire in
1595 the building. (Pause). I just wouldn't argue with that, (author's name removed).

1596 Author: That's a yes.

1597 GMFPP: Yes, absolutely.

1598 Author: What are the benefits of the current fire and rescue campaign to reduce
1599 unwanted fire signals? What are the benefits of that? The benefit, as I see it, the
1600 benefits for the fire and rescue service are that it reduces the number of false calls
1601 they receive with a corresponding saving of time and money, but does it also lead to
1602 a reduction in the amount of fire damage? Is there an unintended purpose to it or
1603 is there a further intended purpose to the campaign to reduce unwanted fire calls?

1604 GMFPP: I think, really, the main driver for the unwanted fire signals is brigades'
1605 reducing the number of fire calls they have or false alarm calls they have. That's
1606 purely and simply; it's cutting down on the number of attendances made. I think
1607 the onus has been, it's certainly been pushed back onto those responsible on the
1608 various premises. I think; I'm not aware that there's been a rise in fire damage as
1609 a result of it. But to be honest, (author's name removed), I don't know where; I've
1610 never looked into it and I don't know, you know, if anybody has? As far as business;
1611 well, the call centres, those that are operating the facility to call out fire services or
1612 police or whatever in the event of an alarm going off, I think they've ...

1613 Author: You mean the agencies, the call agencies?

1614 GMFPP: Yes. They've, sort of, struggled with the concept more and I can un-
1615 derstand, to some extent, why? Because we're in a situation where Leicestershire
1616 would operate and we would say, well we're not coming out unless we've got this
1617 criteria where you get Oxfordshire or one of the other brigades saying, well we're
1618 not coming out at all. There's a huge variation right across the country and you can
1619 understand why some of the bigger operators would be thinking; hold on a minute,
1620 we can't change; we can't just, you know, write something specific to Leicestershire
1621 and something specific to Nottinghamshire, then something specific to Derbyshire.
1622 We've tried to work more regionally; when we first started we tried to make it a
1623 regional approach and we end up setting up a sub-group on the back of CFOA fire
1624 safety to look into that. But I think, you know, it has still resulted in different parts
1625 of the country operating in different ways. It's increased the burden on business
1626 and it's increased the business on the agencies that are handling those calls and
1627 delivering that service as well. But ...

Author: So the intention of the unwanted fire signals campaign, then, is just to save time and effort?

GMFPP: Yes, but, I think, as a consequence of that, it puts the onus back onto the; the University is a good example and the bigger hospitals and whatever; because we've got dedicated fire officers there. They will put in procedures to deal with the various situations and scenarios and that's the whole thing about the going out; we've got an alarm going off somewhere, you know somebody can just carry out, have a quick look, make sure that it's not a false alarm that can be easily identified or whether, actually we do; it's that confirmation; that, sort of, visual from a human being rather than a detector head and I think it's good in relation to them meeting their obligation to fire safety. So the onus is pushed back on them.

As far as detail on unwanted fire signals, you know, if you do want some more detail on that; (name removed) is leading on the CFOA side for unwanted fire signals. So if you did want any more information on unwanted fire signals, probably (name removed) would be a good source of information. Because he can give you the industry viewpoint as well. Because I think he has had a bit of an uphill battle trying to satisfy the fire industries requirements and needs and then taking the brigade's needs and trying to come up with something we can all work with; which he is currently trying to do. So. it may be worth having a word with (name removed).

Author: So, is there an advantage to; does it give an advantage to commercial organisations or any organisation the fact that ...

GMFPP: It certainly doesn't give a commercial advantage to the fire industry that's looking after the fire calls or directing them through to emergency services because they're having to do more work, effectively. Because controls are asking for confirmation of things before they are going to mobilise. So a service that's being provided by somebody say, like (company name removed) or (company name removed) or one of the bigger operators, all of a sudden, rather than their operator getting a signal come up and then calling us to go out; they've got to then go back and get confirmation of the situation before they come through to us otherwise we'll just be asking them the questions. There are ways around that, of course, you just say it's a confirmed fire every time and, you know. But yes, so as far as an advantage to the fire industry know that there isn't an advantage to them as such, as I've said, it's more of a burden than anything. But I think that's why (name removed) been doing the work that he has been doing to try and get some middle ground so that

we're all satisfied that what we've come up with is reasonable and achievable.

Author: If an organisation such as the University takes that on board, though, which (name removed) has; he doesn't look at it as a defeat if he has to call the fire brigade or if the fire brigade gets called; he doesn't look at it as a defeat but he tries to avoid that, if possible, or; he doesn't try to avoid that. He tries to only call the fire brigade when they need to be called. That's his intention, that's his aim; and that's; one of the reasons for that is because, you know, that the fire brigade used to get called to Loughborough University so many times that it was embarrassing to him. So, I suppose it's the embarrassment factor that is part of his motivation; so, in that respect there is an advantage. Not sure; well, there must be an advantage to the University because; well, I don't know. I don't know whether there is less damage, less fire damage.

GMFPP: Yes, potentially there is, isn't there? Potentially you could make that argument, couldn't you? Your initial action; let's be honest, initial actions are crucial, aren't they? We've all, sort of, acknowledged, the fire services across the country that we need to move the focus back again so that we are taking in those initial actions that prevent something from being a one- or two-pump fire to something that ends up as a ten- or twelve- or fifteen-pump fire; and obviously initial actions are crucial in that respect. So, yes, it's a very good point, if the onus is put back onto those responsible for fire safety to actually conduct some kind of investigation, you could argue and make that point, and I think that's a valid point as well. That their actions, if you've got an initial firefighting team or whatever you've got and they do something about it, they could pretty much stop something from getting completely out of control.

40 minutes

And I think there's the disruption side of it as well, isn't there? Somewhere like the University; our trucks turning up all the while; really it doesn't help or look good, for a start, for a University but then there's the disruption that's caused through that, through appliances turning up, you know, an hour, two hours, three hours, whatever they're there for with the difficulties that that has for traffic management around the site, you know, whatever lessons, whatever were programmed into those …

Author: According to (name removed), he now invites the Loughborough Station in because he's concerned that they don't know the University well enough. That's because they never attend now. That's quite poignant, I think.

222

GMFPP: Absolutely, and, to be honest with you, they should be going there because there's a; that crucial link, isn't there for the risk side of it? The crews need to have an awareness of what the risks are. Now, I think with Loughborough University, certainly when I was at Loughborough Station; I met with (name removed) a few times. I know, (name removed), you know, had quite a lot of liaison with (name removed) and I used to think it was a really positive and proactive approach to the way, you know, we operate and the way that; and trying to reduce the potential for things to go wrong. Should we turn up and not have the information and awareness and, I think, we've moved on massively in that respect. And, hopefully, it should continue and we should be focusing on the risks within their areas and should be getting out there and ...

Author: That's good firefighting.

GMFPP: Yes, absolutely.

Author: Okay, the last question then is; do you think it would be beneficial the operational performance of the fire and rescue service with a performance metric that evaluates the efforts of companies and organisations such as Loughborough University, that demonstrate an improvement in business continuity or reduction of fire damage? So, that would be a performance metric that looks at; that somehow measures the standard of the performance of, for instance, Loughborough University, and if that performance reduced the number of calls or the number of fires, reduction of fire damage or whatever? That would reflect on the performance metric of the fire and rescue service, you know, to be maintained or to be measured against or whatever? There's no detail to that, it's just a concept?

