Organising experiences through activity: a comparison of aviation and medical professionals' concept of safety

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Abstract

This thesis examines the concept of safety in two groups of professionals working in the fields of aviation and medicine. These professional activities are uniquely structured but have been compared in the literature as having certain similar characteristics. However, recent attempts at strengthening patient safety by transferring methods from aviation have had only a small effect, with evidence suggesting that professional engagement has been poor. One possibility is that there are large disparities in conceptual understanding about safety across these groups. This was derived from socio-cultural theories of knowledge showing how collective experiences are formed into meaningful categories through situated learning and structured internally through semiotic mediation. A cross cultural comparison of the safety concept was carried out using linguistic data to capture the concept. Forty-one interviews were conducted with participants across two groups comprising senior airline pilots and hospital consultants. Grounded theory analysis was used to code and analyse the data. Taxonomic structures of the two safety concepts, comprising their main semantic sub-categories, are presented, along with models explaining their internal relationships. In aviation, a core category of control was identified involving principles of stability, invariance, and causal attribution. This is dominated by the sub-categories of institutional control and personal autonomy, which are mediated by the availability of information and predictability of events. In the medical sample a core category of clinical success was revealed. This encompassed overall quality of outcomes based on Bayesian thinking about different risks along possible treatment paths. The thesis shows how conceptual knowledge is formed through mediational means within the context of specific purposive activities. A tentative theory of conventionalisation is proposed to explain why top-down interventions for transferring practices between cultures fail when differences between key concepts are large. Interventions, such as change laboratories to scaffold learning towards re-conceptualisation are recommended.

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Chapter 1

Introduction

1.1 The study

This thesis is primarily an examination of the concept of safety; a concept that is so often used by academics, policymakers, and managers alike when talking about this particular feature of the environment that relates to harm, that it has an axiomatic quality about it. It is treated as a taken-for-granted objective phenomenon, and is considered as a given that this concept will be universally understood. Yet, at the same time there is a contradiction at the heart of this assumption, because safety can be manifestly different in different social settings. For example, safety in aviation and safety in healthcare are undoubtedly dissimilar, otherwise fairly recent demands that the latter industry learn from the former would not have been so clearly expressed (Department of Health, 2000b; Kohn, Corrigan and Donaldson, 2000).

Safety must then be about methods and actions and their functions within particular social settings. In other words it must relate to values and principles, and the motivations of people performing particular activities. Yet it is typical to speak of safety as a scientific discipline. We refer to safety scientists, and one talks about models of safety, along with descriptions explaining the functional and theoretical attributes of safety systems. In this way safety is presented as being about generalised, objective and predictive models relating to cause and effect. But this largely ignores the cultural and historical context which mediates behaviour through social artefacts (Scribner, 1990; Wertsch, 1985), in this case as responses to threats that have been singled out as targets for safety activity. So it is through collective acts of culturally mediated behaviour that values, beliefs, and choices are formed into categories that go to make up the concept. (Toulmin, 1991; Wertsch, 1998)

This deficiency in recognising the social complexity of safety, particularly in specific settings like healthcare have led to calls for a shift in emphasis to take into account the situated nature of knowledge about safety practices (Waring *et al*., 2016). This thesis seeks to investigate what is meant by the concept of safety and the way it relates to the social context within which it is used.

But there are several strands to this study relating to questions that operate at different levels of analysis. At the very broadest and most philosophical level the thesis considers what a concept actually is. Some of the literature in this area is examined to try and resolve this question in terms of the relationship between human social activity and conceptual understanding. The main focus of inquiry though relates specifically to the concept of safety and what it means to professionals working in two different specialist areas of activity; aviation and healthcare. It is an interest that derives from my own occupational background within aviation engineering and flight simulation. Being immersed within this industry creates a particular worldview that involves distinctive patterns of thought, certain shared beliefs and assumptions, and a characteristic way of thinking about organisational structures and operational processes. But having many friends and relatives that work in the NHS, it was always puzzling as to why the same principles of safety used in aviation were not replicated in healthcare. So this study was, in the first instance, a response to that question.

This necessarily demanded a continued process of reflection by the researcher upon one's personal values and assumptions. The need to be objective translated into a conscious process of carefully re-evaluating existing taken-for-granted assumptions that are normally held implicitly. There was an active desire to situate within the academic setting and to take on the values of the social scientist. However, the cross-cultural focus of the work was important in creating an appropriate academic distance with the object of inquiry since one is forced to move between alternative worldviews, and to examine each perspective afresh as the analysis progresses. This comparative strand to the study thus aimed at systematically mapping out the concept of safety as it is understood by the professionals working within these two domains of aviation and medicine.

The third strand to this study is more speculative and looks into possible reasons for the reported lack of success in transferring aviation safety methods into the medical setting (HoC, 2009). The comparative findings of the two conceptions of safety are examined to see whether there are significant differences, which could suggest that safety actions transferred from the aviation setting are not recognised by the medical group as being legitimate interventions that fit within their own concept of safety. In this strand of the study, the findings are examined through the lens of Vygotsky's theory of conceptual development (Vygotsky, 1986), Activity Theory (Engeström,1999) and Bartlett's concept of schema reconstruction (Bartlett, 1936) to offer a possible explanation for the lack of effectiveness in implementing changes and creating measurable safety outcomes. This strand forms a theoretical basis for further ongoing research.

The use of a comparative method for examining the concept allows for the selection of two distinctly structured professional activities, so the collective meanings of safety can be evaluated with reference to their context. The two professions that were chosen for this study while arising from a personal interest also tap into an existing background of some comparative discussion regarding safety, often with the message that aviation safety methods should be used in healthcare (Kapur, *et al*., 2016).

1.2 The matter of safety in healthcare

Patient safety has been an important area for policy reform in healthcare provision for well over a decade. This commitment began as a response to increased public awareness about medical errors. Media attention and a growing consumer orientation within healthcare have combined to highlight this issue, and a number of influential research studies have shown that the scale of the problem is considerable. In the National Health Service (NHS) in England and Wales a retrospective review of the medical records of 1014 hospital admissions in two acute hospitals in London identified adverse events causing patient harm in 10.8% of the sample. In those cases where an adverse event occurred, 19% of the patients suffered permanent impairment and 6% died, and it was judged that half of these events were preventable with normal standards of care (Vincent *et al.*, 2001). If these findings are generalised to the whole population of NHS hospitals, then based on annual inpatient episodes of 8.5 million, this would give an estimate of 850,000 adverse events causing harm to patients each year, with anything up to 50,000 deaths. The financial implications of harm to patients on this scale were estimated at £2 billion per annum (Department of Health, 2000). If we think of the rate of error, then those findings are consistent with another, more recent study commissioned by the UK General Medical Council to investigate the prevalence of prescribing errors in NHS hospitals. This research examined 124, 260 medication orders across 19 hospitals and found that 11,077 of them contained errors; an error rate of 8.9% (Dornan *et al*, 2009). Moreover, the nature and magnitude of the problem is not limited to the NHS and seems to be a global issue, with similar levels of patient harm being found in other studies abroad. In Australia, the level of harm to patients resulting in disability or increased hospital stay as the result of an error event was found to have occurred in 16.6% of the hospital admissions examined, of which 4.9% of cases resulted in the death of the patient (Wilson *et al.*, 1995). The Harvard Medical Practice Study carried out in the U.S. is perhaps the most influential study in this area and established the standard methodology for estimating the overall incidence of iatrogenic injury in hospital admissions (Brennan *et al.*, 1991; Leape *et al.*, 1991). The findings of this study found that adverse events occurred in 3.7% of cases and in 13.6% of these it resulted in death. Permanent disability was the outcome in 2.6% of those adverse incidents. If these figures are representative of the U.S. in general, then 180,000 people die each year from injuries caused by potentially preventable errors. The seriousness of these findings was powerfully illustrated by one of the researchers, who compared the safety and mortality rate to that of aviation, declaring that the estimated mortality rate due to medical errors was equivalent to three jumbo-jet crashes every two days (Leape, 1994).

By comparing the safety record of healthcare with aviation, Leape was using aviation as a benchmark against which patient safety ought to be judged. He also provided a frame of reference for drawing attention to the differences in safety between the two types of activities, suggesting that the model of safety used in aviation would be an effective solution to the problems in healthcare. This representation invites the reader to consider alternative notions of error, risk and safety existing beyond the organisational context of healthcare.

Certainly over the past few decades commercial aviation has demonstrated a remarkable safety record. For example, international and domestic air transport operations accounts for approximately 3.2 billion passengers each year (ICAO, 2015 p.5), yet the latest official accident rate for scheduled commercial operations is reported at a rate of just 2.8 per million departures (ICAO, 2016 p.5). This safe and stable situation can be attributed to the successful implementation of a large number of safety systems into the operational activities of airlines and their supporting infra-structure. These changes are a combination of scientific, technical and regulatory solutions including the ergonomic design of aircraft instruments and controls, enhanced flight crew training, and improved operating systems and procedures, along with clear industry and regulatory controls. Many changes derive from research looking at individual operating processes, working practices, and the interactions of flight crews, and form the basis of a model that was founded on a system based approach to error. This record of successfully reducing the rate of air accidents looks impressive when viewed purely in terms of safety as a system in itself. It is therefore no surprise that there have been many calls in journals, conferences, and other forums by policymakers and academics urging clinicians and other healthcare providers to adopt the methods of safety used in aviation and other technical settings.

Perhaps one of the most powerful campaigns in this area is the *Clinical Human Factors Group,* which began in 2005 by Martin Bromiley after his wife Elaine died during a routine operation because of errors that occurred during her procedure (CHFG, 2005). Bromiley drew on his experience as an airline pilot to highlight how those and other similar errors could be avoided if patient safety is given much greater emphasis, and if the sorts of principles used in aviation safety, such as human factors, are taught to all clinical staff.

But these demands for healthcare to learn from aviation had really began two decades earlier in the late 1980's following some rather loose comparisons between aviation and the anaesthetics speciality (Gaba, 1987). There, the focus was on specific issues relating to human factors and teamwork, and a brief review of some of these papers is provided in the following chapter. However, comparisons with aviation safety have persisted throughout the last three decades and had their greatest impact following the publication of the Havard Medical Practice study in 1991, and Leape's subsequent and very dramatic comparison with air crashes (Leape, 1994).

But more recently, Professor Don Berwick, who was one of those early advocates of the use of this aviation safety model within healthcare (Berwick and Leape 1999; Leape and Berwick, 2000), was appointed by the UK Government to conduct a review within NHS and make recommendations for improving patient safety (Berwick, 2013). His report called on the NHS to embrace an ethic of learning, and appealed for leadership that placed patient safety "*at the top of their priorities for investment, inquiry, improvement, regular reporting, encouragement and support*" (Berwick, 2013 pp.15). It was a renewed emphasis on patient safety that followed serious failings within the NHS, occurring most dramatically at the Mid-Staffs NHS trust between 2005 and 2009, where more than 400 people are thought to have died as a result of poor care and serious breaches in patient safety (Francis, 2013). Yet, all that had taken place after the publication of landmark policy documents, where the US Institute of Medicine (Kohn, Corrigan and Donaldson, 2000) and the UK Department of Health (Department of Health, 2000b) had set out strategic responses to those earlier demands for better patient safety by advocating the sorts of methods that had transformed aviation safety in the 1980's and 1990's.

Some of the policy changes that followed those demands are examined in chapter two, along with the literature reporting on their apparent lack of measurable success in reducing harm to patients. Most notable is a UK parliamentary inquiry into patient safety which concluded that there had been no noticeable improvements in the safety of healthcare services in spite of all the policy changes that had taken place in that area (HoC, 2009).

So this background information poses a number of questions about what exactly safety means to the professionals working in these settings, and how it relates to their professional values and local objectives.

1.3 The research questions

The problem of using aviation type safety methods as a solution to patient safety raises a number of interesting questions about what safety means to professionals working in different settings. For instance, how is their meaning of safety related to local objectives, and how is it formed into a concept that is shared and communicated throughout the professional community? Furthermore, the apparent lack of success in achieving results from safety policies written up by referring to safety in areas such as aviation, suggests a few interesting lines of inquiry. In particular, the following question is posed:

- To what degree must the implementation of functional changes within an activity be in agreement with the conceptual understanding of the people engaged in that activity for it to be successfully integrated into normal practice?

This is a very difficult question to answer but it is possible to break this down into a set of more practical questions that will increase our understanding about the way conceptual knowledge relates to the social setting and, more specifically inform us about safety as it is understood in these two important and very critical areas. The following research questions were specified;

- What is safety and what does it mean to the members of each professional group?
- What are its main attributes, and what semantic sub-categories are contained within the concept?

- What is the latent structure of the concept in terms of the sub-categories and their relationship?

- How does the concept of safety relate to the professional setting in which it is used?

These questions will explore the nature of conceptual knowledge and its relationship to human social behaviour. The starting point is a review of the literature surrounding the ontology and structure of concepts. While this will involve a consideration of the various cognitive, psychological, and philosophical studies and debates in this field, the main focus will be on the relevant social theories, since this is a cross cultural project looking at the relationship between external activity and internal knowledge.

The specific focus on safety in the aviation and medical fields will offer useful qualitative insights, and the analysis will provide valuable theoretical explanations for policymakers and managers working in these particular areas. Furthermore, the broader findings add to our theoretical understanding of the way concepts relate to social activity by presenting concrete examples that relate to the specific theories in the thesis.

1.4 Theoretical framework

The thesis has a strong sociocultural emphasis, and approaches cognition from the outside-in, taking ideas from a range of academic sources including the sociocultural turn, situated cognition, and pragmatism to try and understand how safety as a concept is formed and is used to frame experience. But the main theoretical perspective derives from the work of Lev Vygotsky (Vygotsky, 1978; 1986) and the cultural-historical school of Russian psychology, including the work of Leontyev. (Leontyev, 1978).

This framework assumes that human behaviour is mediated through the use of pre-existing cultural and historical products, including language, and that concepts are shared and expressed through the use of words, gestures and other social tools. Concepts are therefore seen as more than just patterns of thinking they are themselves social artefacts.

But also, the concept of safety is a specific form of organising experience that is an act of generalisation which builds on existing knowledge and experiences about safety. This is formed out of a process of learning that is in some way situated. Theoretical perspectives that explain these processes have informed the analysis in general terms (Lave and Wenger, 1991). But more specifically, Vygotskyian thinking suggests that concepts are formed out of a merging of scientific discourse and direct experience during the course of normal human action. Therefore the leading functional and scientific models of safety as they relate to both aviation and medical settings are included within the initial literature review prior to the empirical part of the study.

But once the narrative data began to be analysed and the meanings of safety were deconstructed into the various semantic categories, it became evident that a theoretical approach that expanded upon Vygotsky's ideas of conceptual development to include an account of other important factors within the social setting was needed to take account of the ideas being expressed in these narratives. The work of Leontyev (1978) and the later work of Engeström (1999), which extended Vygotsky's theory of mediated action into the Activity Theory framework, was used to provide a broader perspective on the relationship between conceptual knowledge and professional activity. It is a theoretical dimension which gives primacy to the dialectic relationship between the individual and their social setting, and incorporates additional significant social elements mediating between the individual and the object of their activity.

Additionally, Bartlett's notions of social schemata and the reconstruction of knowledge (Bartlett, 1936) have also contributed to the development of an emerging theory proposing that safety, or other practices, transferred from different social settings could be re-constructed or conventionalised, if the material falls outside certain limits of existing conceptual understanding in a manner similar to Vygotsky's zone of proximal development.

1.5 Outline of the Thesis

Chapter two further examines the problem of patient safety and reviews some of the literature comparing aviation safety with medical safety. It begins by outlining some of the academic models of safety that were developed from studies tracing the aetiology of accidents in technological settings. The systems approach to safety is sketched out for the reader, and the inclusion of human error and human factors into the safety paradigm is introduced. The distinction between the systems approach and a judicial approach to error is examined in relation to aviation and medical settings. Some of the literature describing medical conceptions of human error is then presented as an example of how both behaviour and beliefs about safety differ between these two professional domains. The chapter then goes on to discuss some of the main policy changes that were presented in response to public demands for safer hospitals. The absence of convincing evidence about the impact of these policy changes is set out, and a short examination of some of the literature looking at selected problems in this area follows. One such difficulty concerns the way in which patient safety should be defined and suitable indicators developed so that progress in this area can be objectively measured. The chapter then reviews the literature examining the effectiveness of clinical safety interventions, along with papers reporting on the problem of professional engagement. Finally there is a review of some of the literature comparing aviation safety with healthcare.