GMFPP: No, and I think it's something that, you know ...

Author: The value or the standard of the fire brigade is somewhat dependent on the performance of the; Loughborough University.

GMFPP: Yes, It's certainly something worth exploring. The difficulty we've got with that, I suppose, is that; and it would be a great lever, I have to say, it would be a great lever to get senior management to make them think, you know what, it's the work that some of these guys do that does reduce, overall, you know, our attendance; they know this anyway but at times, you do feel that there's not enough attention given ...

Author: ... to inspecting officers?

GMFPP: Yes, the inspection process and the value of the work that's undertaken. So it certainly would be good in that respect and, if brigades were given that, the difficulty is; is that the resources we've got available to us to do it, effectively. Because the inspection programme is a fraction; it's a fraction of the premises or the properties that we have right across the county. So, it would probably; it's easier for places like the University or the hospitals or De Montfort or Leicester or wherever to; it's easier to meet that because you've got a dedicated resource that can work around that area. Not so easy, I think, when it's a smaller business.

But there are things going on, at the moment, the primary authority scheme is something that they're looking to extend. Do you know about the primary authority scheme?

Author: The primary authority; isn't that where one authority deals with one type of business or (company name removed) or something?

GMFPP: Yes, it's very much like West Midlands used to do with (company name removed) or we now currently do with (company name removed). But what it does, it formalises the arrangement and also enables payment for the time taken to administer and look after the arrangement. So it formalises things around there. And that's where, I don't know, we could end up with, for example, maybe it may be an extreme version, but universities could all come under one brigade. One brigade would look after their, you know, fire safety advice dealing with issues and all the rest of it. The issue that we get is that the post would need to be funded and so all the time that was taken looking after whatever the issues were around those types of buildings, there would be payment for that. You'd end up in a situation; you'd have to end up in a situation where the post was funded through that arrangement and; maybe taking universities is a bad example, (author's name removed), but let's say something like (company name removed) or (company name removed) or whatever, where, yes, we can extend what we've got at the moment which is the Lead Authority Partnership Scheme; we can extend that; we can change it to a Primary Authority Scheme; there's no particular issue with that and, hopefully, it won't take too much work. We can do that, but having that one scheme is not going to be sufficient. What you need is, probably, a hundred schemes, two hundred schemes that you're doing the same thing with to make it work. Because then, at least, the posts are going to be funded. You're going to get sufficient payment in to fund those posts as separate, almost separate posts to the main inspecting officers.

Author: What I'm thinking of is (company name removed), I'm aware of one or two fires at (company name removed) but (company name removed) isn't usually at the top of the list for burning down; I was just thinking of (company name removed) then because there's another (company name removed) burned down in Hampshire the other day and I know that (company name removed) has had one or two spectacular fires but, considering the amount of (company name removed) there are around the country, its a very small percentage. But concentrating so much on these businesses; is it those businesses that burn down? Or is it the (company name removed) ...

GMFPP: I think that's part of the basis of why they're looking to push it. Its as simple as that because, what do they call it? The term is 'assured advice'. So, if you're giving advice on a means of escape dilemma or a fire alarm system; what's sufficient and what's not? Then that would be taken as assured advice and could be applied right across the country to all those similar stores.

So, you're absolutely right; I think what they're trying to do; my argument has been, I can see there's a benefit to it but it is very specific and what they're trying to do is take something like primary authority; which is going to work in some areas; undoubtedly, it will work but it's not quite so easy to do it with fire safety legislation.

Author: The focus of it, though, is because; is to make the; you know, (name removed) manage their business more easily. Because then they don't have problems with each local authorities fire safety inspectors.

GMFPP: Yes and ultimately ...

Author: But does that reduce the amount of fire damage? Does it make the places safer? Does it make; you know, that's not the focus, is it? The focus is actually on that business itself, isn't it?

GMFPP: It is, yes, it is. But that's what being pushed at the moment via the Better Regulation Delivery Office at; from Central Government. That's being pushed as something that brigades are, whether it's statutory or non-statutory is yet to be decided, but, at the moment we've got six brigades doing a non-statutory trial for six months under CFOA and we've got ourselves and another five brigades doing a statutory trial through the Better Regulation Delivery Office. So, and we'll see how that pans out at the end of the day. I think that makes it easier for business, whether; what effect it has on the fire safety overall; the potential for fire starting

in the first place and the potential for it to spread beyond that room of origin? I've absolutely no idea. Absolutely no idea.

Author: And I'm conscious that the (company name removed) place in London, their Head Offices in London some years ago; the plush place, you know, where; multi-storey building but they were prosecuted and fined £400,000; it was the biggest prosecution at the time because of; yes, they had everything in place but they were doing some modifications and they just hadn't thought about fire safety management. They were prosecuted on their fire safety management.

50 minutes

So even though, you know, (company name removed) might get; they wanted to make certain adaptations to their building to accommodate the newest thing coming in, you know, in retailing; it makes their job more easier because they don't have to negotiate with each authority. It's only the fire safety management that's going to save it, isn't it?

GMFPP: Yes, it is. That's what it's got to focus around, is the fire safety management. If the fire safety management is right then, hopefully, everything else should slot into place.

Author: Okay. I'm conscious of the time.

I have a list here and I've titled it, the general viewpoint of a senior fire safety officer. I have a list here and what I want you to do is look at these and confirm that it is your viewpoint as, you know, in your current role and I wonder if you could perhaps prioritise that list? You know, which is the number one, the number; you know, if you agree with the list, you know, which would be your number one priority, number two and so on? Or whether they're equal priority?

(Pause)

GMFPP: It's quite a difficult one, (author's name removed). I would say; (pause) perhaps not, really; (pause).

Author: Make them equals if you ...

GMFPP: (Pause) and that one really ... That's a two, that's a two; that's got to be a two as well; that could be a three; two ones, three twos and; that's not really very helpful, is it?

Author: It is.

GMFPP: Are you sure?

1829 Author: Yes.

1830 GMFPP: I've probably; do you know what? If I sat down and went through them
1831 I'd probably change the priority around again but I'd say, initially, just as a ...

1832 Author: No, that's fine.

1833 GMFPP: Like I say; that there is the whole emphasis of business and that; working
1834 in partnership, they're real biggies at the moment.

1835 Author: I'm quite encouraged by your, you know, what you've said about supporting
1836 the business community because, now sitting where I am, five, six years out of the
1837 fire brigade, it seems to me that, you know, there's a focus on life safety with the
1838 fire safety order; in fact, as part of this thesis, I've been doing a literature review
1839 and I've come up to the; I've started way back in the sixteenth century where the
1840 Great Fire of London, whatever? When certain things were put in place and then
1841 the London Acts from that the Victorian building acts up until the First World War;
1842 sorry, the Second World War, the focus was on building protection and life safety
1843 was secondary, it was by default. But since the Second World War the focus has
1844 gone onto life safety with building protection as default. I have a comment from
1845 an MP in Parliament actually saying that. Yo know, we're going to concentrate
1846 on life safety; as far as regards building protection we're going to leave that to the
1847 insurance companies. So, you know, why was that shift in emphasis and why has it
1848 been reinforced and is still being reinforced? You know, apart from the comments
1849 that you've made this morning. That's quite intriguing to me and I don't quite
1850 understand why that is?