Chapter three directly confronts some of the important questions surrounding the object of analysis by considering the fundamental structure and ontology of concepts. The chapter begins with a review of the main theories describing the form and organisation of concepts. The inherent relationship between the philosophical arguments used to specify their ontological and epistemological status, and the type of empirical evidence used to demonstrate the features, attributes and internal structure of these phenomena is examined. The diversity of theoretical approaches found in the study of concepts is summarised, and the main cognitive experimental studies used to formulate classical, prototype and theory models of concepts is briefly reviewed. The chapter then considers the merit of alternative linguistic and propositional methods, before relevant Hegelian philosophy is outlined along with some related social theories of conceptual thought based on practice, activity, and mediational means.

Chapter four outlines the methodology of the study. The research questions are reiterated, the research design is described, and the chosen methodology is justified. The inductive and exploratory aims of the research are located within its broad social framework and the reasoning behind the chosen methodology is provided. Within the broad context of qualitative research, a systematic method of capturing rich narrative data, and carefully coding the content into constituent sub-categories, was identified. The grounded theory method, which was used to collect and analyse suitable data for answering the research questions is described. The details of the research process are then outlined, and careful consideration is then given to important issues relating to the quality and trustworthiness of the data, and the capacity of this method to answer the research questions effectively.

Chapter five presents the findings from the aviation sample and the resultant conceptual model is detailed. The main coded categories within the model are presented, and each category is explained with reference to the broader narrative context. Selected references are used to illustrate the main points so that each abstracted sub-category retains the original depth and complexity of meaning alongside its generalised character. The core conceptual category of control and the internal contradictions between the '*institutional control*' and '*personal autonomy*' sub-categories are evaluated. The overall structure of the concept for this group is then summarised.

Chapter six presents the findings from the medical participants in the same way as in the preceding chapter. The core category of '*clinical success*' is described in detail along with the other sub-categories in the conceptual model, and each coded category is illustrated with references to the data. The implicit meanings contained within each category are made explicit and there is a discussion about particular elements within the narratives. The importance of clinical outcomes as a semantic container which indistinctly combines safety, quality, and the treatment of illness as part of the primary motivation of reducing patient morbidity and harm is discussed.

Chapter seven compares the findings from the two preceding chapters and discusses the main similarities and differences. Similarities that derive from the division of labour in both settings are described in terms of their unique manifestations; of perceived organisational surveillance in the aviation group, and bureaucratic interference in the medical sample. The differences in overall conceptual structures and their relationship to the motive of the participant's activities are then discussed. The overall findings are then presented and the implications of the study for existing practice and future research is set out.

Chapter 2

Safety as a model of practice

2.1 Introduction

Safety is not simply a linguistic reference to a state of being or a term for labelling the degree to which one feels protected. It is a concept, and like all concepts it is a categorisation of experiences that have been collected together and distilled into a more abstract form such that it transforms those original experiences in a way that is relevant to a collective purpose or intention. A more detailed examination of the form and structure of concepts will be explored in the next chapter. However, at this point it would be useful to prefigure this analysis by highlighting an important distinction between safety as a scientific or academic model, which is introduced into the environment to re-engineer operational practices, and safety as a concept that has been developed locally within that context as an intersubjective representation of experience. With this in mind, one of the difficulties in trying to improve patient safety through the transfer of methods developed in other settings, like aviation, is that these methods get transformed into scientific models of safety. These models are then implemented in a top down manner with very little consideration for the local conception of safety. For the most part, these scientific or academic models of safety already exist as the products of research looking into the causes of accidents within similar technological settings. This chapter will consider the features of some of these different models, along with a short review examining recent attempts at incorporating aviation style safety models into the medical setting.

2.2 The person-centred approach

According to Reason (2000), human error is generally viewed in two ways. There is the systems approach, or the person-centred approach. In a person-centred or judicial approach, the cause of an accident is attributed to the individual performing the unsafe act. Errors are implicitly seen as personal aberrations resulting from character flaws or personal weaknesses, and are usually attributed to carelessness, forgetfulness, or negligence. While sub-standard levels of performance are sought to be removed through remedial action using deterrents such as disciplinary measures, individual sanctions or the invocation of shame. There are typically organisational attempts to identify deviant individuals and hold them responsible for their errors, resulting in a blame culture. Not surprisingly, this leads to secretive and evasive behaviour involving the concealment of problems or errors when they occur (Reason, 1997). This actually makes operational processes even more unsafe because the causes of error become indistinguishable, or hidden, reducing the opportunity for any remedial action.

The person-centred approach with its consequential blame culture has traditionally been the dominant paradigm for human error in healthcare settings, and is recognized as one of the major barriers to patient safety (Department of Health, 2000b; HoC, 2009). But any attempts to change this position will inevitably require a different conception of error along with a fundamental change in beliefs. People have a natural proclivity to attribute the causes of events to human action, and to apportion blame seems an entirely natural response. For instance, psychological experiments have found that people have a general tendency to explain the actions of others in terms of their personal dispositions, and ignore any situational factors (Ross, 1977). And there is some evidence to suggest that this '*fundamental attribution error'* is more typical in individualistic cultures (Miller, 1984). Certainly the behaviour of the medical profession is more individualised than many others, both in terms of their professional autonomy, and when it comes to understanding both risk and error (McDonald, Waring and Harrison, 2005). It is a part of their culture. For example, Freidson (1970) outlined some of the traditional values of doctors as being; personal competence, rational judgement, discretionary choice, self-efficacy and autonomy. These are all tenets emphasising the individual and their competence. However, if there is a natural human tendency to attribute the causes of error to individuals, then the example of aviation shows that professionals can restructure their beliefs in order to view things from a situational perspective (CAA, 2002).

2.3 Systems based approach to safety

A systems approach to safety is very often distinguished by its central premise that humans are fallible agents. It recognises that errors are a consequence of the physical and cognitive limitations of humans, and accepts that variations in performance are inevitable (Reason, 1990, 2000). It follows from this, that safety is all about implementing systems for detecting the conditions that make errors more likely, and then implementing solutions to prevent or mitigate those errors (Helmreich, 2000).

Many of these solutions draw on human-factors, a field spanning the disciplines of psychology, engineering and ergonomics. This places its focus on human interactions, not just between people, but also between people and technology (Dekker, 2014). This focus on the human component is actually a natural progression of safety that has followed on from earlier work looking into the causes of accidents as a result of mechanical and technical failures. Once these technological issues became less salient because of advances in engineering then the focus understandably moved onto the issue of human failures. This had particular relevance in the field of aviation, where early research had revealed that errors by flight crew were a leading cause of airline accidents (Sears, 1985).

So the systems approach to safety has its origins in research looking into the aetiology of accidents in technical systems (Leveson, 2002). For instance, Heinrich's early domino model was the result of an empirical study looking into various types of industrial accidents (Heinrich, 1931). It represented an accident as a chain of linear events, and although it was fundamentally based on the person centred approach, it nevertheless advanced our understanding of safety by highligting those causes that were temporally remote from the event. This model was useful in explaining causality within tractible and loosely coupled systems but it failed to account for feedback effects in complex environments and didn't take account of social and organisational factors (Leveson, 2002; Hollnagel, 2008). However, despite these limitations this idea of sequential, linear, and temporal causation still persists in many contemporary accident models.

More recent models are better at explaining the rapidly escalating effects of failures in complex and tightly-coupled systems. Charles Perrow's '*Normal Accident Model*' is one example. This was based on his analysis of the nuclear accident at Three Mile Island, although his examination was extended to include accidents in other critical technological industries such as chemical plants and marine transport (Perrow, 1984). The findings show that many disasters occur from unexpected interactions within normal systems involving multiple components, rather than originating from a single component failure. This discovery arose from a sociological analysis, rather than the more usual engineering type of investigation that decomposes accidents into discrete parts and separate events. Instead, this was a holistic view that identified dysfunctional patterns of interaction. Similarly, Diane Vaughan's investigation into the Challenger Space shuttle disaster also used a sociological perspective, moving beyond a conventional fault finding exploration, to one that involved a reconstruction of the cultural and social norms within NASA that led the organisation into a drift towards failure (Vaughan, 1997). These sociological models are well known theoretical perspectives, but in practice when it comes to financing and implementing safety in the real-world, then the effort is usually directed at the immediate causes of accidents rather than the more temporally remote social circumstances.

Another type of systemic accident model takes an epidemiological approach to explain causality as a combination of both direct failures and environmental and situational circumstances. This includes one of the most common accident theories associated with aviation safety, which is generally known as the Swiss-cheese model (Reason, 1990 p.208). By examining the reports of several major accidents Reason noted the presence of significant yet temporally distant contributory factors that he classified as either errors or violations. These had been committed at least one or two days before the start of the actual emergency, and it was combinations of these latent errors that had created the conditions for the unsafe acts that eventually triggered those accidents (Reason, 1990 p.188). These latent errors are the design flaws in the equipment, poorly engineered processes, or bad management decisions that create traps within the operation. They often lay dormant within the system as resident pathogens for long periods of time, but they can be detected when they emerge as near misses. The aim is thus to identify these vulnerabilities in advance and provide defensive barriers in order to stop any such errors translating into accidents (Hollnagel, 1999).

A slightly different perspective on safety is concerned with high reliability organisations (HRO). These are organisations within critical industries that actively create high reliability through embedded rapid flexible adjustment to operational displacements. The organisational theorist Karl Weick outlined the following five characteristics of HRO’s, that are all aspects of behaviour within the organisation; a preoccupation with failure, reluctance to simplify interpretations, sensitivity to operations, a commitment to resilience, and deference to experience (Weick & Sutcliffe, 2007). It is a perspective that involves creating the right culture. Practically though, it is not so easy to pinpoint exactly what needs to be done in any particular organisation without a considerable targeted effort looking into the way operations actually succeed in practice rather than how they should be done in theory. Consequently it is more usual for managers to adopt a narrow and more ridged systems approach involving discrete interventions.

In summary, what delineates systems based models of safety is their much broader perspective on the causes of accidents that extends well beyond the actual event. They take into account environmental circumstances, and look to introduce system defences, and better ergonomically designed interfaces between front line operators and their equipment. There is a concern to find upstream latent errors and correct these failings. This produces a more proactive approach, which typically involves the collection of incident data as part of a search for resident pathogens within the wider organisation (Hollnagel, 2008; Reason, 2000).

2.4 Aviation perspective on human error

Safety in the airline industry is strongly influenced by the accident models developed by James Reason. But it was his theories on human error that had the most impact (Reason, 1990). This was an extension of Rasmussen's work on human performance which led to his explanation of the mechanisms and circumstantial triggers surrounding human error. It was a theory that challenged the traditional notion of pilot error and helped shift safety policy towards adopting a more situational perspective.

Rasmussen had classified human performance in terms of three types of cognitive processing; skill-based, rule-based and knowledge based (Rasmussen, 1986). Reason then demonstrated how different types of errors were related to these three types of cognitive performance (Reason, 1990). He distinguished between unintended actions such as omissions, slips or lapses, and planned actions that produced the wrong outcomes. These errors all relate to the type of cognitive processing required to perform a particular task, with each of Rasmussen's three levels of processing being associated with different categories of error. For instance behavioural slips result from certain environmental situations which can falsely trigger actions at a skill-based level of performance. These stimuli are said to initiate inappropriate motor schema triggering automatic behavioural responses (Reason, 1990). While the sorts of errors that occur during knowledge based performance are usually intended actions that are wrong because of incorrect knowledge or faulty reasoning.

This theory was responsible for highlighting the inherent fallibility of humans, and redefined human error as a consequence of failure rather than a cause. Reason argued that human operators should therefore be viewed as process vulnerabilities, and advocated that systems should be designed to mitigate their weakness (Reason, 2000). It is a perspective on error that is widely disseminated throughout aviation; with many of these ideas being directly communicated to pilots through mandatory human factors training (CAA, 2006). Factors such as situational awareness, planning and decision making, teamwork and communication, along with an appreciation of the physical effects of stress and fatigue are regularly presented in what is known as Crew Resource Management (CRM) training. The exact impact of these behavioural changes is difficult to measure since many technical solutions have also been implemented over the same period, but in terms of overall safety, it is clear that significant progress has been made over the past decades and current statistics are impressive. For example, the global accident rate in 1959 was around 50 accidents per million departures (Boeing, 2016 p.16), yet by 2015 this figured had been reduced to just 0.28 (ICAO, 2016 p.5).

2.5 Medical conceptions of error

There is a suggestion that errors might be understood differently by medical practitioners, with some literature reporting how doctors' speak of medical errors as being random, stochastic events arising from the inevitable uncertainty of medicine (Millman, 1977; Bosk, 1979; Rosenthal, 1995). Other evidence suggests that there is also a general unwillingness to look back on past medical decisions. One notable ethnographic study for example noted how doctors avoided any critical or objective examination of their own past performance (Millman, 1977). It was attributed as being a type of psychological defence, which guarded against the emotional consequences of confronting a reality that one's past actions could have harmed a patient. Along fairly similar lines, other studies have noted a reluctance to analyse the performance of colleagues (Rosenthal, 1995). For example, one of the themes surrounding professional competence within medical practice was found to be a norm of non-criticism between doctors;

> "*It is common for doctors to express a strong sense of permanent uncertainty about aspects of their clinical practice, to share a deep sense of personal vulnerability which makes it reasonable to understand and forgive colleagues who experience untoward patient outcomes*" (Rosenthal, 1995 p. 124).

These expressed standards of professional behaviour demonstrate a shared sense of personal vulnerability, which Rosenthal designated as '*necessary-fallibility*'. It reflects an awareness of a personal exposure to error, but Rosenthal found that it was bound up with medical uncertainty to such an extent that it was sometimes carried to the point of denial of mistakes (Rosenthal, 1995). But those findings were based on interviews conducted in 1993, and were presented by Rosenthal as shared perceptions. There must therefore be a degree of caution about extrapolating these findings to current practice. A great deal has changed within the NHS in the last twenty years and doctors may be more reflective nowadays. Nevertheless, more recent literature shows that when there is reflection about errors, it does create anxiety for individual doctors (Wu & Steckelberg, 2012). Indeed, there is evidence of a broad range of negative psychological effects in response to errors, such as shame, anxiety, and guilt, as well as negative social outcomes such as loss of reputation (Sirriyeh *et al.*, 2010). This affective dimension to error would support Rosenthal's suggestion that there was a level of denial through effects of personal vulnerability.

Furthermore, the medical profession has a long cultural and historical tradition, which could account for persistence in thinking about error in terms of personal responsibility. One study identified certain norms relating to error in the surgical domain (Bosk, 1979). In this study, four types of error were distinguished; technical errors, judgmental errors, normative errors and quasi-normative errors. While technical and Judgemental errors are what we would consider as errors in the traditional sense, normative and quasi-normative errors are different. They are really moral errors involving a failure to follow behavioural expectations and the code of conduct of the professional group. Bosk noticed that these moral errors were more harshly punished than the technical errors were (Bosk, 1979 p.169). He reported that medical mishaps were normalised as inevitable, although regrettable, events within the learning process. As long as the rules of professional behaviour were internalized, then those technical errors would be ignored.

Critically, there is a sense of vulnerability that is at odds with the social expectation that doctors appear as authoritative and confident by the patients. Doctors are left holding a set of actions and beliefs that disagree; a state of identity conflict that motivates them to emphasis the random or stochastic nature of error through the use of expressions such as bad luck or misfortune. It reduces cognitive dissonance (Festinger, 1957) so that the role of learned professional is balanced by conceptualising errors as random and unfortunate outcomes of the uncertainty of medicine.

2.6 Progress and engagement in patient safety

The background to this increased emphasis on patient safety and the accompanying policy changes are reviewed in this section. But it is worth noting that it was some of the documents published by the UK Department of Health that advocated using aviation safety methods in the NHS. They used aviation examples to illustrate the sorts of policy changes that ought to be implemented (Department of Health, 2000b). This led to a restructuring of the NHS in response to some of these ideas. However, achieving success in overall patient safety has been difficult to establish for various reasons. Some of these difficulties will be examined in this section (Leape and Berwick, 2005; HoC, 2009; Wachter, 2010).

2.6.1 Patient safety policy

Since the publication of the seminal Harvard Medical Practice Study in 1991 (Brennan *et al*., 1991) there has been much debate surrounding the question of medical error. This has led some experts to propose that aviation type safety methods be used in healthcare services (Leape, 1994; Gaba, 1994; Reason, 1995; Schaefer et al., 1995). For example, some authors have argued that utilising the sorts of human factors techniques that have been so successful in aviation safety would reduce the number of medical errors (Gurses, Ozok & Provonost, 2012; Waterson & Catchpole, 2016). But there has been scepticism amongst doctors as to how effective these methods could be if they were applied within the medical environment (Ricci, 2012). Indeed following the publication of the findings of the Harvard Study (Brennan *et al*., 1991) initial medical reaction to the findings was indifferent. Although doctors acknowledged the presence of medical error, the claims of serious harm to patients were dismissed as being isolated and uncommon events (Leape, 1994). However, despite this initial lack of response the momentum for improved patient safety began to increase on the back of several highly publicised media reports which brought the issue of patient harm into public consciousness (Millenson 2002; Leape 2008). Popular demand for safer healthcare lead to the publication of the influential report; '*To err is human*', by the US Institute of Medicine (IOM) (Kohn, Corrigan and Donaldson, 2000). It called for a national redesign of patient safety within healthcare by placing more emphasis on the identification of systemic faults and moving away from the blame culture towards a more open system of reporting and learning. The same concerns were expressed within the UK, beginning with general concerns about the quality and standards of healthcare, but gaining a political impetus that eventually led to a top down reorganisation of the NHS that was aimed at producing better quality and accountability (Department of Health, 1998). In 2000, a milestone report published by the Department of Health echoed the recommendations of the IOM report, and called for the introduction of a mandatory reporting system for errors and incidents (Department of Health, 2000b).

A number of key structural changes were subsequently implemented to facilitate the recommendations of the report. It included the establishment of the National Patient Safety Agency (NSPA) in 2001, a body responsible for the coordination of patient safety reporting, analysis of incident data, and dissemination of findings throughout the health service. Following this in 2004, the National Reporting and Learning service (NRLS) was set up within the structure of the NPSA to run a national voluntary reporting system and the co-ordination of incident data collection from all NHS trusts. These organisations were then subsumed under a public body called *NHS improvement,* which supports NHS trusts and foundation trusts in providing safer care, quality services, and financial stability. But during the period of those early structural re-organisations between 2001 and 2005, a number of independent safety initiatives were also implemented. These were functional changes to patient safety aimed at the clinical level. For example in 2004, *The Health Foundation,* an independent charity dedicated to improving quality in healthcare, launched its safer patient's initiative (SPI). While in 2007, the recently created *NHS institute for innovation and* *improvement* introduced their *Safer Care* programme to engage, inform, and motivate staff about patient safety, as well as improve safety related education and implement safety changes. Further strategic changes were made in 2009 when the National Quality Board was set up. This followed Lord Darzi's review of NHS care and was a means of providing a forum where key strategic bodies within the NHS could create a shared vision relating to quality and safety (DoH, 2008). Although its initial effect was fairly low key its emphasis was renewed in 2014, and a concordat outlining a shared commitment towards training and other activities aimed at embedding human factors into frontline clinical services, was affirmed by its various members (NHS England, 2014). Those initiatives were a national response to what has become a global concern with patient safety.

Other international efforts to improve patient safety have included the formation of the *World Alliance for Patient Safety* (World Health Organisation, 2004). This was set up by the World Health Organisation (WHO) to coordinate the implementation of clinical safety directives across the diversity of its various member states.

Much of public demand for patient safety was driven by a concern with medical errors following a number of high profile cases in the 1990's involving serious clinical error and professional negligence. For example, the Bristol heart scandal (Kennedy, 2001), cases of botched practice involving gynaecologists Rodney Ledward (DoH, 2000a) and Richard Neale (DoH, 2004), and the death of patients like Wayne Jowett, who died from accidental intrathecal administration of the drug vincristine (Toft, 2001). All of these cases were widely reported in the media.

More recently, the failings at the Mid Staffordshire NHS Foundation Trust gained extensive public attention. But the subsequent public inquiry and final report all helped to shift the focus away from medical error, towards clinical failings as a result of organisational issues and managerial decisions (Francis, 2013). It is a change in emphasis that draws attention to the complex relationship between quality and safety, and resonates with the research question that asks what is meant by safety.

2.6.2 Measuring progress in patient safety.

The selection of appropriate metrics is essential for tracking progress in patent safety. Without suitable measures there is no objective way of determining whether safety is improving (Berwick, 2013). But the selection of appropriate measures can be contentious since there are different types of harm to patients. For example, in the Francis report there were 29 recommendations relating to measures of performance. These included proposals for indicators that ranged from clinical outcomes, staffing levels, competence of staff, cultural health and so forth (Francis, 2013). But the problem of identifying good patient safety measures is not resolved, and one report looking into this issue has emphasised the importance of collaboration with clinicians in the relevant settings when establishing a suitable direction for safety measurement (Vincent, Burnett and Carthey, 2013).

The selection of suitable metrics depends on the chosen criteria for patient harm. There should be clarity about the sort of harm that is to be prevented by any future safety policies and safety interventions. For example, some of the milestone research studies into patient harm used measures which were quite complex, but the definitions were clearly specified. For example, the definition of harm that was used by the Harvard Medical Practice Study (Brennan *et al.*, 1991; Leape *et al.*, 1991) was; injury caused by medical treatment, which either delayed discharge, or caused a measurable disability or death. This study originated in the USA against a background of concern over increasing medical malpractice litigation where there is a strong focus on people's actions. This derives from the theory of tort law, where notions of civil wrongdoing, fault liability and negligence are important concepts for establishing whether adverse events could have been reasonably avoided. But this means that a distinction has to be made about whether decisions about the process of medical diagnosis and treatment were either appropriate or inappropriate. This requires some form of expert assessment.

In this regard, the Harvard study, and other similar research (Wilson *et al*., 1995; Vincent, Neale and Woloshynowych, 2001) used a method involving a retrospective review of medical records. It is essentially a subjective process of interpretation. The Harvard study utilised a two-stage process, with records being initially screened by nurses and medical records analysts. Then records identified as possible cases of patient harm were passed on to be independently reviewed by two physicians who graded the likely occurrence of an adverse event and the level of any consequential disability (Hiatt *et al*., 1989). It's a very time consuming process that can only be practically used for research. The resources involved during the assessment process would preclude it from being used as an ongoing measure of safety. Nevertheless, it does tell us that medical error it is a considerably nuanced phenomenon.

The problem is then that there are no patient safety indicators readily available, and to further complicate matters, because of the complexity of medicine it is often the case that medical experts will disagree on what constitutes avoidable harm. Finding suitable indicators is one of the biggest challenges in patient safety (Vincent *et al.,* 2013). This situation can be contrasted with the field of aviation, where it is much easier to unambiguously identify when something has gone wrong. Aircraft accidents are highly visible and undisputed events.

2.6.3 Patient safety indicators

The most direct indicators are measures of adverse events. This would include things such as wrong site surgery, retained surgical swabs, or medication errors. However, although this seems clear-cut, ambiguities do exist. For instance, not all medication errors turn out to be harmful to the patient (Dean *et al*., 2002). Similarly, a patient's condition can deteriorate suddenly because of underlying medical reasons that are hidden from the doctor, giving the appearance of a medically induced harm even though the correct medication or treatment protocol had been followed.

As an alternative one could use systems or process indicators that are associated with safer patient outcomes. So instead of attempting the difficult task of defining specific medical errors from amongst all the other unavoidable complications, a measure of local safety activity could be used instead (Reason, 2000). Of course, these are less direct indicators and it can never be known for sure whether the presence of these processes actually translate into fewer adverse events. It is the same for measures of safety-culture or employee attitudes about safety. These can be good indicators of staff knowledge and their motivation for safer practice, but are no substitute for outcome data (National Patient Safety Agency, 2001). There is no doubt that the most valid outcome measures are those that come from definable events (Vincent *et al*., 2008). Available measures that are often used include mortality, healthcare acquired infections, and drug errors, but beyond these traditional metrics there is a lack of reliable safety data which is said to be hindering progress (Vincent *et al*., 2008).

There has been no shortage of research activity in this area. For example, the US Agency for Healthcare Research and Quality produced nine measures of patient safety derived from routinely available administrative data (McDonald *et al*., 2001). But there is a circular dilemma over their validation. While these markers were judged to have face validity by an expert panel, it was not possible to validate them against safety outcomes because these measures were the only data available relating to safety. This problem arises because of the very small number of undisputed adverse events, and validation is made even more difficult by the diversity of clinical specialisations. However, the feasibility of utilising routine data as low cost surrogate markers of safety has shown been shown in some NHS settings to have some potential (Raleigh *et al*., 2008).

One of the main problems in evaluating the efficacy of all patient safety interventions, concerns the great difficulty in screening out confounding variables. This arises because of the complex and highly variable nature of medical treatment. (Brown *et al*., 2008). However, there is a long tradition of using mortality statistics as indicators of quality and safety (Keiding, 1985), the most common measure being the hospital standardized mortality ratio (HSMR). This metric compares the number of expected deaths in a particular hospital with the actual number of reported deaths, adjusted to account for various demographic and other risk factors. They are frequently used by healthcare intelligence organizations like Dr. Foster, as well as the Care Quality Commission (CQC), to try and identify problem hospitals. But, despite the widespread use of these measures their reliability has been questioned (Manktelow, Evans & Draper, 2014; HoC 2009a).

2.6.4 Patient Safety Interventions

It is easier to measure and control patient safety interventions when they are more narrowly defined and specifically targeted. But reducing complexity by carefully isolating variables in a scientific manner is not usually possible in clinical practice (Brown *et al*., 2008). Nevertheless, some successful safety interventions have been reported (Provonost *et al*., 2006). For example, one notable intervention to reduce catheter-related bloodstream infections achieved large and sustained reductions in infection rates by implementing a simple checklist procedure supported by education and equipment reorganisation (Provonost *et al*., 2006). While an evidenced based practice intervention carried out in a several children's hospitals demonstrated a significant reduction in adverse drug events (Sharek *et al*., 2008). Another study published in the New England Journal of Medicine found that limiting the work hours of post-graduate doctors by removing extended shifts of greater than 24 hours substantially reduced the amount of serious errors being made (Landrigan *et al*., 2004). Effective improvements have also been documented in cardiology (Williams *et al*., 2005), in surgery (Weiser *et al*., 2010), and in the field of obstetrics and gynaecology (Pettker *et al*., 2009). It is notable that each of these successes involved specifically targeted and locally implemented interventions that had been carefully planned, rather than general changes instigated widely across the organisation.

More general improvements in patient safety outcomes are less apparent. The definitive question about whether there has been overall progress as a result of the combined efforts of local, regional and national initiatives in patient safety has not been fully answered. For example, one study that sought to establish the overall effectiveness of a wide range of patient safety interventions reviewed a retrospective sample of admissions from ten hospitals in North Carolina over a period of six years (Landrigan *et al*., 2010). They noted that patient safety activity in this US state was high, yet the study failed to find any significant changes in the overall rate of harm to patients.

Similar disappointing outcomes were found in two studies set up to evaluate outcomes from a large scale UK programme; the safer patient's initiative (SPI). This involved 43 interventions carried out over two-phases (Benning *et al*., 2011). Despite a significant financial investment in the programme the results failed to detect any notable effect on patient safety compared to controls, although there was some credible evidence that general quality of care had improved in both SPI hospitals and controls over the 18 month period of the study. These results show that general progress beyond small scale, specific interventions is meagre and illustrates the concerns of some patient safety experts who question whether any real progress has been made (Leape and Berwick, 2005; Wachter, 2010).

In 2008 a UK parliamentary select committee on health began an inquiry into the effectiveness of patient safety policy and its progress in reducing harm to patients within the NHS. The report concluded that there were *"sufficient deficiencies in current policy",* and noted "*that for all the policy innovations of the past decade, there has been insufficient progress in making services safer"* (House of Commons, 2009, p.3). Resolving the problems of patient safety had been the focus of much attention but the inquiry found that there was often a failure within many hospitals to adopt known patient safety solutions, and that even those cases where changes were initiated they were frequently viewed by clinicians as diktats handed down from on high. It was concluded that part of the problem was down to the difficulty in engaging clinicians who were too often unconvinced about the effectiveness of the proposed changes.

2.6.5 Professional engagement in patient safety

This apparent widespread lack of progress, and the issue of poor clinician engagement, has been a topic of some debate. One paper identified a need for the various adaptive aspects of change to be introduced into safety improvement programmes (Provonost, Berenholtz and Morlock, 2011). These various cultural, emotional, social, and political factors are necessary to combat the resistance of clinicians, who are often sceptical of top down changes, particularly if the supporting evidence is perceived as weak or invalid (Auerbach, Landefeld and Shojania, 2007). It is a typical reaction by doctors that has been observed in a number of ethnographic research studies reporting poor compliance with patient safety protocols. For example, a review of four studies in this area found that professional rule-breaking and protocol deviations are fairly common, and are usually justified strategically by doctors using claims of clinical freedom and discretionary judgement in order to get things done under poor organisational conditions (Dixon-Woods, 2010). These non-conformities were occasionally deliberate acts of professional resistance, but more usually, they were a consequence of the inconsistencies and complexities of frontline hospital services. Clinical uncertainties, inadequate resources, and changing priorities often created interruptions and distractions that were all too often tolerated by doctors, who had learnt to repair problems and retrieve the situation.

Furthermore, local political issues were also evident. Some of these were found to relate to professional boundaries and the hierarchical structures within medical profession. For example, problems of undefined authority and dissolved responsibility among senior doctors were said to sometimes invoke instances of non-conformity. The author also questioned whether some of the doctors' claims of specialist knowledge and immunity from standardised practice were really political acts contrived to protect their professional autonomy from management intrusion (Dixon-Woods, 2010). In this regard, there is some historical and cultural background surrounding the reluctance of medical professionals to participate fully in centrally driven safety initiatives (Neale *et al.*, 2007). They argued that strong political power and the financial independence of doctors, along with the longstanding traditions of autonomy and the craft model of medical training are inhibiting progress.

This conclusion was in agreement with another group (Amelberti *et al.*, 2005) who argued that professional values of autonomy, discretionary freedom, and the craftsman mindset are factors in the creation of barriers to patient safety. They observed that the historical traditions of medicine are robustly defended by doctors. Since most patient safety initiatives involve changes that conflict with professional customs it was reasoned that they are bound to have limited success.

Patient safety falls within the broader activity of care quality, and so any research examining poor levels of professional engagement in quality improvement generally, will also offer an insight into why clinical engagement in patient safety is lacking. One comprehensive literature review that fits this bill found that disagreement and social conflict between the professional sub-divisions played an important role in deterring doctors from becoming involved in quality interventions (Davies, Powell and Rushmer, 2007). In this review eighty-six empirical studies were assessed, with several common points emerging from this work. In particular, there existed a general scepticism among doctors that these quality initiatives would have either very little effect, or that they might even have a detrimental effect on both patient care and clinical practice.

The reasons for this lack of optimism included poor agreement between stakeholders concerning the definitions and aims of the programme. In addition, the separation of each professional sub-group, each with their own distinct hierarchies and networks and characterised by poor communication between them, created diffuse and divergent views about how quality should be defined (Firth-Cozens, 2001). These disagreements were often seen to hamper the implementation of changes at a local level, but other social divisions were also implicated. In particular, there were persistent tensions between doctors and managers regarding clinical interventions. Whilst doctors hold the view that clinical quality is an integral function of their profession, managers believe that clearly defined standards and marked accountability require systems of control that are to be implemented as part of their managerial remit.