1851 GMFPP: There's definitely a national approach nationally with what's going on and
1852 what they want is for enterprise partnerships; local enterprise partnerships to run
1853 the whole better business side of things and to try and bring the regulators together
1854 and work under the LEP umbrella. So, Yes. Like I say, ourselves and West Mids,
1855 actually, are the two that are involved. But, I think, we started up slightly before
1856 West Mids did; so we got the ball rolling before West Mids did. So, yes there's a lot
1857 going on.

1858 Author: Great, Thank you (name removed).

1859 GMFPP: You're welcome.

1860 Author: I appreciate your time.

E. Appendix 5: Transcript of interview with the The Director of a Fire Engineering Consultancy

18 January 2013

Author: The whole thing is about fire safety management. That's the core of my Masters. So, I've got fire incident data for the University. I've got fire incident data for Leicestershire and I'm comparing the two, but I'm interested in the University because, from my point of view, the fire safety management is extremely good in Loughborough University.

DFEC: You've spoken to (name removed), is it?

Author: I've interviewed (name removed), he was my first interview and I've interviewed (name removed) who is the local District Manager of Leicestershire Fire and Rescue Service; his office is in Loughborough Fire Station and yesterday, I interviewed (name removed) who, at the moment, is the senior fire safety officer in Leicestershire. So, I've got the viewpoint of (name removed), the fire safety manager, the practitioner; I've got the viewpoint from the local District Manager whose responsibility includes the Campus.

DFEC: So he's the enforcer?

Author: ... the enforcer, regulator. He is, yes, but he's more the operational side.

DFEC: Oh, okay.

Author: The enforcer really is the fire safety, the senior fire safety inspecting officer, (name removed). Because he, you know you have the two sides to the fire brigade, you have the operational side, you have the fire safety side. So I have the practitioner, the operational guy, the regulator and then I was looking for someone from the

insurance side. Because, to be honest, that's the side I haven't delved in. It's a side I don't know too much about?

DFEC: Well do you know the University is insured by (name of company removed), something like that?

Author: I didn't, no.

DFEC: As part of my work, I've tried to speak to one of their surveyors; he was very evasive but I know the name of the guy who surveys Loughborough University on behalf of the insurer. So I can get you his contact details.

Author: Don't worry about that at the moment; that's a bit more, probably, involved than I want to be at the moment. Because what I want to pick out is the principles of what (name removed) does to manage fire safety so well. Because I think those principles could be, perhaps enhanced or, if I could find out or measure those principles then that could be some sort of measurement system of fire safety management. But I'm aware that the insurance side, particularly the FPA, is already; measures fire safety management to a certain extent. It certainly does a lot of training and ...

DFEC: Well, it measures losses, it measures when it goes wrong in terms of financial consequence.

Author: Yes. And I think the starting point is the Regulatory Reform (Fire Safety) Order because that is whet the fire and rescue service regulate but that only focuses on life safety, it doesn't focus on property protection. So that sent me down another course; why doe we only focus on life safety, why don't we focus on property protection? And if you look back in history; up until the Second World War, probably, we did focus on property protection. All the legislation, all the regulation was to do with property protection then, suddenly, it flips about and we focus on life safety. Nobody focuses on property protection, as far as I can see? And that's; I think it's that ...

DFEC: It's not only the Regulatory Reform (Fire Safety) Order but also the building regulations; when you're designing a building, the building regulations are very much focused on life safety issues; its; means of escape and there's a bit about limiting spread of fire to other buildings but it is the safety of people, is the main focus of it.

Author: Property protection is by default, really.

DFEC: Property protection, yes, I mean property protection is only really enforced by insurers or people who are a bit more enlightened when they're putting a design together. Because architects tend to focus on, what they see as the bare minimum they've got to do and that's compliance with the building regs. As soon as I've done that, I can get on with making the building look nice.

Author: That's right, that's right and, in fact, some of the conversations; the conversation I had with (name removed), yesterday, he mentioned one or two examples of that; which I know full well because I've been in the same situation myself. You know, dealing with an architect or a building designer or a fire engineer who has to meet certain ventilation requirements has got the space to do it. Where do you make the compromises? That's an argument goes on every day with fire officers. And of course, fire officers struggle because now we've got people like yourself; fire engineers who are highly qualified, knowledgeable and you're dealing with fire safety officers who aren't so highly qualified and who aren't so knowledgeable. But you have to get their say so for your designs and it's quite difficult; I know that and I know it's getting worse because we now have fire-engineered solutions.

But that also brings me to; fire-engineered solutions are also exacerbating the problems with fire safety management.

DFEC: So you're defining fire safety management; sorry, I should ask you; how are you defining fire safety management?

Author: As the sum total of what the fire safety manager has to take into consideration to correctly manage the building that he's, you know, responsible for to make sure it's safe for the occupants and to make sure that the business that's, you know, in the building continues. So I think it's the sum total of everything he has to do.

DFEC: Right. So, I mean, obviously within the scope of an MSc, you've got to focus in on certain elements of it so you're looking at buildings in use. That's the main element, isn't it?

Author: Yes, such as the University.

DFEC: ... which is an enormous organisation with lots of property and quite; I looked at; when I was; for the last couple of years I've sat on the Civil and Building Engineering Department's Safety Committee as a post-grad rep. That was quite interesting because I could see how (name removed) fire safety management policy was being devolved down to Schools and then buildings within the Schools. So

it's actually the safety officer within the department who is responsible for implementing the management plan, so; I suppose one of my criticisms of the fire safety management policy within Loughborough University is there's a slight disconnection between the policy and keeping tabs on how it's implemented at the local level. The building; the building that we work in is provided with a protected staircase; it's got signs that say 'refuge' at each level with an intercom and when I asked at the Safety Committee, what happens when you push that button? What are your procedures, if you have a wheelchair user on the first floor? What are the department's procedures for ...

Author: ... who deals with it? What's the management system?

That is part of the sum total of fire safety management.

DFEC: That is the nitty-gritty of fire safety management, isn't it?

Author: Yes.

DFEC: It was interesting; they then asked me to come up with a departmental; to enhance the departmental procedures to include that kind of thing; but they've got fire wardens that walk round but nobody specifically mentions that there could be some mobility-impaired people who have entered the building, come up in the lift but they can't use the lift to get out. Who has actually discussed with them; well, we've got these refuges in that staircase over there and, if you press that button, you'll be put through to Security and; who has done that joined-up thinking? Within the department, it wasn't there?

Author: It wasn't there. I was a fire safety warden in that department and that was never discussed with me. so, you know, that's one of glitches. But, I mean, the probability of a wheelchair being there and, you know, it's lowered anyway, isn't it? The probability of that happening when there is a fire is lowered anyway. You know we get away with these things on probabilities, really.

DFEC: That's right. But it's interesting when you provide (unintelligible) of health and safety legislation as well because the building is provided with equipment but we've not provided any training in how to use that equipment.

10 minutes

Author: That's right. and one of the things about the building regs is you've got this Section 38, where you have to provide all this information to the occupiers. I went into a brand new police station in (name of city removed) and they'd got; it's

231

just reminded me because they'd got these intercoms on the stairs and that was my first question, you know, how does this work?

Well, you press the button.

Yes, but who does what?

Well, I don't know?

Well, first of all let's see what the information; you should have some information under Section 38 of the building regs?

Right?

Have you got any information on any of the systems in here?

Oh yes. We have these folders.