Other researchers have also shown how different beliefs about clinical work exist between different professional groups. Whereas clinicians hold individualist conceptions about clinical work, managers hold more systemised conceptions of healthcare (Degeling *et al.*, 2003). These differences are linked to professional identity and form the basis of many tensions surrounding healthcare reform. It seems that any management lead quality changes or patient safety initiatives that intrude on professional roles are instinctively resisted.

But divisions between managers and professionals are not unique to healthcare. They also exist in in aviation. These tensions are usually based on issues of mistrust concerning what is perceived to be excessive interference in operational activities. In the case of aviation though, pilots are robust defenders of existing safety systems, which they often see as being under threat by managers overly concerned with commercial performance (Bennett, 2006). Therefore, pilots align themselves with existing safety regulation, not least because of genuine concerns about the personal risk associated with flying. So the differing levels of engagement between pilots and doctors, with what are introduced as safety systems, must relate to what is considered as appropriate safety systems for the setting. But whether there are enough similarities between the domains of aviation and healthcare to justify the suitability of aviation safety methods as a solution to patient safety remains unclear. In spite of this, there have been many calls for healthcare to adopt an approach to safety comparable to aviation. In this regard, some papers have sought to highlight certain similarities between the two activities.

2.7 Comparisons between aviation and healthcare safety

Most papers referring to safety in aviation and healthcare are theoretical comparisons (Kapur *et al.*, 2015), editorial discussions (Ricci, 2012, Rutherford, 2003; Wilf-Miron *et al.*, 2003), or commentaries (Karl, 2009; Toff, 2010; Ornato and Peberdy, 2014), that either propose or question the transfer of aviation safety methods into healthcare. In many cases the different levels of safety performance are contrasted (Leape, 1994; Stahel, 2008). Any analysis is usually concentrated on functional processes, often with an emphasis on selected compatibilities between these two professional activities, while the many contextual differences are often glossed over.

Links between aviation and medical safety started to develop following the publication of a number of papers in the 1980's and 1990's that began to look at medical errors and equipment failures in the medical field, particularly within the speciality of anaesthetics (Cooper, Newbower and Kitz, 1984; Gaba 1989). The reasons for the causes of these errors were discussed, with technical models of safety sometimes used as a framework for the analysis. For example Perrow's accident model was used to explain anaesthetic mishaps as products of a tightly-coupled and interactively complex activity (Gaba, Maxwell and DeAnda, 1987). This located the operating theatre within a technical realm and set up the conditions for comparing safety methods with other technical industries such as aviation (Vincent *et al*., 1991). Some papers began to talk about medical error in terms of the cognitive factors involved. For instance, Leape (1994) examined the general principles of safety operating in aviation and compared these to healthcare, arguing that the aviation model would improve patient safety.

Most of the literature comparing these two industries concerns human factors. For example, James Reason argued that his theory on human error, and his model of accident aetiology, should be applied to medical tasks within the operating theatre (Reason, 1995; Reason, 2000). The current differences between the two domains were highlighted and the opportunity for learning was emphasised. Some research compared attitudes towards error, stress and teamwork between these two sets of professionals and identified some differences, which suggested a potential for change (Sexton, Thomas and Helmreich, 2000). This had followed some earlier proposals that aviation teamwork principles be implemented in anaesthetic practice (Schaefer, Helmreich and Scheidegger, *1995)*.

But, while these methods are identified as being relevant, there is also scepticism as to whether safety could actually be improved using these methods without significant tailoring (Reader and Cuthbertson, 2011). The evidence of their effect on safety is difficult to establish and there are signs of reluctance by medical staff to engage with these aviation style methods. For example, one study which introduced training in the use of aviation team-working skills reported some resistance from medical staff, and while team-working abilities were assessed to have improved following the intervention, the actual effect on safety was undetermined (McCulloch *et al.,* 2008).

In other literature, cultural similarities between the aviation and medical professions was sketched out, with the complexity in both these roles and their use of technology and team-working described as common factors within these two professions (Helmreich and Merritt, 2001). Some of their shared negative attributes were also outlined, including failures by the members of both groups to recognise their own vulnerabilities to the effects of stress and fatigue. However, the quantitative survey methodology used by the authors in their research measured pre-selected categories. This effectively screened out the social nuances and mediating factors that would give the deeper insight that is necessary when examining the effects of culture on safety.

Other comparative research has also used a survey method for measuring differences in safety climate between healthcare respondents and naval aviators (Gaba, 2003). In this study problematic responses were observed in the healthcare sample, but once again, a further qualitative inquiry would be necessary if the full cultural complexity behind these results is to be understood in depth. Nevertheless, the findings were attributed to organisational factors, supporting arguments put forward by the same author in an earlier paper comparing healthcare with other hazardous industries including aviation (Gaba, 2000).

Most of these comparative papers examine safety as a process activity, with outcomes described in relation to system inputs. This sometimes includes things like culture and learning, but in the majority of cases professional similarities are emphasised. Even in those cases where the differences are highlighted, the depth of analysis fails to capture the real meaning that underpins those dissimilarities.

In a more recent review comparing aviation and healthcare and its implications for patient safety, the researchers identified some areas between the two professional activities that could be transferred from aviation into healthcare. These involved CRM training, incident reporting, checklists, and organisational culture (Kapur *et al*., 2015).

But, while it was recognised that healthcare had much to learn from aviation, it was stressed that the transfer of those safety principles must be nuanced if they are to be successfully implemented.

Some authors have argued that many of the comparisons that have been drawn between aviation and healthcare safety often go too far (Rogers, 2011). In one editorial review it was argued that the context specific differences between these two areas must be understood if patient safety is to be improved through the implementation of safety techniques used in aviation (Ricci *et al.*, 2012). This thesis aims to fill this gap by answering some of these questions through an examination of each group's conceptions and representations of safety.

2.8 Summary of the key issues and criteria for the current study

The main points described in this chapter will be summarised below, since these top-down representations will have a significant influence on the way conceptual understanding about safety is formulated by the professionals in these two groups. The scientific models and key policy issues just outlined will operate on, and combine with, embedded local and tacit knowledge to produce the overall concept (Vygotsky, 1986).

- At an institutional level, safety is considered to be vitally important for both of these professional activities. Its level of importance that derives from public demand. In the case of aviation this is self-evident because of the highly visible consequences of an accident, while in healthcare main-steam media reports of medical errors and cases of negligence have brought this into public consciousness. This has driven experts and policymakers into recommending proposals for improvements to patient safety. These recommendations include the use of safety methods taken from industries like aviation.

- Aviation has a cultural and historical legacy of technical progress and the development of safety through the involvement of engineers and academics. This has been interwoven with the development of scientific models of safety, including the current systems approach. It involves learning about multiple sources of causality, situational factors surrounding human error, and wider organisational failures.

- The medical field has a much longer history of evolution based on the doctors' prolonged medical training, and the relationship between doctor and patient. Medical practice involves greater levels of uncertainty, leading medical errors to be generally characterised as chance events or complications.

- There have been recent attempts at transferring principles of aviation safety into healthcare, but the results have been disappointing. The literature suggests that clinicians have failed to fully engage with some of these methods.

- Most of the literature comparing aviation and healthcare safety are mainly theoretical comparisons relating to selected processes and functional characteristics of safety in each of the two domains.

The traditional approach has been to compare scientific or functional models in these two areas, with attention being focussed on implementation as a top-down process. However, safety is not just an academic concept it is also a local concept that forms a category of knowledge for those individuals embedded within these distinct social settings. It therefore makes sense to examine safety from the other direction. This thesis will examine the concept of safety from the bottom-up, to investigate how safety is actually understood and communicated by the professionals working in these two settings.

There are no strict criteria for the comparison in this study. Ultimately, the research is open to whatever the professionals in these two groups consider to be meaningful in their descriptions of safety. However, the central issues described within the literature will inform the interpretive processes, and will help in the developing act of delineating the interviews so that they remain within the semantic domain of safety and don't deviate too far from the conceptual boundaries.

Chapter 3

What is a concept?

3.1 Introduction

A concept is generally understood to be an abstract thought or idea. It is something that holds together sets of similar experiences by combining them into a form of symbolic representation. They are the essence of human activity and are involved in a diversity of cognitive processes such as categorisation, memory, perception, reasoning, and language. Concepts are the very basis of all theories of mind, but there is a great deal of debate about both the form and structure of concepts, much of which is founded on philosophical questions concerning the nature of consciousness and its relationship to external reality. Although it is beyond the scope of this chapter to explore such intractable questions, it will nevertheless be helpful to consider some of the assumptions underpinning research in this area. But before setting out the main epistemological positions it is worth surveying the range of different research perspectives that mark out the field of study into concepts.

3.2 The breadth of research in this area

Much of this work has examined the process of categorisation, with early cognitive researchers using experimental methods to investigate semantic structures within memory (Collins & Quillian, 1969; Collins and Loftus, 1975). Some studies have explored the semantic boundaries or features that delineate particular categories (Rosch & Mervis, 1975; Murphy and Wright, 1984; Armstrong *et al.*, 1983), while linguists have examined how concepts operate as systems of propositional rules (Margolis & Laurence 2007; Peacocke, 1992; Zalta, 2001). Other theorists have looked at the organisation of concepts as idealized cognitive models using language mechanisms such as metaphors, metonyms and other linguistic sets (Lakoff, 1990), and anthropologists have also contributed to the debate about conceptual structure by examining links between culture and the implicit rules underpinning social or familial concepts (Lounsbury, 1964). Other areas of inquiry include studies into artificial intelligence and the application of computational approaches to cognition (Anderson 1990). Furthermore, connectionist networks have also been used as a framework for demonstrating the representation of conceptual knowledge in terms of dynamic probabilistic patterns (Rumelhart, Hinton, and Williams, 1986). But of most interest to this thesis is research examining the social and dynamic aspects of memory, where knowledge is organised as culturally significant patterns of experience known as schemas (Bartlett, 1932; Wagoner, 2013).

It is clear then, that in order to understand how the concept of safety differs with social context it is first necessary to be absolutely clear what the term 'concept' actually means. The following sections will consider this question, but I shall begin by examining some of the assumptions that underpin much of the published research in this area.

3.3 Philosophical assumptions

The elusive nature of conceptual thought has been a topic of philosophical debate for centuries. But in more recent times it has been of interest to psychologists, particularly those researchers working on the theory of mind. It is essentially a subject concerned with the nature of external reality and its relation to conscious experience. Most cognitive approaches assume a Cartesian duality, separating the consciousness of one's own thoughts from external reality. According to Descartes, since physical objects can be known only through the contents of conscious experience, then ones knowledge about reality is simply a product of intuition; either through the immediate apprehension of sensory information, or indirectly through a deductive process involving logical steps (Marková, 1982 pp. 17-23). The division between consciousness and reality is what Kant distinguished as the realms of *phenomena* and *noumena*; the world as it appears, and the world as it really is. External reality, according to Kant, is beyond experience and thus unknowable. Knowledge is therefore apprehended only indirectly; either through the senses, or *a priori*, through reasoning (Kant, 2009 p. 45). He argued that concepts are derived empirically, but it is through reason that the mind reveals the nature of those concepts. Kant introduced the notion of *transcendental schema* to explain the organising principle that mediates between our sense impressions and the formation of categories. These procedural rules thus associate pure sensible concepts with sense impressions to give them both sense and significance:

> *"In truth, it is not images of objects, but schemata, which lie at the foundation of our pure sensuous conceptions…the conception always relates immediately to the schema of the imagination, as a rule for the determination of our intuition, in conformity with a certain general conception. The conception of dog indicates a rule, according to which my imagination can delineate the figure of a four-footed animal in general, without being limited to any particular individual form which experience presents to me, or indeed to any possible image that I can represent to myself in concreto"* (Kant, 2009 p. 217)

Something becomes a meaningful concept when sense impressions are apprehended through the mediation of transcendental schema. That is to say the phenomenal appearances of objects are linked to pure *concepts of the understanding* through these schemas. Of course, Kant had a great deal more to say about these internal representations and the types of propositions that determine thought. But the key point is that there is an assumed separation between the world-in-itself and our internal experience of the world. Our sensory impressions are mediated through a process of interpretation to produce knowledge.

This assumption underlies many theories about the nature and structure of concepts, particularly those theories developed within the field of cognitive experimental psychology. But we must not be mistaken in thinking that concepts are simply representations of something existing within the real world. Many concepts do not have any real-world counterparts, and they frequently involve several abstractions. For example, unicorns are meaningful objects that don't actually exist in any physical sense. A concept is thus a mental state, and it doesn't matter whether that mental state relates to something that is true or false, only that it is about *something*. It is a unique property of the mind that the philosopher Franz Brentano identified as *intentionality,* and it is this feature that, according to Brentano, distinguishes mental states from all other objects. He illustrated this by referring to the capacity of the mind to create *intentional inexistence*, which defines the ontological status of mental phenomena as objects-in-themselves (Churchland and Churchland, 2013 pp. 1-18). Of course, intentionality is what we would now label as a concept. But the notion of inexistence is appropriate to the concept of safety. This is also an intangible phenomenon; defined in terms of the absence of something. Safety is effectively the absence of unspecified harmful or threatening conditions. It is an object of the mind, but there are still questions about the way concepts are formed?

3.4 The structure of concepts

The form and structure of concepts is difficult to establish. Past research has looked at this issue from different perspectives and there are diverse theories concerning the nature of these phenomena. These have variously suggested that concepts are; representational maps, linguistic structures, theoretical terms, or goal directed abilities. One common approach is to investigate the properties of particular concepts and establish the relationships between those properties. For instance, the classical approach emphasises the nature of categorisation of phenomena into groups by examining their membership criteria. In this view, concepts are seen as abstract containers for combining objects on the basis of similarity (Medin and Smith, 1984). It assumes that certain defining features are necessary in order for things to be categorised together, and research looking into the way that people classify categories based on their properties has suggested that we typically organise things into taxonomic structures. For instance, when people were asked to report sets of features for various concepts, it was found that those reported features seemed to be organised into a hierarchical structure based on familiarity. This centred on a basic level category containing the greatest number of agreed features, with clusters of other features branching off into superordinate and subordinate categories. The further away from the basic category, the fewer the number of agreed features (Rosch *et al.*, 1976). On the face of it, it seems reasonable that an abstract concept like safety could also be organised hierarchically in this way. One could imagine some agreement over the familiar attributes of the subordinate categories linked to safety. Such sub-categories could include things like accident, or threat, hazard, harm, or risk. However, one of the problems with this model of conceptual structure is that a precise definition for any particular concept is always difficult to pin down. The specification of attributes, even for concrete concepts, can be hard to define once it is subjected to detailed specification (Armstrong *et al*., 1983). For instance, not all birds can fly. If concepts were based on categories with necessary and sufficient features, then all instances of a particular category would be equally recognised, and this is not the case. Some examples are usually judged to be more typical than others (Rosch and Mervis, 1975).

In his earlier consideration of linguistic categories, Wittgenstein (1953) had contemplated how the meanings of words might be defined. He came up with the notion of '*family resemblance'* to explain how word categories contain members whose similarity depends on their collective features rather than the presence of specific traits. It is a principle that resonates with the prototype theory of concepts. This theory suggests that concepts are a form of prototype model based on abstracted attributes that centre on the most commonly experienced features (Rosch and Mervis, 1975). It is able to explain observed asymmetries in different category members, and provides a logical explanation for the typicality effects and fuzzy boundaries that have been observed in studies looking at category membership criteria. One of the interesting things about this theory is that it also fits in with behaviourist notions of environmental adaption and nicely reflects the view that categorisation is a means for producing probabilistic estimates for partially recognised objects. Along these lines the accuracy of predictions would be proportional to the degree of similarity with the conceptual prototype. However, there are problems with judging things based solely on similarity, which we shall turn to in a moment. But first there is the issue of context.