We opened this cupboard and along the bottom there were about twelve folders. So we took them out and all the information was in there which was provided as per Section 38 of the building regs but had never been opened. So they were of no use whatsoever!

DFEC: I've worked with (name of organisation removed) in their premises; you've got an evac chair. Has anybody been trained in how to use it? No. Have you got any personal evacuation plans for wheelchair users who might want to use those, or choose to use them? No. So, sometimes, there's some good intent in the design of buildings and systems provided but its fire safety management is crucial to the operation of the building and to actually allow these things to be used properly and effectively and to be maintained.

Author: That's right and that brings me back to the fire-engineered solutions because now we have more and more and more of these engineered solutions; and not only completely fire-engineered solutions but partial fire-engineered solutions; the fire safety management of looking after a building with a fire safety solution is or could be, potentially, totally different from a traditional building itself. So, unless the fire safety manager understands how the fire engineering works; understands what should be maintained and in what priority and, you know, how it should be tested and that; it's never going to work, is it?

DFEC: Really it; that strategy is left in the capable hands of the fire safety manager and then; throughout the life-cycle of the building and so if, in five years time, they want to change that meeting room into a storeroom because they need more storage,

it's the fire safety manager who has to understand the implications of that change and whether the fire resistance of the doors and the walls are adequate; all of that stuff and ...

Author: ... and if you do the change through the proper channels; you go through building control; who then liaises with the fire officer, both the building control officer has to understand the whole of the system to see what effect it has and the fire officer has to understand the whole of the system to see what effect it has.

DFEC: But someone's got to know that to make that change, you've got to go through those processes because the local building users could say; we don't use that material anymore, do we? Let's just use it in storage and it goes unnoticed until there's a problem.

Author: That's right. That's right. I means this is all focused on life safety. I'm looking at property protection and business continuity because I'm looking at the fire damage, you know; how much fire damage; how much increased fire damage, is there, if the fire safety management doesn't work? If the system is faulty, does it then result in extra fire damage? Fire damage is, you know, loss of jobs, damage to the environment, etc. etc. etc. Which is where the insurance comes in because the insurers.

I mean, that was one of; one of the responses from (name removed), the local District Manager; when I started to talk about, you know, what happens if the; what happens if the; I can't remember the thing but it's what happens if the building burns down, his response was; well, they have insurance?

Well, yes but, you know, I didn't expect that response from him? Because, yes they've got insurance and, yes, they can have a sum of money the next day but how about the jobs that are lost? How about the building that's lost? How about the ...

DFEC: Let me give you an example. In 2005, there was a building in a university in the south of England that caught fire. And it was a Sunday morning, it cause £50 million of damage; it was Sunday morning, the fire service attended, the facade of the building was behaving strangely. There was; the fire service suspected there were cylinders within the building because of the research that went on so, consequently, the fire service started defensive firefighting and didn't go into the building and were trying to protect surrounding buildings from the strange way that this building's facade just fell away like a bonfire. So, no-one was hurt. Was that a successful design?

Well, from a life safety perspective; a building regs perspective; a legislative perspective, it was fine. Like you say, they're insured, the fire service did a dynamic risk assessment at the fire scene and did what they had to do, and did all they could do to save the surrounding buildings. However, this building housed an electronic research facility. They were the world leaders in this field. They had contracts with multi-national companies to do this ground-breaking research and the research that went on in that building counted for 60% of the universities income. And that income ceased overnight.

So, from a building that was designed in the 90s that passed building regs; was managed by the university with risk assessments that took place annually; everyone thought everything was fine but the fire resulted in that university; not only the insurable loss of the building; that's fine. £50 million? Yes, I'm sure the insurers would pay up for that. It was this 60% of the university's income stream that stopped overnight; but you can't insure for that; and that was the big embarrassment to the university. Such an embarrassment that, despite me trying to use it as a case study in my research; I met with the Chief Fire Officer of the brigade concerned. I met with the Facilities guys on site at the university campus. I met with the insurers; all three of these organisations were happy to talk about it but, like the fire service said; we've got this big folder of information but I can't let you see it unless we have the university's permission and the university wouldn't give me permission to use it as a case study because it was so embarrassing.

So that's a good case of not thinking about the actual activities that go on in a building and how that relates to the business or the operations of the organisation and ...

Author: Business continuity, isn't it?

DFEC: Business continuity being paramount in that building. And if that was recognised before the fire then they would have done something differently. They wouldn't have had a building that was designed with good means of escape and a fire detection system alone. They would have had this research broken down into fire-resisting cells; they would have had (unintelligible) and fire suppression in there. They would have had better passive fire protection so any incident that happened would have been contained and because their fire safety management procedures were lacking because; the biggest fire safety management failing in that incident was that they had cylinders and they couldn't account for cylinders within the

234

building. If they had had a proper management regime for that and they knew the locations of them, then the fire service might have been able to go in and do a bit better job of salvaging the; rescuing the building.

Author: They hadn't recognised the risk ...

DFEC: They hadn't recognised that risk.

Author: ... appropriately. they'd recognised some risk but not the risk.

DFEC: And that was a university building.

Author: And. you know, it's a good example. A good example of what I am on about, I think? It's; it's also when things change. Because if you've got, say, the (name of shopping centre removed) in town, which is dependent on its sprinkler system; what happens when the sprinkler system goes down? Which, they occasionally do. Do they shut the shopping centre?

20 minutes

DFEC: Well, I've got personal knowledge of (name of shopping centre removed) in (name of city removed) and; have you ever been to (name of shopping centre removed) in (name of city removed)?

Author: I have, yes.

DFEC: (Name of city removed) is the biggest concentration of people for miles around and, consequently, (name of shopping centre removed) is the biggest risk on the patch of (name removed) Fire and Rescue Service within that district. So they pay close attention to what goes on at (name of shopping centre removed).

Author: (Name of city removed) Fire Station is the only full-time volunteer station in England.

DFEC: And it's right next to the shopping centre, isn't it?

Author: but it's the only volunteer fire station in England (laughs).

DFEC: Anyway, I know they've had instances where a vehicle in the loading-bay has reversed into a valve set, cutting out a section of the sprinkler system and the fire service have said; the fire service have come and said, I'll put a prohibition notice on you unless you get that sorted within half an hour.

So, yes. To answer your question, shopping centres can get closed down if the protection measures aren't in place and that costs; the consequential damages from that are millions in terms of losing trading hours.

Author: Yes, but it's the fire safety manager who has to be aware of how important the sprinkler system is; how vital it is to the shopping centre, to be able to then, do something about it. So he also has to have the authority to do something about it. And, such as (name removed), you know, with all his valiant efforts, he hasn't got the total authority that he needs and he's always batting his head up against a brick wall. He hasn't got that lifeline to the; not the Chief Executive; the Chancellor, the Vice-Chancellor. He hasn't got that line; direct line to the Vice-Chancellor, there are people between. But he needs that because he has to make decisions or, potentially, make decisions like that.

So, you know, there are lots of problems for a fire safety manager.

DFEC: I suppose for you to put this into some kind of structure so you analyse what we're talking about, have you got to ask me these questions in order? Have you got to ask me these questions so that you can some analysis or are you alright with a chat?

Author: I've used the questions; I've done that with the other three interviews. I wasn't going to be so strict and rigid today because you're an academic anyway, you know what it's all about. I wanted to, really, explore how you see things with your particular background. As I say, it's one that's alien to me anyway.