One of the problems with the prototype theory has to do with the variations that exist when people are asked to identify or define concepts in a range of different situations. The most salient features of concepts appear to change depending on their setting

(Barsalou, 1983; Lakoff, 1990). One suggestion is that concepts consist of multiple individual representations of previously encountered exemplars rather than a single abstracted composite (Smith and Medin, 1981; Hintzman, 1986). Although this theory allows concepts to retain sufficient details across different settings, it does seem to violate the principle of cognitive economy, since the many different instances of each concept likely to be encountered in a person's lifetime would be unfeasibly large. One adjustment to this theory that takes into account the limited capacity of memory, is the proposal that categorisation could instead be based on a typical subset of stored examples rather than every instance (Smith and Medin, 1981). In terms of safety, it does seem intuitively plausible that this concept could function by using previously experienced examples tied to its contextual use as a means of making sense of and anticipating future events. But the attributes could be quite different in each case.

So it seems that the exemplar model focusses too much on the surface attributes of conceptual categories and fails to explain the deeper structure. For example, Medin (1989) illustrates one problem of using similarity to define category membership by referring to the work of Tversky (1977). He showed how judgements of similarity between two instances of a concept can vary depending on the level of importance placed on each attribute. This is nicely illustrated by considering that there are circumstances when a zebra and a barber pole can be classified as more similar than a zebra and a horse if the property '*striped'* is assigned sufficient weighting. The salience of particular properties, and their relationships, is therefore important. But this can depend on context, and so the inferential process of classifying something as a particular concept must depend on other existing knowledge about these relationships and the way they relate to the environment. In other words it suggests that there is some underlying principle or theory that binds these attributes together so that they can be recognised as belonging to a particular category.

The *theory-based* framework goes some way towards explaining why things are organised into the concepts and categories that we have by suggesting that they have an inferential utility (Markman and Ross, 2003). So rather than grouping phenomena into categories simply because they are similar, it is the usefulness of the conceptual structure in producing an explanatory relationship that is significant (Carey, 2009; Lakoff, 1987). If we consider a complex concept like safety, then the only way that different attributes can combine to produce a sensible model is with an internal structure that relates things like hazards to outcome objectives, or spatial-temporal relations to cause and effect. So, individuals and groups will have particular goals in mind which will form part of the concept, and this in turn will define the boundaries for the internal properties of that concept. Some of the strong supporting evidence for this *theory-theory of concepts* comes from studies looking at conceptual development in children (Carey, 2009). Exactly how these conceptual representations are acquired is a matter for debate, but Carey for example argues that they are produced through inferences derived from sensory and perceptual evidence, and that these in turn are used to build further networks of more complex concepts using higher order inferences. At the base of this sophisticated structure are said to be innate representational primitives derived from systems of core cognition. These primitives translate perceptual features into fundamental concepts, which might involve things like causality, object-agent relations, and paths of motion, or shapes, colours and so forth. The evidence for these sorts of modules derives from empirical studies including the mapping of conceptual changes that occur during childhood (Carey, 2009).

In any case the notion that concepts are structured through their relationship to other concepts on the basis of a particular theory is quite compelling. In much the same way, Lakoff (1990) had earlier argued that people organise knowledge using idealised cognitive models, which they impose on the world around them. He noted similarities between cognitive categories and linguistic categories and argued that the observed prototype effects, and basic level properties, are actually superficial phenomena resulting from the core cognitive models used to structure categories. The types of models that he suggested included propositional models, image-schematic models, along with metaphoric and metonymic models used to denote meaning.

3.5 The role of language in concepts

The semantic structure of language and the structure of concepts have a great deal in common. So much so, that some philosophers have argued that language is the symbolic mechanism which determines conceptual thought. At the extreme end of this argument is the linguistic determinism of Whorf (1956), whose basic argument was that the partitioning of experience occurs differently with different language speakers. By drawing on the Native American Hopi's use of language, he suggested that their different linguistic references to time represented a different conceptual structure for time. But the circular reasoning to his argument was soon picked up on his claims have been rightly criticised. The assertion that thoughts are different because talk is different does not in any way clarify the relationship between thought and language, and his method of using translations back into English also raises problems about the inferences he made, and subsequent evidence concerning their use of cultural artefacts has now largely discredited many of his claims. Nevertheless, the degree of influence that language has on conceptual thought is still debated in weaker versions of this hypothesis.

From a more social perspective, language and the meaning of words are important because concepts are used for communicating. It therefore makes sense to consider these phenomena as external entities rather than internal representations. Much of the cognitive psychology reviewed in this chapter assumes the latter position. But there is a strong argument to suggest a different ontology. This is the notion that concepts exist as abstract entities outside of the mind.

The philosopher Gottlob Frege was very influential in putting this case through a careful logical analysis of how semantics are derived (Frege, 1948). He took the view that concepts are basic elements of meaning involving propositional attitudes and their structured relations, and a central idea in his treatment of this problem was the distinction between the sense of a word and its reference. This, he argued was the critical factor in determining the meaning of the word. Margolis and Laurence (2007) illustrate this by comparing the expression "*George Orwell is Eric Blair*" with "*George*

Orwell is George Orwell". The former expression is a significant statement because it reveals that the author's real name is Eric Blair, while the latter statement is trivial because it has a different sense, even though the name denotes the same reference (Margolis and Laurence, 2007). So, although the truth value of a statement can remain the same, the sense can alter the meaning. The same applies for the two statements; "the morning star is bright" and "the evening star is bright". Both statements refer to the plant Venus, but they convey different information because of the mode of presentation (Laurence and Margolis, 1999). This relates to the paragraph about Brentano's *intentionality,* where there can be meaning without the actual existence of a referent. So the name '*Pegasus'* conveys meaning without referring to any physical entity. It is the *sense* that provides the meaning. Now there are arguments about how we define whether something exists as a referent or not, but the notion of sense in terms of the structuring of propositional attitudes within a phrase broadens the definition of a concept to include its context.

So if concepts are like Fregean senses then this implies something about their ontological status. Unlike mental representations, which are unique subjective phenomena existing as internal mental states, senses are shared between people and must therefore exist externally as abstract objects. This subjective-objective distinction is subtle, but it could be thought of in the following way; the mental representation shared by two or more people includes their subjective representations, which could be thought of as being personal tokens of the same shared type, with the type being the external abstract concept (Margolis and Laurence, 2007). This makes sense because successful communication doesn't require that people have the same mental images rather that they are able to talk about the same thing without misunderstanding. This resonates with Wittgenstein's (1953) arguments about the inter-subjectivity of concepts, where meaning is formed as part of specific '*language games'* operating within much broader '*forms of life'* (Toulmin, 1999 p. 59). It is a position which asserts that it is the social context that provides the practical backdrop through which language is understood.

For the purpose of this present thesis, this shared quality of the concept is of most interest since we are looking at whether differences in group conceptions of safety might explain why the transfer of the aviation safety model into healthcare settings has not been successfully achieved. However, the existence of concepts as abstract entities raises the question once more about the nature of knowledge and its relationship to reality.

3.6 Social foundations of concepts

While Descartes separated the world of consciousness from the world-in-itself, Hegel questioned the clarity of this distinction. Since consciousness is the only directly available material, then what is known about reality is only the world-as it appears. There is no external standard with which knowledge can be compared since consciousness only has its own internal reference. The only distinction that can be made is between consciousness of the object, and consciousness of one's knowledge about the object. The process of knowing can therefore only come about through the comparison of knowledge and experience (Heidegger and Hegel, 1970). If there is disagreement between these two aspects of consciousness, then knowledge must be altered to conform to experience. But this reconciliation necessarily involves both aspects of consciousness, because if knowledge is altered, then so too is the reference against which new experience is measured. Hegel referred to this change as a negation of existing states of consciousness; resulting in a complete transformation, and creating a new unity of both knowledge and perceived reality. For Hegel, consciousness is an endless dialectic process of development towards truth which starts from a position of sense-certainty. Initially, objects of reality are apprehended directly through the senses without the mediation of conceptual knowledge so that only their existence is experienced. There is then an ongoing journey of discovery, which begins with this sensory awareness, proceeding towards higher forms of perception and self-awareness. While Cartesian consciousness was all about reason and thought Hegel was concerned more with self-awareness and expression, and the transformation of the mind from potentiality to actuality (Marková, 1982 pp.103-183).

But to know ones apperceptions depends on the level of experience of ones consciousness in relation to the entity being apprehended. This requires self-consciousness, and yet the primary attainment of such self-consciousness can only be achieved through identification with another self-conscious entity. Therefore, for any kind of knowledge to be possible, it must be communicated and shared with another conscious entity (Marková, 1982). It is this expression of knowledge, through social action, including language, which produces consciousness beyond the immediate apprehension of sense data, as the mind reflects on and compares information to produce categories in the journey towards truth. This epistemology is important, for it is the foundation for a number of theories which assume that knowledge of concepts is situated in social interaction.

3.7 American Pragmatism

This movement emphases creative agency as the process through which people give meaning to their experiences in order to adapt to their social circumstances. So Pragmatists, like Peirce, James, and Dewey offer an alternative, less idealistic philosophy about the nature of knowledge that is based on external action rather than mental processes. For them, conceptual categories are formed out of experience as a function of practical outcomes. This point is encapsulated in the well-known pragmatist maxim;

> *"Consider what effects, which might conceivably have practical bearings, we conceive the object of our conception to have. Then, our conception of these effects is the whole of our conception of the object"* (Peirce 1878 p293)

The statement asserts that the meaning given to a concept is derived through its practical application and its consequential effects. The subtle behaviourist influence of the time is evident since the focus is placed firmly on external action and its outcome rather than mental states. Dewey for example, rejects the notion that knowledge is an internal representation of an external truth that is out there waiting to be passively perceived. Instead, he argues that it is the product of an adaptive process of active inquiry. This is an epistemic standpoint which affirms that knowledge is a temporary yet developing state of understanding about the world involving human responses enacted in the pursuit of specific needs and objectives. For Dewey, all knowledge, and therefore conceptual knowledge, is the result of human activity within the environment;

> *"The object of knowledge is not something with which thinking sets out; but something with which it ends: something which the processes of inquiry and testing, that constitute thinking, themselves produce. Thus the object of knowledge is practical in the sense that it depends upon a specific kind of practice for its existence"* (Dewey 1916 p.334).

In order to elucidate the process through which knowledge specifically connects with human activity Mead proposed that individuals form meanings about objects within the world through a process of symbolic, interactive communication (Mead, 1934).The meanings attached to these objects are therefore intersubjective. This includes social objects, and Mead argued that this process extends to the individuals own self-identity, as people come to view themselves as objects. A great deal has been written about Mead's work on symbolic interactionism and the development of self-identity (Blumer, 1969; Powell, 2013), but it is how this general perspective might be applied to the production and reproduction of conceptual knowledge that is of specific interest. According to this position, humans actively give meaning to the actions of others, and then fashion their own behaviour based on this interpretation, in a process that Blumer (1969 p.17) called *'joint action'.* Because objects are given meaning through this contingent action, the definition for that object is thus attached to human objectives within particular situations. So meaning is not inherent within the object itself, but depends instead on the way the object is defined through human interaction (Blumer, 1969). While this focuses attention on human interaction and the motivation that lies behind those actions, it fails to properly account for the significance of language and the symbolic nature of communication. The concept of safety no doubt has practical origins, but as an abstract concept it is used to order experiences so that they are transformed into a higher order category of knowledge to facilitate communication and comment. Through this and other social activities, the concept will be reproduced and also subject to development and change. But the pragmatic framework seems to overlook the way that human actions and conceptual knowledge are mediated through social artefacts. In this regard, the work of the Soviet psychologist Lev Vygotsky provides a more persuasive explanation of how conceptual knowledge is derived from socially mediated interaction (Vygotsky, 1978).

3.8 Vygotsky and mediated thought

Vygotsky's idea that artefacts, including tools and signs, function as a second order stimulus between the individual and their objective, offers a compelling account of the way knowledge is both culturally and historically derived, and yet also open to developmental change. Vygotsky described these artefacts as an auxiliary stimulus, which mediates between the subject and the object, introducing new forms of behaviour;

> *"Because this auxiliary stimulus possesses the specific function of reverse action, it transforms the psychological operation to higher and qualitatively new forms, and permits humans, by the aid of external stimuli, to control their behaviour from the outside"* (Vygotsky, 1978 p. 40).

Human artefacts therefore rebound back and forth between inner and worlds in an ongoing dialectic process in which conceptual knowledge develops. This involves both material and psychological artefacts, with speech and language critical in this process of mediation. Vygotsky emphasised the importance of word meaning in the development of consciousness, tracing the pathway of external speech inwards, towards inner speech and verbal thought; where meaning comes to mediate thinking. It was this dialectic between thought and word that was important to Vygotsky as a window into consciousness, where he contended that "*consciousness is reflected in a word as the sun in a drop of water*" (Vygotsky, 1986 p.256). But he also recognised that behind this process is a source of motivation which ultimately drives both thoughts and actions;

> *"Thought is not begotten by thought; it is engendered by motivation, i.e. by our desires and needs, our interests and emotions. Behind every thought there is an affective-volitional tendency, which holds the answer to the last "why" in the analysis of thinking. A true and full understanding of another's thought is possible only when we understand its affective-volitional basis…to understand another's speech, it is not sufficient to understand his words-we must understand his thought. But even that is not enough- we must also know its motivation"* (Vygotsky 1986 p.252).

This motivational source was never fully developed by Vygotsky, but he did have much to say about the actual process of concept formation. In his work on the development of concepts in children, he described how cultural patterns presented through social communication operate to reform knowledge that has been spontaneously acquired (Vygotsky 1986). He distinguished between scientific and spontaneous concepts, which both operate in a dialectical manner, moving in opposite paths with each of them re-organising under the influence of the other. Spontaneous concepts are induced intuitively from concrete situations. They develop upwards, becoming transformed when coming into contact with scientific concepts that in turn are operating downwards. These scientific concepts are generalised models that are mediated culturally through signs, cultural artefacts, and social interaction. Like the hermeneutic circle of understanding returning to itself in Hegelian epistemology, the whole provides a reference for the individual parts, which is itself altered through the recognition of those parts. In this way, the process of conceptual understanding emerges through social interaction (Vygotsky 1986).

Vygotsky offers a convincing social explanation for the development of concepts in individuals. But if we are to address the question of conceptual understanding in professionals operating in different industries then a much broader, more collective framework is needed. Activity Theory provides such a framework. It builds on Vygotsky's ideas by including the broader aspects of collective activity but uses the same cultural and historical outlook.

3.9 Activity Theory

Vygotsky's notion of cultural mediation as the basis for human action focussed primarily on individual action. But most of human activity is both social and collective in nature. By emphasising individual action, Vygotsky's explanation is mainly centred on the relationship between the individuals' internal and external processes. While this helps us to understand how conceptual thought emerges out of action, it fails to fully account for the cultural breadth and historical genesis of human activity. This deficiency was partly addressed by Leontyev (1978), who showed how the '*actions'* of individuals can be understood in relation to the collective '*activity'* of the group. It was a distinction illustrated through the example of a primeval hunt, demonstrating how individual '*goals'* can differ from the collective '*motivation'* of the group. In his example, the action of the beater in the hunt is to drive the prey away, yet the motivation of the hunt activity is to kill the prey. The example demonstrates clearly how individual or group *actions* are formulated as part of a collective *activity*. Although the individuals may not all have the same *goal* in their actions there is nevertheless a common *motive* for all those functioning within the activity.

But there are also other factors within the whole that comprises all the individuals and their environment, and which forms the overall artefact mediated, object-orientated cultural and historical Activity *system*. By drawing on the material dialectics of Marx, and the phenomenology of Hegel, Engeström (1987) further extended the Activity Theory framework to include various factors that determine the dynamic cultural and historical transformations which structure the environment within which the activity is located. These other factors include the community of professionals who share the object of the activity, the division of labour, and the various rules and norms that govern behaviour. All these components within the activity system mediate in some form between the subject and the object, combining to produce a structure within consciousness that guides the individual's actions within that social environment. Concepts, such as safety, therefore develop through this dialectical relationship that exists between the subject's internal consciousness and their external object-oriented activities.

3.10 Concepts as social schema

If concepts are assumed to be socially mediated phenomena then another useful theory to draw on would be Bartlett's (1932) work on memory and his elaboration of Herbert Head's notion of *schema*. Bartlett used this term to refer to patterns of socially and culturally situated thought and behaviour. It is well suited for examining differences in group concepts, since the main outline of the theory offers a framework for explaining the general organisation of knowledge in a way that accommodates both social activity and environmental adaption. His original theory though, was about the process of memory, and was based on empirical studies involving the repeated recall of meaningful material over extended periods of time. It involved participants reading culturally different material to see how it was retained in memory. Bartlett found that recalled information differed in quite specific ways from the original material (Bartlett, 1932). Now, this is significant to the current study if we consider that the internalisation of conceptual knowledge might function in the same way as any other cultural material stored in memory. The way that people use concepts to make inferences about their environment and guide their intentions is also similar in many respects to the way that memory was seen to function in Bartlett's observations. Some of these similarities could therefore offer fresh insight into the way that concepts provide contextual reference for people's responses when they are presented with material that has been taken from other cultural groups.

In Bartlett's research, he noticed that while the general structure of the story in terms of its form and plan remained consistent with the original, there were some very noticeable changes to the details being recalled. In particular certain details were omitted when the information was either; irrelevant, unfamiliar or inconsistent with existing conventions. Perhaps the most interesting finding was that some of the details were transformed or reconstructed so as to be more consistent with familiar social patterns. There was, he suggested, a dynamic processes of *'conventionalisation'* of the given material to bring it more into line with existing cultural conventions. He argued that this process enabled new material to fit in with existing '*schema'*. Now for Bartlett, a schema was a specific pattern of ongoing social activity within a particular context, and his use of the term '*organised setting'* exemplifies the active and emergent nature of this schematic knowledge;

> *"It would probably be best to speak of "active, developing patterns"; but the word "pattern", too, being now very widely and variously employed, has its own difficulties; and it, like "schema," suggests a greater articulation of detail than is normally found. I think probably the term "organised setting" approximates most closely and clearly to the notion required"* (Bartlett, 1932 p.201)

His thinking seems to be in accordance with Hegelian epistemology and the application of dialectic logic, because Bartlett believed that this re-construction was an indication of an expression of both the creativity and direction evident in the task of remembering (Wagoner, 2013);

> *"When a subject is being asked to remember, very often the first thing that emerges is something of the nature of attitude. The recall is then a construction, made largely on the basis of this attitude, and its general effect is that of a justification of the attitude"* (Bartlett, 1932 p. 207)

Bartlett also drew in ideas relating to motive by speaking of the organism's '*attitude'*. It was this attitude he said, that directs the reconstruction of material based on the features or elements contained within the schema being activated for recall. This attitude appears to be some form of instinct within the schema that is orientated towards the current environment. It suddenly mobilises certain elements of that schema to become objects of consciousness whenever any contradiction or discontinuity in the normal stream of activity occurs. We might think of this as a sort of sudden self-conscious attunement towards events;

> *" To break away from domination by immediate experience the schema must become, not merely something that works the organism, but something with which the organism can work"* (Bartlett, 1932 p. 208)

Bartlett referred to this as “*turning around upon one’s own schemata and constructing them afresh*” (Bartlett, 1932 p. 206). It is a phrase that describes a process involving an implicit comparison of knowledge and experience. So people reflect on their experiences, enabling a readjustment of both their knowledge and the reality of the situation. This seems to be an active process of reconstruction, where people make the unfamiliar more familiar or meaningful, in what Bartlett described as ‘*a fundamental process of connecting a given pattern with some setting or scheme’*. Bartlett called this process ‘*effort after meaning’* (Bartlett, 1932 p.20).

The criticism of Bartlett’s theory of schemata that it is too vague is justified, but the ideas are in harmony with some of the evidence on conceptual structure described earlier in the chapter. For example, the cognitive experimental findings suggesting the presence of prototypes or family resemblances, as well as the suggestion that concepts consist of structural relations that resemble theories, are both consistent with Bartlett’s work on memory. Even though the explanatory framework is different the observations are quite similar. His ideas are also compatible with the social theories of knowledge proposed by pragmatists and activity theorists. Indeed, both Vygotsky’s notion of mediation through signs, and Mead’s concept of the significant symbol could both be possible explanatory processes for what Bartlett meant when he spoke of the self-reflection involved in “*turning around upon one’s own schemata and constructing them afresh*” (Wagoner, 2013). These theoretical processes, although different, address two aspects of this self-reflection. One involves the internalisation of meaning through social practice, while the other describes a process of behavioural self-evaluation by viewing the self-as-object. In both cases it is an instantaneous and holistic process of evaluating stored experiential patterns in order to compare it with one’s current state and create an appropriate response. The notion of social schemata provides a good way to encapsulate these ideas, emphasising the dialectical nature of knowledge. If we are to return to safety and think of the concept in these terms then it is likely that the content of experience that forms the concept of safety will be structured in a form of social patterning that resembles Bartlett’s schema.

3.11 Conclusion

Although the psychological studies into concepts outlined earlier in the chapter describe some of the structural and relational manifestations of concepts, Bartlett's (1936) idea of schema could explain the underlying process of concept recognition and reconstruction, and thus give some weight to the proposition that knowledge transferred from one professional domain will be re-constructed so that it is assimilated with existing knowledge. So in order for material to be recognised as legitimately belonging to a particular concept like safety, it reasonably follows that there must already be significant and appropriate content consistent with the current conceptual schema for it to be recognised and usefully transformed without too much distortion. If we accept that conceptual knowledge gains its meaning within particular '*forms of life',* and understood inter-subjectively in a given '*typified action sequence'* (to use a phrase signalling the use of Activity Theory as a framework), then it is fair to say that concepts are both culturally and historically formed, and yet can also be spontaneously and creatively altered through "*the innovations of creative individuals, and their acceptance or rejection by the professional community*" (Toulmin 1999 p.60). This is relevant when transferring safety models between professional domains, because as Bartlett showed, in order for new material to be successfully transferred to a different cultural setting, there must already be certain similarities in the conceptual content. We could think of this as some sort of cultural validation of the proposed practice changes and their justification. So in order that those changes are recognised as legitimately belonging to the conceptual category specified they must be familiar in some way, otherwise the justification will be viewed with suspicion and the tensions created through existing divisions of labour will be brought into consciousness. However, creative changes can transform existing practice, but as Activity Theory tells us, such innovations normally arise through a spontaneous and expansive process through which contradictions within the activity system are dialectically resolved as part of the object orientated activity (Engeström 2014). Similarly, Vygotsky's theory about the zone of proximal development also suggests to us ways in which experts with local knowledge could expand the safety concept in ways that would include some of those new practices. But there must first be a clear understanding of the gap between the existing concept and the point at which that new concept could reasonably be expanded to include those new practices.

In addressing the problem of safety and the way its local conceptualisation is linked to professional motives, it is therefore necessary to consider the model of safety, not as a universal generalization, but as local knowledge, because it is issues of substantive soundness that are of the most importance when considering practical enterprises (Toulmin 1999). The process of understanding how to make any changes to practice work, particularly when they are presented using a justification involving a conceptual category like safety, must first begin by examining their local meaning in relation to the primary activity. This involves collecting professional descriptions and accounts of what this conceptual category means and the way it relates to their professional field.

Chapter 4

Methodology

4.1 Introduction

This chapter explains the rationale for the chosen research method. It sets out the ontological and epistemological positions from which the research methodology was selected, and describes the process of data collection and data analysis.

4.2 The Aims of the research and the research questions

In chapter one the problem of patient safety was outlined, and this was contrasted with the success that has been achieved in aviation safety. However, the literature showed that although there have been attempts at transferring some of the aviation safety methods into the medical setting the outcome of this has not been very successful. The literature suggests that one reason for this outcome was the poor engagement of clinicians during the implementation of these methods. This raised the following question;

- To what degree must the implementation of functional changes within an activity, be in agreement with the conceptual understanding of the people engaged in that activity for it to be successfully assimilated into normal practice.

As we saw earlier, it is a question that is based on the assumption that cognition is contextually situated and that there is an inter-relationship between structure and human agency. Since the two professional groups involved in this investigation both have distinct cultural and historical evolutions it provides a perfect opportunity for conducting this type of cross-cultural research into the relationship between conceptual thought and human activity. By taking the concept of safety as the object of analysis and examining what it means to the members of each of those two professional groups enables us to explore the question above whilst at the same time establishing the structure of this concept for each of these two groups of professionals. The research thus asks the following questions;

- What is safety and what does it mean to the members of each professional group?
- What are its main attributes, and what semantic sub-categories are contained within the concept?
- What is the latent structure of the concept in terms of the sub-categories and their relationship?
- How does the concept of safety relate to the professional setting in which it is used?

This sets out very clearly what this research aims to find out. But in order to properly answer these questions it is important to first consider the ontology and the epistemology of the object of investigation. This will then determine the sort of data that is needed in order to provide satisfactory answers for achieving the aims of the research.

4.3 Methodological assumptions – ontology and epistemology

The starting point for any social research has to begin with the researcher. There must be some reflection, and then a resolution, about what ones beliefs and assumptions are regarding the nature of reality for the object of the investigation, along with a consideration of its degree or status as an object of 'truth'. In other words, there should be clarity about the ontology of the phenomena that is going to be researched, because this then informs the research epistemology (Devalle, 1996). The epistemology relates to these fundamental beliefs, principles, and assumptions in order to establish what can be known about the phenomena being investigated, and the ways in which this knowledge can be gained. These various assumptions are often grouped into foundational epistemological types to form research paradigms, which then guide the choice of methodology and research design (Guba, 1990). Within social research there are broadly speaking, two main paradigms; the positivist research paradigm and the interpretive paradigm. Underlying this distinction are many philosophical arguments about the status of human experience and its relationship to external reality, most of which concern the issue of objectivity and the degree to which the principles of scientific observation can be applied to social phenomenon (Smith, 1998). The positivist paradigm attempts to generate authoritative knowledge, and produce theories and general laws about social phenomena through empirical observation of the regular patterns of behaviour within societies, communities and social groups. It derives from thinkers like Comte (1798-1857) who took inspiration from the natural sciences as a way of creating knowledge that could lead to social progress. Durkheim is also considered to be a positivist since he sought to establish social science as a rigorous academic discipline, refining Comte's traditional social positivism to include among other things the idea of social realities existing above or beyond individual actions. He eschewed reductionism in favour of a group perspective towards the study of society and formulated the idea of social structures, norms, moral rules, and other collective social phenomena, which Durkheim classified as *social facts*. These social facts were the manifestation of the rules of conduct, customs and social obligations that were placed upon individuals as they performed their roles within the various structures of society (Durkheim & Lukes, 1982). However, the interpretative paradigm recognises that social phenomena, particularly when it involves motives, beliefs, and values, are subjective entities. Even Durkheim's social facts can be contested on the basis of the measurements that have been made, since there is always the involvement of some judgement or interpretation in deciding how such phenomena should be categorised. The problem of separating facts from values, and unravelling the subject and the object, particularly when examining social and psychological phenomena is extremely difficult to achieve. Indeed, there are good arguments that demonstrate that all human knowledge is culturally and historically situated. This derives from Hegelian thought, which views the relationship between consciousness and external reality as dialectic, and where the apprehension of knowledge is seen as a developing process that is achieved through ongoing social interaction; as an active process of practical discovery (Marková, 1982; Marx, 1975). If knowledge is temporary and dynamic, as this position suggests, then attempting to separate out the phenomena of interest from the context within which it is inextricably embedded is fruitless. And as Kuhn demonstrated, even scientific knowledge reflects the organised activities of historically and culturally situated scientific communities, rather than the independent truth it purports to present (Kuhn, 1962; Smith 1998). So the value of knowledge is in the way it helps to achieve understanding and create meaning that is useful for achieving progress. Within social research there are always value judgements, and so the interpretive paradigm aims for a rich understanding of social phenomena and the meanings attributed to them by the people embedded within these activities. In this study, the object of analysis is the collective concept of safety as it is understood by members of two professional groups. As we saw in the last chapter, where different theoretical perspectives on conceptual understanding were reviewed, a concept like safety is not only an abstract concept but it is knowledge that is created socially. The literature suggests that there could be a discontinuity between a local understanding of what safety is, and the meanings attached to the imported practices of safety that have been derived within a different social setting. It is clear that an interpretive paradigm is more suited to capturing the rich complexity of meaning within the concept for each of the two professional groups.

4.4 Research design

The choice of a suitable research design was based on the assumptions outlined in the previous section; which is that there is an assumed link between conceptual knowledge and social interaction. Since human activity and language are the main medium through which knowledge is transferred, then this would suggest that qualitative methods like ethnography and discourse analysis would be appropriate options for collecting the required data. However, the research questions demand some form of methodical decomposition of the participants understanding of safety, which is an abstract concept. While this concept has meaning for the participants, it is not explicitly clear how it is related to their social and cultural activities. For instance, it is not an immediately obvious social process that can be documented through observation, nor through an analysis of the participants' social interactions, or their patterns of speech. So an approach was required that could rigorously tap into this tacit knowledge of what safety means to the participants in order to map out this concept and reveal both its content and structure. Since this knowledge is deeply embedded within the participants' experiences, then a method was required that would involve them in a process of reflection and narrative construction, so that the rich complexity and latent theoretical structure of the concept could be captured. The use of interviews therefore appeared to be the best method of inquiry. But in order to decompose the data and map out its structure, then a form of detailed exploration of that data would also be required. It needed a method suitable for separating raw narrative data into analytic categories, and then further abstracting those categories in order to identify the theoretical structure that holds the concept together. The most suitable research method for achieving this is Grounded Theory, since it offers the required systematic approach but also retains the thick contextual details necessary for the sort of understanding required by the questions posed in this research.

4.5 Grounded theory

Grounded theory (GT) was developed by Glaser and Strauss as a method of inquiry that moved qualitative research beyond the realm of descriptive studies into new areas of explanatory theory building (Glaser and Strauss, 1967). Its epistemological origins have some links to the Pragmatism of the Chicago school, where Strauss completed his doctorate, so there are some underlying principles within that tradition that inform the method. For instance it is assumed that humans are active and inquiring agents involved in the construction of their social reality (Charmaz, 2006 p.7). Strauss's background in ethnographic research, and his early work in the symbolic interactionist tradition, provided the qualitative social basis for the method.