Question 3 there, it says, do you think there's a parallel between the standard of fire safety management and the amount of fire damage?

DFEC: Yes. I think an example of that was the management of cylinders within a building ...

Author: I know (name removed) has palpitations about cylinders at Loughborough because, if you go in, I think it's the (name of building removed) for one; that's one I've walked around with (name removed) and I know there's the odd Acetylene cylinder, you know, here and there and (name removed) explained to the building manager about what happens if there's a fire involving an Acetylene cylinder. You know, there'll be an exclusion zone; you won't be able to get back in the building for at least twenty-four hours, you know, are there alternatives you could use instead of Acetylene, It's just batting his head against a brick wall because they are still there because; oh no, we can't use anything else, it's impossible, we have to use Acetylene. So that's one example of ...

DFEC: It's one example but, yes. I think that a good standard of fire safety management does reduce the likelihood of fire and, probably, fire damage as well. Because,

236

the likelihood of fire is to do with good management of keeping ignition sources away from fuel, isn't it? It's about reducing ignition sources so it's about portable appliance testing, it's; you do test your fixed wiring ...

Author: I think; going back to my definition of fire safety management; I think I would reduce it to the control of the ignition. Fire safety management is the control of the ignition. If it's a process of using an ignition, it's controlled, however?

DFEC: It could also be control of the fuel itself, though because good housekeeping and making sure that you don't store combustible waste inappropriately and stuff like that, is part of it, isn't it? Making sure that your wheelie bins aren't right up against; I mean, a lot of this good fire safety management can be about prevention of arson as well, can't it? Or making sure you are not giving a source of fuel to potential arsonists by having wheelie bins unlocked underneath the eaves of a building.

Author: If you live in an area where arson is, you know, (unintelligible speech), you have to have precautions.

DFEC: Having a secure site and monitoring it. So. yes. I can't say anymore except, yes. I do think ...

Author: If you concur then, that there's a parallel between them, let's go onto the next one. The next one is about the fire service campaign for; to reduce unwanted fire signals.

DFEC: What are the benefits of it?

Author: That was brought in, in my opinion, that was brought in purely to reduce the amount of time and effort that the fire brigade does. I don't think there was any consideration given for businesses, organisations, occupiers as to what effect it would have on them? And I know that I've seen, no end of times, comments and complaints, you know, from the fire industry saying this is unacceptable, this should have never been and why are they doing this? And so on and there's no; there doesn't seem to be an explanation to it? So, I wondered what the benefits to the industry are; what the benefit to commerce is?

DFEC: Well, I don't know if there are any benefits to commerce except that, hopefully, their council rates would be coming down if they're not paying so much to the fire service for unwanted interventions but for the end-user, it means that they've got to be aware of the situation and if they've got, for example an auto-dialer on their fire alarm system which sends a message out to an alarm receiving centre,

they've got to back that up with a physical 'phone call as well. If they want the fire service to come out can't rely on just that signaling, they've got to confirm it, haven't they? They need to know that.

Author: Well it depends where you are because it's a post-code lottery again.

DFEC: So for large organisations who have got premises; like hotel chains, for example, who've got places all around the country; they need to know their local (unintelligible speech), don't they? It doesn't really apply to Loughborough University so much.

Author: Well, it does and that has been a big motivator for (name removed). Because when he first came to the University, the fire brigade were turning up every five minutes for false alarms, so he put in a system that's still running today where the Security check first before; well, I think it depends on time of day, it's different during the night hours from the day hours but the; it results in one years-worth of alarm signals within the University was 450 that a fire alarm was activated in, you know, one of the buildings on the University site. Out of those 450, only five times were the fire brigade called to site. Whereas it would have been 450 times in previous years. Which is what really impresses me about what (name removed) has done, to be honest.

DFEC: What was the most obvious cause for unwanted alarms? Was it students doing daft things?

Author: It's cooking, more than anything. It's cooking setting off smoke detectors in the residential units; the student halls.

DFEC: So, is that a a human thing or is it something; would it be able to make   30 minutes
him (unintelligible speech) in the way the building was designed to prevent some of those? For example, making sure there were closers on doors; cooking only took place in designated kitchens; kitchens had detectors; there were self-closing doors so that smoke doesn't get into the corridor where there were smoke detectors?

Author: He's certainly tackled that but what he's got is an education programme in place that starts in August/September and he teaches that year's intake and gets, you know; gets the number of calls down; reduces them to a certain extent then they go away and the next intake comes and he has to start all over again. But, yes, he does tackle that and it is seasonal, so yes. But that's; if you ask (name removed), what are the benefits of this unwanted fire signals that it's forced him to do that.

It's forced him to look at the management system and to fine-tune it so the fire brigade don't get called.

DFEC: I know it's probably focusing on life safety but another advantage of reducing unwanted signals is, it gives confidence in the building so that when they hear the fire alarm, it's a fire. It's not, duh, it's another false alarm. I'll not bother leaving just yet. So it does give confidence.

Author: Other than those benefits to the fire brigade and the benefit that (name removed) mentioned which has made him; forced him to do things, I can't see; I'm not aware of any evidence that it reduces the amount of damage or the number of fires ...

DFEC: No, and it might be the opposite? Because it might be that there's a delay before the fire service actually respond to genuine fires.

Author: Well the insurance companies would be complaining then, wouldn't they? Because they'd be paying more out on the insurance and I'm not aware that that message is coming out from say, the FPA?

DFEC: Well they are complaining. I can get you a report; send you a report that RISCAuthority produce. RISCAuthority is the insurer funded scheme that the FPA administer, which was looking into just this issue and the implications to insurers. And it was a lobbying kind of document to say that it was actually being detrimental to industry.

Author: That would be interesting.

DFEC: Right, I'll get that for you. And it was based on certain statistics as well. I think that's quite a useful document for you.

Author: My next question was a, sort of, concept one. The fire brigade have always; well not always but since the 1990s have had performance indicators which this present Government has rescinded. But the fire brigade are so into performance indicators that most fire brigades have kept them and, in fact, introduced, what they call, local performance indicators, which they've dreamed up themselves.

I was wondering if it would be possible, and I'd welcome your opinion on this; if it would be possible to bring in some performance indicator that measured the performance of the fire brigade related to the amount of fire damage that was in their administrative area. So, how you would measure it, I don't know. But what it would mean; the fire brigade would have to make some effort to reduce the amount

239

of fire damage and if there's a parallel between fire safety management and the amount of fire damage then it would mean by addressing fire safety management they would automatically reduce ...

DFEC: Well that would be much more of a motivational factor for fire prevention work.

How are they measured at the moment, then?

Author: They're measured on the amount of deaths but it's specific because it's fire deaths in accidental dwelling fires. But as I said, they're not measured now because this Government has rescinded them, so they're not. But most of the fire brigades are still carrying on with measurement in their risk management plans. It's the number of fire deaths in accidental dwelling fires. So that excludes all the deliberate fires; deliberately setting fire to yourself and so on. They're measured on the attendance times. Most of them measure the, you know, the number of female firefighters, the number of ethnic ...

DFEC: Diversity?

Author: Diversity. They're those type of measurements. But the one for fire deaths has caused the fire brigade to reorganise, partially. They've brought in this, what they call, community fire safety; which really is focused on accidental deaths; fire deaths in accidental dwelling fires. So now, if you ring up the fire brigade they'll come round and do an inspection of your house. They'll give you a free smoke alarm. If you're in; what they done is they've looked at the statistics and found out the risk profiles. So if you go on a fire station now and say; what's the most likely profile of the next person to die on your patch, they will say, well, it'll be an elderly man who lives on his own and smokes because that is the most likely to die in a fire.