Now these links between Grounded Theory and the symbolic interactionist tradition are well documented (Chamberlain- Salaun, Mills and Usher, 2013; Aldiabat & Le Navenec; Jeon, 2004), although Glaser and Strauss never made this explicit. On the other hand, Glaser's background was from a more positivist tradition, and it was this combination, of his analytical approach and Strauss's qualitative input, that combined well to produce Grounded Theory as a rigorous method of discovering emergent patterns within the data, and a means of producing substantive theories (Charmaz, 2006). It is an inductive approach to research, where the theoretical explanation of the phenomena emerges from a process of empirical observation and careful analysis of the data. The objective is to produce a substantive theory (Glaser and Strauss, 1967). This is achieved by identifying and naming patterns within the data along with their abstractions, and finding the best fit and relevance of these emergent concepts, and then establishing their relationships. Glaser talks about discovering theory through the generation of emergent conceptualizations;

> *"All that GT is, is the generation of emergent conceptualizations into integrated patterns, which are denoted by categories and their properties. This is accomplished by the many rigorous steps of GT woven together by the constant comparison process, which is designed to generate concepts from all data...Because GT operates on a conceptual level, relating concept to concept, it can tap the latent structure which is always there and drives and organizes behaviour and its social psychological aspects, all of which are abstract of objective fact"* (Glaser, 2002 p.3)

In this summary of GT, it is clear that the method is a systematic process of data analysis that builds upwards from the raw data and through successive stages of abstraction, in order to generate meaningful concepts and establish the propositional relations that bind them together. In this way the emergent theory is grounded in the data rather than forced into it by preconceived notions about what should be there (Glaser, 1992). The technique normally progresses using a process of theoretical sampling, which involves directing the focus onto areas of theoretical interest as they emerge from the data (Urquhart, 2000). However, even though the researcher must be careful to analyse the data in a bottom-up or inductive manner, it is still necessary to possess a level of attunement with any significant contextual issues and keep in mind an awareness of relevant theories identified in the literature. This is known as theoretical sensitivity, and involves being steeped in the literature and associated general ideas (Glaser, 1978). It is a principle aspect of the inquiry that is in line with Blumer's (1969) notion of sensitizing concepts, which are the guiding interests and disciplinary perspectives that provide points of departure for developing ideas and lines of questioning within the interview process (Charmaz, 2006 p.16). This principle immediately highlights the delicate balance of sensitivity needed to identify the emergent theory without imposing predetermined ideas onto the data. It is a question of the degree to which knowledge gained through this method is constructed. Glaser used the more objectivist terminology of '*discovering'* the theory that emerges from the data in his descriptions of the research, while Strauss and Corbin (1998) used language suggesting a slightly more constructivist take on the process (Seaman, 2008; Mills *et al.*, 2006). As a researcher, I take a position that is mostly consistent with Charmaz (2006), which is to acknowledge the role that the researcher has in interpreting the data, to the degree that "*any theoretical rendering offers an interpretive portrayal of the studied world, not an exact picture of it"* (Charmaz, 2006 p. 10). The actual process of data collection and analysis will be outlined in the following sections, but the underlying philosophy of the method and the type of data that it produces underscored its suitability as an appropriate method for this project.

4.6 Aviation participants, sampling and access

A sample of senior airline pilots was decided upon in order to tap into the conceptual knowledge of the most experienced and influential professionals within this group. They were selected from several large commercial airlines so that a range of experiences were sampled. As with all qualitative research methods the sample sizes are relatively small. However, although the findings are not intended to be generalizable the aim was to provide enough diversity of participants within the delimitations of the selected population so that a fairly representative sample could be achieved. In the event, the sample was determined by the constraints of access to the population. There is no list of currently employed airline pilots and the CAA do not maintain a register of licensed and working pilots and so the participants had to be accessed through the airlines.

According to the Civil Aviation Authority, there were 24 registered UK airlines in the category of air transport operators using aircraft with greater than nineteen seats. Each of these airlines were contacted and a process of negotiating access to the participants followed. This involved a strategy of prolonged communication to develop the trust of gatekeepers (Feldman *et al.*, 2003). Eventually, one airline agreed to provide access to their pilot roster and the provision of five Captains as participants. Additionally, after further negotiations, requests for volunteers were published in the newsletters of three other airlines, and a similar appeal was published by the British Airline Pilots Association (BALPA). The participants who came forward to take part in the research were drawn from five UK airlines operating a range of large jets including the Boeing 737,757,767, and 787, and Airbus A320, and A330;

- Eight Captains and three senior first officers volunteered from airline A
- Five Captains were selected randomly from the crew rostering list in airline B
- Three Captains volunteered from Airline C
- One Captain volunteered from Airline D
- One Captain volunteered from Airline E

However, restrictions on recruitment and the nature of the research questions meant that the normal process of theoretical sampling associated with Grounded Theory were altered to facilitate the research. In this regard, the interviews were all conducted prior to the completion of a comprehensive GT analysis, rather than in concert with the process of analysis. To compensate for this, an initial stage of partial analysis was completed after each interview. This involved re-listening to audio recordings and taking notes in order to elaborate and refine the questioning for subsequent interviews. Under normal circumstances sampling is continued until a state of theoretical saturation is reached (Charmaz, 2006 p.113). However, free and unlimited access to participants was not possible, and so the specified number of participants had to be arranged in advance. A best estimate of the required sample size was therefore assessed on the basis of literature concerning sample sizes in qualitative studies (Mason, 2010; Sandelowski, 1994). Charmaz (2006) indicated that 25 participants is usual, but given that the design of the study involved two groups, and the level of analytical detail required for each interview it was decided to sample 20 participants in each group.

4.7 Medical participants, sampling, and research governance process

The medical setting contains a diverse and multidisciplinary team of medics and other clinical staff. But since the research question relates to the disappointing levels of progress in patient safety and the poor levels of engagement by clinicians outlined in chapter two, then the focus must be directed towards those clinicians that have the most influence when it comes to setting the conceptual framework for safety, and in this regard it is the consultants who lead the clinical services; the surgeons that operate, the physicians that diagnose and prescribe medical treatments, and the anaesthetists that take over the patients' physiological reflexes during surgery. They are the group who have the greatest amount of influence over the junior doctors and their training, and have the most power over other clinical staff. So it is this group of professionals that are most likely to provide the data required in answering the research question. Furthermore, there is also some evidence within the literature to suggest that in certain areas relating to patient safety it is the doctors who are ones that are least likely to engage with some of the initiatives (Yu *et al*, 2017; Mitchell *et al*, 2015).

The participants were therefore selected from a list of Consultants in two NHS hospital trusts. A full list of hospital consultants employed within the NHS is held by the Health and Social Care Information Centre. However access to that list was not possible for small scale research, and so an alternative less up to date directory was used. The healthcare intelligence organisation 'Dr Foster' provided a directory of hospital consultants and their specialist clinical areas. This list was used to randomly select consultants from within a purposefully selected stratum of specialities, for each of the two NHS trusts. Consultants were invited by letter to take part in the research. The letters were sent out in batches of ten, and the response rate was about 20%. The participants who were selected for the research were drawn from five hospitals across two NHS trusts as follows;

- Three Consultant Surgeons (different specialisations) from NHS trust A (two hospitals)
- Two Consultant Radiologists from NHS trust A (two hospitals)
- One Consultant Physician from NHS trust A
- One Consultant Anaesthetist from NHS trust A
- One Neurologist Anaesthetist from NHS trust A
- Seven Consultant Surgeons (different specialisations) from NHS trust B (three hospitals)
- Two Consultant Paediatricians from NHS trust B
- One Consultant Cardiologist from NHS trust B
- One Consultant in Emergency Medicine from NHS trust B
- One Consultant Physician from NHS trust B

However, before any contact could be made with NHS consultants for the purpose of research, there was a requirement that all researchers must complete an NHS research governance and ethics process before proceeding with their investigation. This process was done using the online *'Integrated Research Application System'* (IRAS). A local collaborator was found and appointed for each NHS trust, and an administrative process of checking that the research project met the standards set out in accordance with NHS clinical research policy (DoH, 2005) was carried out before approval documentation and a letter of access was granted. This was a fairly long process involving extensive checks into the ethical standards of the study and the quality of the method.

4.8 Data collection

As outlined in the rationale for the research design, interview was chosen as the preferred method for collecting appropriate data. Careful consideration was given to the type of approach to be taken during the interview process in terms of the degree to which the interview questions should be structured. Highly structured interviews provide a consistency during the inquiry and ensure that each participant responds to the same topics of discussion (Bryman, 2004). However, it obviously tightens the participants' narrative field of choice and provides little room for the researcher to follow up on important and interesting areas. It would not be suitable for this study as it would restrict the process of gathering the sort of rich experiential data that is need to answer the research questions. Conversely with an open approach there is a danger of losing focus if the participants drift away from talking about the object of the investigation. When conducting a GT inquiry the "*questions must explore the interviewer's topic and fit the participant's experience"* (Chamaz, 2006). A semi structured interview approach is therefore the most suitable method for allowing the data to emerge during the course of the inquiry (Charmaz, 2003).

The interviews were conducted following accepted academic practice (Roulston, 2009; Spradley, 1979). An initial interview with an air freight pilot was conducted as a pilot study in order to determine the efficacy of the process; to check equipment and technique, before the main interviews were arranged. All of the Medical interviews and about half of the aviation interviews were conducted face to face, in a quiet room, with good positioning of seating, appropriate eye contact, and with good rapport. Trust was established through a brief initial period of relaxed informal conversation. Ten of the aviation interviews were conducted over the telephone due to the participants' geographical location. A rough interview guide outlining the *'substantive area'* (Glaser & Strauss, 1967) was prepared as a back-up resource to stimulate further dialogue during difficult interviews (Appendix C). This included a schedule of basic questions, but most of the interviews were conducted so they followed the path directed by the participants' responses. The outline structure was used as a departure point when topics were exhausted. The GT principle of theoretical sensitivity (Glaser

1978; Urquhart, 2000; Charmaz, 2006) was applied throughout the process, with the researcher's role being to reflect and follow up on emerging categories throughout each interview and across the whole group as the inquiry developed. Following the informal phase of the interview process, all interviews started with the same question;

- Can you explain to me what safety means, and what its main attributes are?

This opening strategy required a narrative response from the participants, and it facilitated a reflective process where they could start organising their thoughts and begin setting out answers in a way that could easily be followed up. This required careful attention and notetaking throughout the interview in order to capture divergent areas for later questions, and allow an elaboration of ongoing ideas through the use of probing and appropriate follow-up questions. So this would range from the use of long pauses, to requests for more details and further elaboration, or it might involve some direct questioning. For example, to stimulate further dialogue I would make a brief comment of encouragement followed by a pause;

> *"That's an interesting point (3)..."*

Another probing technique would involve repeating the participant's words back to them as a prompt for further information;

> *"So you think standardisation=proceduralisation is absolutely essential (2)"*

The same method sometimes involved using the participant's words as a point of contrast to probe in other directions;

> *"So a number of factors that you've mentioned there (0.5) are vigilance (0.5) checking (0.5) and minimising distractions (0.5) can you think of any other factors=if you're thinking of things that could be associated with safety"*

In other cases a more direct question taken from the list of topics in the rough interview guide (Appendix C) would be used;

> *"Yes (2) so where would you say the main threats=or the main threats to safety actually come from (1) where do they originate"*

> *"Yeah (0.5) and what is the involvement of risk in that process"*

A further example of the sort of open probing that might occur towards the end of the interview is an open invitation to bring up a topic that had not already been talked about;

> *"is there anything else that you would like to=that you think would be interesting to share with me"*

The main purpose of this technique of probing and following up was to capture the participants understanding of safety by communicating to them a genuine and strong interest in finding out about their personal views and seeing things from their perspective.

In line with NHS ethical standards, and following initial contact, an information sheet was given to all participants explaining the research practice and ethical standards, including the process of data protection, anonymization of reports, consent procedure and so forth. Consent was obtained by all participants before the data was collected. In all cases the interviews were recorded using a Tascam DR-05 solid state recording device and data was securely stored in mp3 format in line with NHS ethical standards.

4.9 Data Analysis

The first part of the process involved transcribing the audio data, which was achieved using the *Express Scribe®* application to manage the audio files. A simplified version of the Jefferson system of transcription was used to document the audio content (Jefferson, 2004; Hepburn & Bolden, 2013). This included all dialogue spoken but only very limited emotional content. It thus captured what was said but not much information on the way it was said. However, if it was thought to be significant to the meaning of the utterance in terms of the research question, then this information was included in the transcript using the appropriate Jefferson annotation. These transcripts were then used for more detailed analysis using the Grounded Theory method. The analysis of the data using grounded theory is well established, although there are slightly different coding strategies. These can be distinguished into two main strands, and diverge along the two different paths set by the founders of GT; Glaser and Strauss. The Glaserian approach suggests 18 coding families, which he argues, offers a more open and receptive attunement to the patterns within the data so that substantive theories can emerge without being forced by more rigid prescribed coding (Glaser, 1978). The coding procedure suggested by Strauss and Corbin (1990) involves a four step process of abstraction instead of the three step coding process advocated by Glaser. But importantly it also prescribes the use of a coding paradigm and a '*conditional matrix',* for assisting in the process of conceptualisation (Urquhart, Lehman & Myers, 2010). These differences centre on the question of 'forcing' theory onto the data versus 'emergence' of the theory. Of course, it can be argued that Strauss and Corbin's (1990) approach is perhaps more inclined towards verification and so open to the forcing claim, but it is more systematic. In any case, the process outlined in their book is both popular and accessible (Urquhart, Lehman & Myers, 2010). But putting any differences aside between these two strands of the method, the coding format used in this research project took aspects from all sources, although the main coding method used was the three stage coding process outlined in Strauss (1987). This approach was also supplemented by following some of the practical advice outlined by Kathy Charmaz (2006). Both professional groups were analysed separately as two distinct bodies of data. In order to help with the management of the coding and analysis of this data the QSR *NVivo®* qualitative data analysis software application was used.

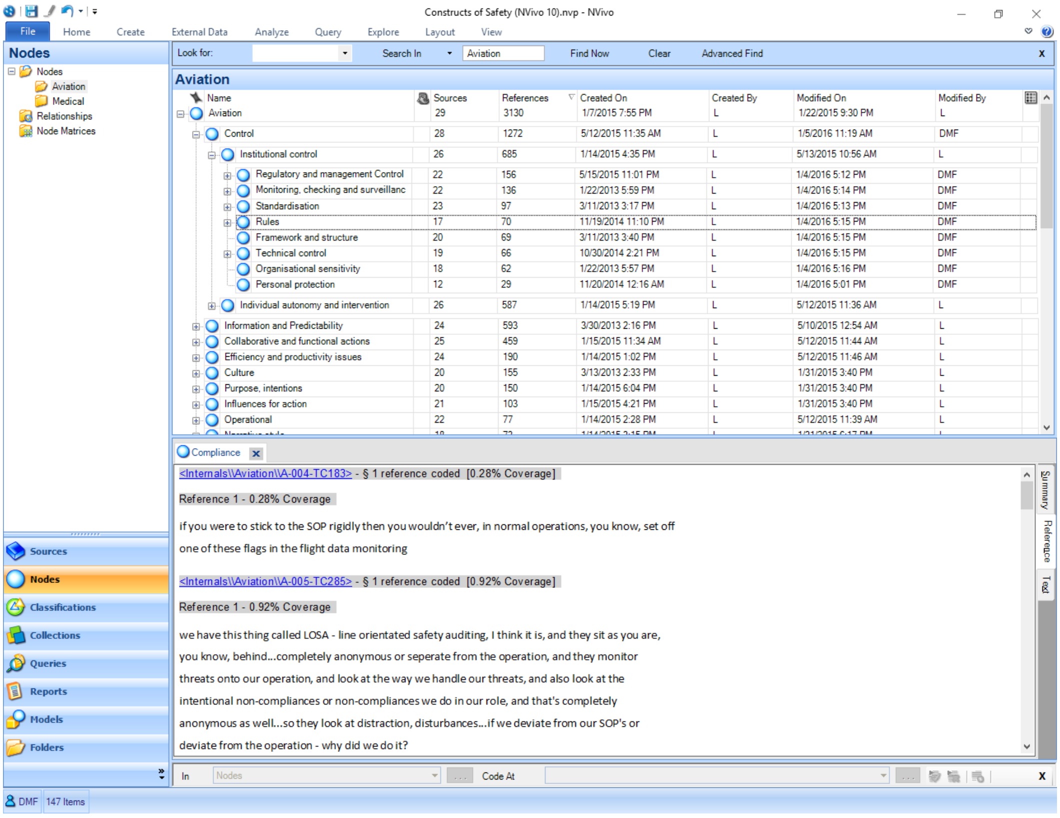

Figure 1: Coding using QSR NVIVO 10

Some of the drawbacks of using such software to manage the coding process were noted (Bryman, 2004), but with so many interview transcripts to code, the advantages of the application were much more significant. But even before this formal coding was undertaken, an initial stage of preliminary analysis was carried out by re-listening to the audio data and making notes. This helped to initiate a process of immersion in the data (Charmaz, 2006), and this was further realised during the subsequent process transcription. After the initial audio analysis of each interview, notes were taken, and a process of preliminary categorisation and theoretical memo-writing was initiated. Memo-writing is one of the fundamental techniques of GT and is described by Charmaz in the following way; *"Memo-writing frees you to explore your ideas about your categories. Treat memos as partial, preliminary, and provisional. They are immediately correctable"* (Charmaz, 2006 p.84). Memo-writing is thus a formal way of organising ones thinking about the content of the data and a means of sparking ideas about possible categories.