But, if you went on a fire station; and this is the point I'm making; if you went on a fire station and said; what's the most likely profile of the type of premises that's going to burn down in your area, they won't have a clue because the work hasn't been done on it. And, I think, where I'm coming from, is the work could be done on it, we could have risk profiles for places such as this or (name of a business park removed) down the road there; and we could have the probability of that being the, you know the next likely type of fire, in which case it would be up here on a priority list, you know, more at risk than this one. So if you tackled the fire safety management in that one, you know, you could reduce the risk just like they are with fire deaths in accidental dwelling fires.

DFEC: That's an interesting concept and it would focus resources in a different way, wouldn't it?

Author: If it worked and it reduced the amount of fire damage then it would reduce the need for the number of resources that they have at the moment. The resources that they have at the moment for tackling fires are the most expensive. If you have an operational firefighter and a fire safety officer standing next to each other, the one is far cheaper than the other; because you have to have a fire engine and all the equipment to service this one but you only need a notebook and pen to service this one. So, if this one could have the knowledge of all the fire safety management priority; what it should; what it should tackle and it reduces the amount of fire damage, you will reduce the need for the expensive one. So, potentially, it's a far cheaper fire service.

DFEC: I don't know if this is; I don't know the truth behind this statement but it's been told to me a couple of times; the difference between fire service, not mentalities but motivations. If you picture rufty-tufty Americans, they want to be on the busiest fire station. They want to be going out to the most fires whereas this contrasts with a place like Hong Kong where they see it as a personal failure that they actually have to go out and attend a fire because they're so focused on the fire prevention and fire safety. That is their mandate and they see it; the station officer feels a personal failure if there's a fire on their patch or on their watch.

It's funny, isn't it? That that's the kind of change that we're talking about?

Author: Yes, we're talking about the change from reactivity to proactivity. If you can get in first and prevent the problem, it's a lot better than waiting for it to happen ...

DFEC: ... it's cheaper.

Author: Yes, it's cheaper and less damaging to the environment.

DFEC: So you could measure it; you could measure that in terms of pounds; monetary loss or you could measure in terms of area, I suppose for; it would be a difficult one to measure but the concept seems to have legs, doesn't it?

When you think about the history of the fire service, they were, way back; weren't they started by the insurance companies anyway? It was all about, if you had your insurance policy and you had the plaque on the wall, the fire service would come and put your fire out.

Author: That's right.

DFEC: It was all about property protection and then there was; a lot went into 40 minutes salvage operations as well? So after you'd put your fire out, the fire service were interested in making sure the water they'd used wasn't running off and damaging other areas; I don't know if that's much of a focus these days?

Author: It is a focus but I don't think it's so much of a focus. I can remember sheeting up machines and sheeting up roofs and so on but it doesn't seem to go on so much today and they don't carry so many salvage sheets as we used to carry in those days.

DFEC: It's odd how the focus has changed and perhaps it's about time (unintelligible speech).

Author: Well it's, I mean the motivation for tackling fire deaths is because society won't tolerate it. It won't tolerate too many fire deaths. You know, if there's five people die in a fire, as there has in Leicestershire, you know, there's a big outcry; because what are the fire brigade doing about it? Well, this is what the fire brigade are doing about it. They're doing smoke alarms, they're doing risk inspections, etc.etc.

You know, (company name removed) down the road here, burns down; there's no outcry, is there? That was the biggest fire that Leicestershire's ever had!

DFEC: But it's been talked about a lot in insurance circles ...

Author: I'm sure it is, yes.

DFEC: ... and it's still going through the courts. As to who's going to pay for it because there's some doubt over; I don't know the details but there's conflict between the sprinkler maintenance company or something like that. Was the sprinkler system fully operational and then when there's large sums of money at stake, it's amazing how motivated the insurance companies are to investigate thoroughly what happened.

Author: I investigated that fire and I was looking over the shoulder of three, four insurers because I was just fascinated by their methods, to be honest about it. We had formed this little working group, you know, to investigate the fire and really, I was sitting back just listening to what they were talking about.

DFEC: What were the big issues there then?

242

Author: Well, the big issue was the fact that; do you know the story of the fire?

DFEC: I don't.

Author: The big issue was that they tested the sprinkler pumps at half past nine one morning and there was a burst in the; underneath the car park. The burst pipe was six foot under the ground. So they immediately tried to dig it up and repair it and they went through a gas main, which meant they had to stop. And it was, that was half past nine in the morning, well it was seven o'clock at night when (company name removed) ignited. Of course the sprinkler operated for two minutes and then stopped. The fire brigade had no chance because they expected the fire to be controlled by the sprinklers. I have to say the firemen from (name of town removed) here, they, you know, I would credit them with doing the right things but being defeated by what had happened.

But what never came out and what hasn't come out, as far as I am aware. It didn't come out in the fire report because the fire investigation report; because that's just to investigate the cause of the fire. What didn't come out was the fire safety management failure. Which was that the site management 'phoned around the twenty-eight units and told them that the sprinkler system was inoperative; it was only a verbal message ..

DFEC: This is (name of business park removed) management?

Author: The site management for (name of business park removed). They 'phoned through to each of the the units and told them that the sprinkler system was inoperative; they didn't give them any advice on what to do or what effect that might have; it was just a bald statement; your sprinkler system isn't working but, certainly in (company name removed), that message just got lost. So the fire safety manager obviously didn't realise the implications of that message.

DFEC: Oh, I see. It was the main to the site itself that was burst?

Author: The sprinkler system was a ring main and, I understand from the insurers, that there was a; and I looked at the diagrams myself but there was a way of diverting the; around the burst. I never fully understood how that could have been done but the insurers were positive that it could have been done and I guess that's what the insurers negotiations and argument have been about? But, it was a sprinklers system; the ring main which; with a burst so none of the twenty-eight sprinklers off that main would; I think there were four pumps and I think you could have two major fires in the twenty-eight units before it was overdrawing the system.

243

So it was down to that burst sprinkler main but my contention is that it was also a fire safety management failure because the information was there but nothing was; it wasn't challenged; it just got lost.

DFEC: What did actually cause the fire?

Author: It was never found out. I had got an argument with the insurers that it was twenty yards away from where they thought it was. I had got all the footage, the CCTV footage and so on but I just eliminated all the ignition sources that I could and I was left with nothing (laughter).

But I think that is part of my motivation for this thesis, is that that was a fire safety management failure; because the company could have done something. I don't know what? I mean, first of all they could have found out what a risk it was; what risk they were taking if they did nothing?

DFEC: At the bare minimum they could have had a more stringent fire watch whilst the sprinkler system not going to function properly?

Author: They could have, yes. It would have cost less in the long run.

So there was no consideration of that information, there was no understanding of what it meant?

DFEC: They didn't quantify that additional risk in terms of what it could do to them? And, yes. A very high profile fire, really, within the industry, within the insurance industry, anyway.

Author: I'm sure and certainly the biggest fire that Leicestershire has ever had!

DFEC: So, wow! I mean is this, sort of, one of the recommendations that is going to come out of your work?

Author: I don't know? Because I don't know whether it's feasible. I think the concept is good; it's the feasibility. I don't know how you're going to measure it?

DFEC: How did your fire service interviewees respond to that?

Author: Oh, it won't work. No way of measuring it. But that's not good enough, I'm afraid.

But I think a performance indicator would be some measure of the amount of fire damage, you know, the fire damage would reduce somehow which would measure; would measure the performance of the fire brigade. How that would happen I don't …

2407 DFEC: Ultimately there has to be motivation from the Government to measure
2408 something again.

2409 Author: I think, at the end of the day, it's down to us as a society. Because it's us
2410 complaining about the number of fire deaths that makes the Government act to do
2411 something and it would be us complaining about the amount of fire damage that
2412 would compel the Government to do something; and we're not complaining. Fire
2413 damage is still increasing; eight and a half billion pounds or something per year;
2414 well, that depends on how you measure it because it's the consequences of it and,
2415 you know; if you include the costs of keeping the fire engines in the fire station into
2416 that cost; there's different ways of costing it, as you know; the amount of damage.
2417 But as far as I can work out, it's still increasing and we still accept it in our insurance
2418 premiums and whatever?

2419 DFEC: I think it's a good concept; it's very, yes; you're right. It's always a tough
2420 sell.

2421 Author: The last bit; I don't know whether I put it in the e-mail; did I put? Ah.
2422 I've got some points down here which I've called the general viewpoint of an insurer
2423 and I wondered if you would just look at those and see whether they're valid and   50 minutes
2424 perhaps; these are the points here. They're valid and, if so, what sort of; would
2425 there be a priority order for them and are there any missing, I suppose would be
2426 the other question?

2427 DFEC: Did you know that insurers do not make a great deal of money from insuring?
2428 They make their money by investing it on the stock market.

2429 Author: I'd guessed; I don't know exactly how insurers make money but I can
2430 imagine that there are all sorts of mechanisms to do something with the money, to
2431 make money.

2432 DFEC: Insurers, quite often, pay out in claims, more money than they take in
2433 premiums. But it's because of their investments; how they invest that money that
2434 they take from people before they have to pay it out, that makes the organisation's
2435 money.

2436 So, obviously, if they're taking on a risk, as they call it; if they have a financial
2437 incentive in a risk, then they are very keen to know that that is being managed as
2438 best as it can be.

2439 Author: What efforts do they go to?

2440 DFEC: Well, before they take on a policy they, quite often, send out a surveyor to
2441 have a look at it. So they look at; depending on what the policy is? It's very rare to
2442 find pure fire insurance policies now, it tends to be a property insurance, so that's
2443 security, flood as well as fire; all the perils, as they call them, they don't tend to
2444 have so many hurricane risks in this country but that's all included in there. So
2445 the surveyor goes out to make sure the building is constructed of materials that fits
2446 within the risk appetite of the particular insurer; some insurers, they won't take on
2447 timber-framed, for example. So they'll only; they're looking for a building that's
2448 constructed from robust materials, bricks and mortar or sandwich panels, stuff like
2449 that.

2450 Author: Is it true that it's difficult to insure thatched buildings?

2451 DFEC: Yes, it is difficult, yes.

2452 Author: Some insurers won't even insure thatched buildings.

2453 DFEC: So they're looking at construction; they're looking at how well maintained
2454 that building is. Whether it's in a good state of repair, housekeeping, management
2455 does play a large part. They're looking at how the fire precautions within the
2456 building are maintained. They're very interested, if the building is sprinklered,
2457 they want to know that it is maintained properly and they may want to do some
2458 testing of the pumps, themselves; and then they tend to have annual insurance
2459 programmes of surveying whilst they're responsible for those buildings. So, for
2460 example, Loughborough University; I've thought of his name now, (name removed),
2461 does Loughborough University; (name removed) goes out annually to Loughborough
2462 University on behalf of (name of company removed) to do his checks,

2463 Author: So he would interview (name removed), presumably?

2464 DFEC: He probably talks to (name removed), yes. I'll get you his contact details,
2465 it might be worth a 'phone call at least.

2466 So, fire safety management is important but, from an insurance point of view, prop-
2467 erty protection really is about; good property protection is about physical things
2468 that don't require human intervention. Because wherever there's human intervention
2469 there's a chance that things could go wrong. And the insurers calculate insurance
2470 policies based on a concept called estimated maximum loss (EML). Now, estimated
2471 maximum loss is, basically, a calculation of a typical ignition source and a typical
2472 fire; what's the most we can lose here? And they tend to base that calculation on

246

things not working. So, they wouldn't reduce their EML if the building is sprinklered, for example, or if it's got fire detection because they might not work. So an EML is calculated based on physical; as a two-hour compartment walls or physical boundaries of buildings. So, for example, if you are looking at the EML of the Department of Civil and Building Engineering, it would be 100% because one fire could travel throughout the whole of the building; a total loss. So that building would be 100% irrespective of how well that building is managed. The pricing of that policy would be based on the insurer could see 100% loss of that building.

And, they're quite stubborn about that sort of thing and insurers attitudes are based on historical loss statistics and they've got statistics for different types of occupancy and they know that for different types of industry or different types of warehousing, statistically speaking, they can expect to have any fires in any given year and that's what they base their pricing on. So it's historical fire statistics; loss statistics and this concept of EML.

So, fire safety management probably comes quite low down their list of priorities. Important, and they might make it more attractive for them to take on a policy but it probably wouldn't affect the pricing much.

Insurers want hard facts and, not just metaphorically speaking, but practically they want hard walls and they want to know that a fire is going to be limited by boundaries within the construction.

Author: Which is what, you know, how it used to be. That's the principle of compartmentation? Which is all going now with fire engineering.

DFEC: Yes. Fire engineering does present a problem to insurers if they're going to insure a property. For example ...

Author: And it also makes fire safety management more important.

DFEC: It does, exactly. It's interesting. It's a perverse world, really. The investment part of the insurance life, where they make their money, they're probably investing in fire-engineered buildings. If you think about the Gherkin in London. That was commissioned and the majority of it is owned by a Swiss reinsurance company, (company name removed). Now that's a building with, not a great deal of compartmentation. It's a high profile building which is based on; completely fire-engineered and other insurance companies have offices within that building, it's so high-prestige but it makes you think; are they practicing what they preach?

So, the general viewpoint of an insurer; reduce the amount of fire damage, well, yes definitely; and that's probably one in order of importance. One and two; I know you only have four here but these are probably nine and ten.

Author: (Laughs) No, that's useful.

DFEC: Fire safety management is a nice to have but it's not what motivates the insurer to a great extent ...

Author: ... and it doesn't motivate the fire service at all, I don't think?

DFEC: Which is odd because from the legislative point of view I'd have thought the; the Regulatory Reform (Fire Safety) Order was predominantly talking about the Responsible Person managing fire safety, in the appropriate way?

Author: Yes, I'm sorry. In relation to property protection, I was thinking. You're quite right, yes. It is about fire safety management. It's all about fire safety management but it's about fire safety management with a focus on life. Providing the life is saved, you know, hang the building.

60 minutes

DFEC: Does that help, in terms of motivation of the insurer?

Author: It does.

DFEC: That's why the insurance surveyor goes out every year and (name removed) goes out every year. (name removed) is doing his life safety fire risk assessment. (name removed) is going out and doing his insurance survey. They're looking at the same buildings but from different perspectives.

(Name removed) is coming out with his fire risk assessment which is life safety focused; (name removed) is coming out with his insurance report which is very much property protection focused; he's looking at how the building is built? He is looking at how it's managed, to a certain extent; he would be horrified if he saw cylinders randomly strewn across a building but he's looking at hard facts and physical structure.

Author: Now I must correct you there because (name removed) looks at; he focuses on life safety because he knows that is the focus of the fire risk assessment but his equal focus is on something that he calls, asset protection; which is business continuity and property protection. He has an equal focus, in my opinion, an equal focus both of those.

DFEC: Right. Excellent. Yes. Which is brilliant because, sometimes, business continuity is a strange term because it applies whether you're in business or not.

2539 Mission continuity, is another way of looking at it. The School's should be designed
2540 with business continuity in mind; not because we're in business generating money
2541 but because they need to be providing a learning environment, you know, for the
2542 children that they're responsible for; and, if their school burns down then there's a
2543 failure there, isn't there? There's a big failure and they're not able to continue their
2544 mission, their objectives.

2545 Author: (name removed), thank you. I'm grateful for your time

2546 DFEC: You're welcome.

F. Appendix 6: Data Access Agreement with Leicestershire Fire and Rescue Service

DATA ACCESS AGREEMENT for sharing an extract from the Fire and Rescue Incident Database (Source: IRS) between Mr Alfred Baker and Leicestershire Fire and Rescue Service (LFRS)

Introduction

The purpose of this Data Access Agreement is for sharing Fire and Rescue Service Incident Recording System (IRS) data between LFRS (Data Owner/providing organisation) and Mr Alfred James Baker (beneficiary) Master's Degree Student. LFRS agree to share this data with Mr Baker on the understanding that it only be used by the person named hereunder for the bona fide statistical and research purposes described and that it will not be shared with other individuals or third party organisations. For the avoidance of doubt LFRS will ensure that all data provided to Mr Baker under or otherwise in connection with this Data Access Agreement contains no personal data about individuals.

Data Owner (Authorising) Organisation(s) / Data providing organisation:
Leicestershire Fire and Rescue Service (LFRS)

1. **LFRS Responsible Statistician:**
   Paul Botterill (Data Manager)

2. **Beneficiary and person responsible for receiving data and adhering to all the conditions in full :**
   Mr Alfred Baker

   The beneficiary must ensure that he:

   - Has the appropriate knowledge and experience necessary for handling anonymous data for research projects;

Response: When working as a Local Authority Fire Officer, the beneficiary had full access to similar confidential fire incident data and, by the use of Fire Data Reports (FDR1) and Fire Investigation Reports, assisted in creating similar local and national fire incident data.

   - Demonstrates a commitment to protecting and maintaining the confidentiality of any sensitive information contained within the data during the creation of outputs and publications that arise during the proposal.

Response: As a Researcher at Loughborough University and subject to a similar confidentiality agreement with the Department of Communities and Local Government (DCLG), the beneficiary had access to provided datasets of the national FDR1 and IRS databases. Analysis of these datasets has already led to two academic papers being submitted to the 'Fire Safety Journal' which are, as yet, unpublished as they are still in the process of being peer reviewed.

3. **Statistical Purpose and Outputs**

The purpose of the data analysis is to assist in the completion of a thesis in pursuance of a Master's Degree by Research. The research looks into the subject of fire safety management and its relationship with the amount and type of damage recorded at fire incidents attended by the fire and rescue service.

1

Figure F.1.: Page 1 of the LFRSData agreement

The overall aim of the research is to evaluate how fire safety management in buildings can be targeted by fire safety managers and the fire and rescue service to reduce the amount of damage caused by fire.

Access is granted by LFRS for data extracted from IRS to Mr Baker for the aims of evaluating the prevention and protection activities of LFRS and is limited to the scope and duration of this Master's Degree.

Information will not be released to any individual(s) without the permission of LFRS, except in the form of non-disclosed statistical tables or conclusions. LFRS would be pleased to be involved in ensuring that outputs are not disclosed.

Disclosure is when identity or location is specified in the information, can be deduced from the information, or can be deduced from the information in combination with any other published information.

The source of data will be referenced in all outputs and publications, and will include a statement that analysis and interpretation are the responsibility of the author and not of the data provider.

4. Lawful Use
Mr Baker undertakes to ensure that his use of the Fire and Rescue Incident Database will be in accordance with the Data Protection Act and guidance issued by the National Statistician and UK Statistics Authority, for example on protecting confidentiality. Further, the data will only be used for the purpose described.

5. Undertakings
Use of the Fire and Rescue Incident Database must be compliant with any undertakings made at the time of collecting the data.

6. Definitions
LFRS agrees to provide all available necessary definitions to the interpretation of the IRS Data.

7. Data Storage and security
Mr Baker will ensure that the data is stored on a secure server which is password protected as a minimum (encryption considered a higher standard to prevent unauthorised access) and complies with the Data Protection Act 1998. LFRS will be pleased to discuss and advise on the adequacy of arrangements proposed, and to be involved in reviewing outputs for this purpose. LFRS reserves the right to scrutinise any outputs derived wholly or in part from the IRS data for disclosure control purpose before publication.

8. Time Limits
The IRS data will be provided to Mr Baker by LFRS for the purposes specified in this Agreement and the duration of his research.

9. Closure
Mr Baker agrees to securely destroy all copies of the IRS Data he has been provided with once his research and studies are complete

10. Consent
Mr Baker acknowledges the consent of LFRS to provide access to the IRS data.

2

Figure F.2.: Page 2 of the LFRSData agreement

11. Persons not listed as authorised above and contractors and sub-contractors
If any processing of the IRS data is to be carried out by persons other than Mr Baker, this will be with the knowledge and agreement of LFRS.

12. Freedom of Information
This Data Access Agreement and a list of the signatories will be made available to the public on request and included as part of the metadata attached to any of the outputs arising from the access as per the Freedom of Information Act 2000.

13. Indemnities
The Fire and Rescue Service warrants that the information provided is accurate as at the date of publishing but the Service reserves the right after that date to change, at its absolute discretion, the information provided in any way it chooses including but not limited to deletion and addition without further notice to you.

The recipient undertakes to make no claim for any loss as a result of either the receipt or non-receipt of data.

14. Data Security in transmission, storage and usage
Data will be transmitted taking appropriate security precautions. Data will be stored securely by Mr Baker ensuring that it is only accessed by him as the named beneficiary, and in accordance with best practice, taking account of relevant National Statistics guidance, or guidance which succeeds this.

Physical media and any paper will be stored securely.

15. Reporting Breaches
If there is a breach or suspected breach of confidentiality or a loss of data, the LFRS Data Manager, will be informed immediately. The information will require an assessment of impact. Details of the nature of any breaches to this agreement may also be passed to other departments and agencies.

3

Figure F.3.: Page 3 of the LFRSData agreement

We the undersigned representatives of Leicestershire Fire and Rescue Service and Mr Alfred Baker agree to the terms and conditions of this Agreement as specified above.

Signed: Date: 4 DECEMBER 2012

Name: Mr Alfred James Baker

Signed: Date: 10/12/12

Name: Mark Andrew

Position: Head of Human Resources & Planning & Performance
LFRS

Signed: Date: 4 /12 /12

Name: Paul Botterill

Position: Data Manager
Planning and Performance
LFRS

4

Figure F.4.: Page 4 of the LFRSData agreement