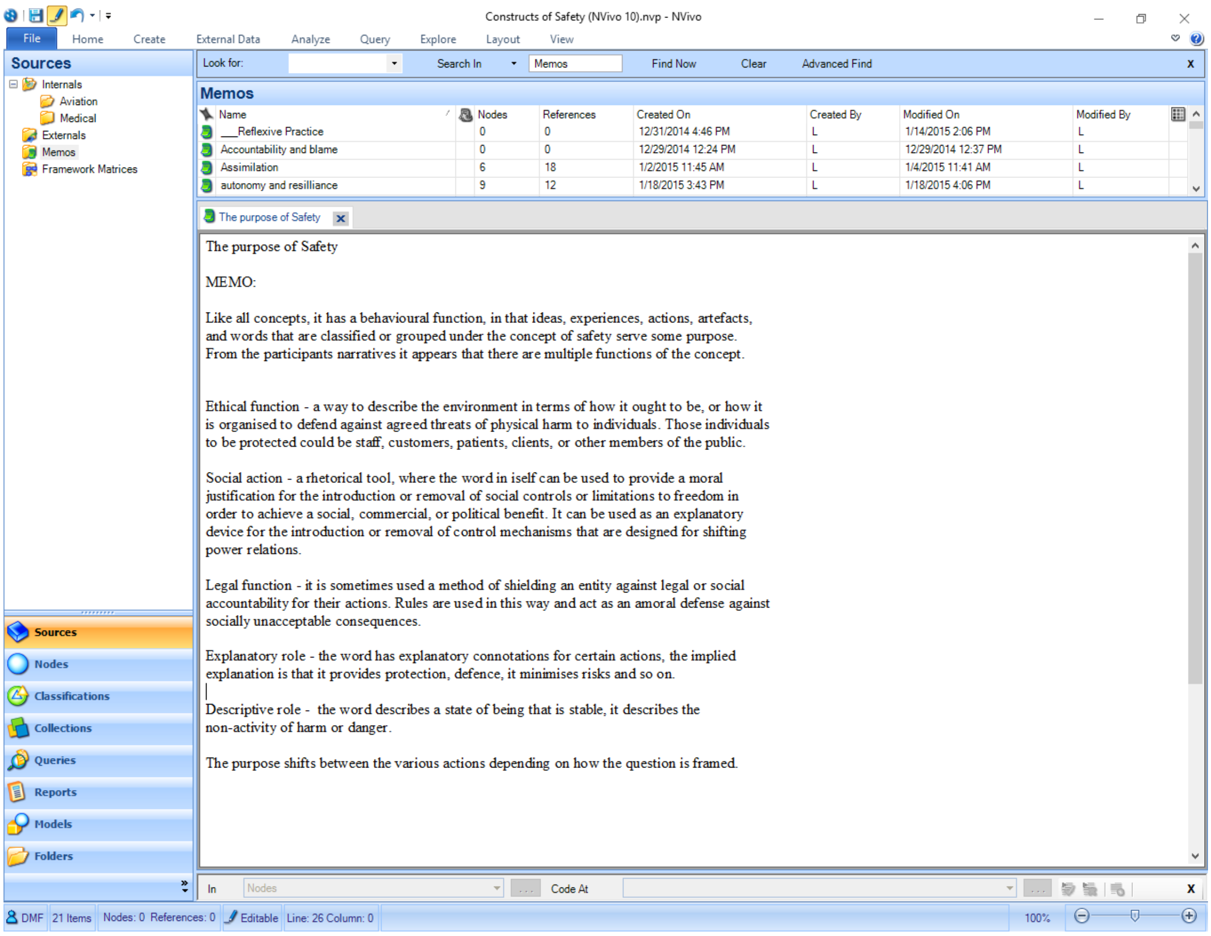

Figure 2: An example of a Theoretical Memo in NVIVO

So this initial audio review helps to contextualise the data and it starts off the process of theoretical sampling by drawing attention to particular features within the data. It is important to point out though, that proper detailed coding and categorisation only began once all the data had been collected because of the practical timeframes involved in accessing the participants. Under normal circumstances, the questions in early interviews will be more general, but then become much more focussed as the process of theoretical sampling develops in the later interviews (Strauss & Corbin, 1998, p. 77). This process did occur but the effect of narrowing the research focus was more limited. Once the data had been transcribed then the formal coding process began. The three coding stages are open coding, axial coding and selective coding. Now, the foundation of all coding in GT is the technique of constant comparison (Glaser and Strauss, 1967). This requires close inspection of the data together with the emergent coding categories to look for both similarities and differences at all stages in the process. But the systematic process of the three coding stages begins with '*open coding'*. This involves examining the transcripts on a line by line basis. It is an unrestricted process of naming each of the data slices in order to try and identify concepts that fit (Strauss 1987). It is provisional, but it opens up the inquiry so that the researcher can respond to the phenomena as a detached observer, being both immersed within the data but also able to step back and develop a theoretical understanding about it. It involves searching for in-vivo codes, constructing codes that fit the narratives in meaningful ways, and constantly asking questions about what is going on within the text and what it means. It is a long and detailed process that continues until the code becomes saturated. The open coding analysis for the two data sets examined sentence level chunks rather than line by line extracts, and the following number of preliminary categories was produced;

- Aviation – open coding produced 124 initial categories
- Medical - open coding produced 153 initial categories

The second coding stage was '*axial coding'*, which involved a lengthy and concentrated analysis of each category and its contents. This examined the conditions and the attributes of the category, looking at each one in turn. It is important to note that it was not a discrete sequence of stages between open coding and axial coding, but rather a movement back and forth until the axial coding phase became more prominent as the analysis progressed. Axial coding specifies the properties and dimensions of each category but it also included a process of recognising dominant concepts and common dimensions or attributes to create super-ordinate categories. This process is similar to the stage of '*focussed coding'* described by Charmaz (2006), and it involves a synthesis of data to relate categories with sub-categories, and explore the relationships between them. The emergent categories and their relationships are presented in the two findings' chapters. The final stage of coding was the *'selective coding'* stage. The objective of this stage of coding is to systematically integrate and refine categories in order to generate a core category which provides the most parsimonious fit to the data in terms of its final structure, or theory (Strauss, 1987). The core categories that were established in both the aviation and medical data sets were central to the other sub-categories, and they each explained the concept of safety in terms of its function as an epistemic artefact and its use in organising experience as part of the professional activity.

4.10 Reflections on the method and summary

The research questions demanded a method that could capture the conceptual understanding of safety in the language of the participants, as they reflected upon their own professional experiences, and what it meant to them and their colleagues. The semi-structured interview process was therefore a good way in which this internal, yet socially constructed, phenomena could be made visible. But at the same time a systematic analysis of the whole corpus of narrative data was required to dissect this dialogue and reveal its underlying pattern of conceptual concerns, thus making those meanings more explicit. Grounded theory was therefore a very good method for achieving this, whilst at the same time providing techniques that allowed the latent structure holding the concept together to emerge from the data. Because this structure, or theory, is grounded in the data it provides a method of re-constituting the concept in an explanatory format, whilst still retaining its rich descriptive and contextual content.

In scientific research, issues like reliability and validity are concepts that are more suited to the process of inquiry concerning phenomena that are objective, like physical objects in the natural sciences, or mathematical propositions. Many social scientists instead prefer to talk about the authenticity of the research findings, or the trustworthiness of the research (Lincoln & Guba, 1985). This relates to issues of credibility, transferability, dependability and confirmability. It is therefore important to emphasise that the findings relate only to these two groups of participants, and cannot be generalised without qualification. However, the process of combining stratified purposive and random sampling has helped to produce a fairly representative sample in terms of the observable characteristics of those organisations and the professional staff that were investigated in this study. It is also important to emphasise that the findings fit within the existing literature, both within the fields of aviation, and safety, and it also provides empirical evidence to support existing literature concerning the structure of concepts. This coherence provides evidence of the credibility of the findings. There is a clear audit trail involving the process of data collection and analysis. This involves all of the documents relating to correspondence with participants and their gatekeepers, the original audio files and transcripts, as well as the content of the data analysis software for this project. It all helps to address the requirements of dependability and confirmability (Lincoln & Guba, 1985). Furthermore, in terms of transferability, the thick description of the phenomena and the rich detail within the extracts presented in the findings help to provide further credibility and greater understanding about the way professionals develop and apply conceptual knowledge within their professional settings. At this point the interpretative input of the researcher must be acknowledged, since the process of coding and creating theoretical memos has to involve a level of interpretation and inference about the meaning of the data. Constant reflection and stepping back during this analytical activity was therefore very important, as was seeking third party opinions to see if there was agreement with the coding.

It is also important to highlight how qualitative data can be sensitive to the research context. For example, it has been noted that the average duration of the interviews varied between the two groups. This was due to the time that the participant's had allocated when they agreed to take part in the research. Now, most of the interviews with the airline pilots were conducted when they were off duty and typically took place at the participants' own homes. As a consequence, they were more relaxed and willing to talk for a much longer period of time. In contrast, the medical interviews always took place in the consultant's office during their working hours, which meant that they were more conscious of the interview duration because of the limited time allocated. It is therefore possible that this difference in context could have had some effect on the extent to which the topic could be explored. In spite of this, the quality and depth of the data and the breadth of categorisation that emerged revealed no obvious limits, yet it is always possible that other dimensions to the concept could have emerged had the consultants been interviewed in a more relaxed setting.

In summary, the theoretical representation of the safety construct for each of the two groups should not be presented as an objective explanation, but rather it is an accurate portrayal of the participants own constructions of the concept as they communicated it at the time the research was conducted. This nevertheless, enabled the research questions to be answered in a way that is useful for the sort of progress needed in this area.

Chapter 5

The Concept of safety in Aviation

5.1 Introduction

For the most part the term safety is used implicitly as a taken-for-granted term. Indeed, during the interviews most of the participants struggled at first to articulate a definition that captured any depth to the concept beyond its implied meaning as a state of being free from any significant danger. But once they began to structure their narratives and set out their ideas a rich depth of data about safety activities and underlying values began to emerge. The analytical task for this research was to excavate beneath those narratives to locate and map out the conceptual pattern that defined the term.

Grounded theory analysis was used as a systematic method for distilling the content of the data in order to identify the fundamental principles behind the participants' narratives. This process revealed the main semantic categories within the concept. These categories, and the way they cluster together, form the conception of safety for this particular professional group. This does not mean to say that this structure represents a one-to-one mapping of safety actions onto the safety concept as if it were a single mental depiction of the safety process, but rather it is a collection of socially mediated patterns of experiences that have been internally categorised as safety and externalised through language. Each individual account represents the personal conceptual schema for safety, in the same way that Bartlett referred to schemata as socially embedded patterns of thought (Bartlett, 1932; Wagoner, 2013). But what the body of data represents is the concept as a social artefact, formed out of language and used by members of the group, since it is the collective configuration of safety narratives derived from each individual's experiences of their own actions as they operate collaboratively to achieve certain goals. This resultant conceptual map thus provides us with an insight into the general boundaries of safety for this particular group and it allows us to make comparisons between this and other groups, so that we may see precisely how the meaning of safety alters with social context.

The average interview duration was 66 minutes, and the average transcript was 9457 words or 17 pages in length. The table below outlines the details regarding the raw data.

No.	Description	Time	Duration / mins	Words	Pages
A001	Air Transport Captain B757/767	01:09	69	10822	20
A002	Airline Captain A330/A321	01:17	77	11416	23
A003	Airline Captain B757	01:21	81	12509	25
A004	Airline Captain B757	01:08	68	9464	19
A005	Airline Captain B757/767	01:02	62	9868	21
A006	Airline Captain B757/767	01:08	68	8690	18
A007	Airline Captain B737	01:09	69	11504	21
A008	Airline Captain A321	00:45	45	6739	11
A009	Airline Captain B787	00:49	49	8677	16
A010	Airline Senior First Officer B737	01:00	60	8980	14
A011	Airline Captain B757/767	01:04	64	9386	15
A012	Airline Captain B737	01:47	107	13979	20
A013	Airline Captain B737	00:51	51	7288	12
A014	Airline Captain B737	01:10	71	9156	14
A015	Airline Senior First Officer B737	00:57	57	9440	15
A016	Airline Captain B737	01:14	74	10140	16
A017	Airline Senior First Officer B757	01:05	66	9681	16
A018	Airline Captain B737	00:57	58	7957	13
A019	Airline Captain B737	01:05	65	9329	16
A020	Airline Captain B737	00:50	51	6349	11
A021	Airline Captain B757/767	01:04	65	7215	12
	Totals	23:00	1,377	198,589	348

Table 1: Source data for GT analysis of aviation safety concept

In line with traditional grounded theory (Glaser and Strauss, 1967), the analysis of the data exposed several main categories. During the open coding phase of the analysis, a total of 3,950 references were coded from the 21 transcripts. These references, comprising small sections of the data, usually sentence level extracts, were coded into 124 categories. These categories were further refined during axial coding, where they were organised into category groups depending on the relationships between them. Following this process, a number of super-ordinate categories were identified.

Continuous reference to the data using constant comparison between references enabled five main categories to be identified. The following table lists these main categories and the number of references that was coded for each category:

category	Refs
Institutional control	1125
Individual autonomy and intervention	588
Collaborative and functional activities	469
Information and Predictibility	808
Efficiency and productivity issues	248

Table 2: Main categories and references

These main categories were then integrated during the treatment of the data to form a core conceptual category accounting for most of the variation in the participants' experience of safety. In this case the core category of *control* was established. This served as a top-level semantic classification. It also happened to fit Glaser's criteria of what he termed a basic social process (Glaser, 2005). In other words the main categories within the safety construct collectively form a basic process of control. So, when airline pilots recount safety narratives they are mostly describing the various stages of an extended process of systemic control whose purpose is to arrange operational activities in such a way as to prevent the occurrence of any adverse outcomes, in this case it is specifically the avoidance of an air crash.

This core conceptual category follows the criteria set out by Glaser (2005). It is central to the other categories, it occurs frequently, and is relevant to the resultant theory. What has been established from the data in this case is that the *control* category is comprised of two pivotal sub-categories that are designated *Institutional control*[1] and *individual autonomy*.

These two sub-categories of control are like two branches that are dependent upon the content of another category. This interceding category has been labelled as

[1] The category label *institutional control* might be more usefully described as organisational control, but because it also includes narratives describing state regulatory controls as well as management controls the term *institutional control* was deemed to be more accurate.

information and predictability, and contains narratives that are about the presence or collection of information, facts, or any other data that would increase the level of epistemic certainty in the operation. This includes dialogue describing the identification of threat scenarios, causal pathways, and any talk about incident reporting or monitoring as a means of collecting data. These narratives often connect with discourse classified under the *institutional control* category. But often when there is lack of this type of dialogue then the association is with stories that are about *individual autonomy* and personal intervention.

Another category of narratives, labelled *collaborative and functional activities,* contains dialogue about activities that overlap into both of the categories of *institutional control* and *individual autonomy*. These talk about individual actions and personal decisions that have been enacted within a collective situation or within an organised activity. A further category labelled *efficiency and productivity issues* emerged as a container for narratives about the negative, or risk enhancing effects of organisational controls. These accounts refer to productivity demands that need to be addressed by either regulatory acts or through individual discretionary counter-action. In essence, the underlying discourse about safety for this group is of an activity involving operational control that is designed to predict future events, maintain stability, reduce invariance and contain outcomes within a prescribed operational range.

This is said to be achieved through a dual process of compliance with organisational demands and the use of what are best described as corrective interventional actions. Many of the narratives contained within these main categories are descriptions of actions that are ordinarily performed as within the participants' professional roles, demonstrating the situated nature of this concept. But to be clear, this represents conceptual understanding of safety, not the functional model. This distinction is very important because it refers to the way safety is understood by the group, not the way that safety is created by the managers, policymakers and people who enact the process. The following diagram illustrates the conceptual structure showing the main categories and their relationships;

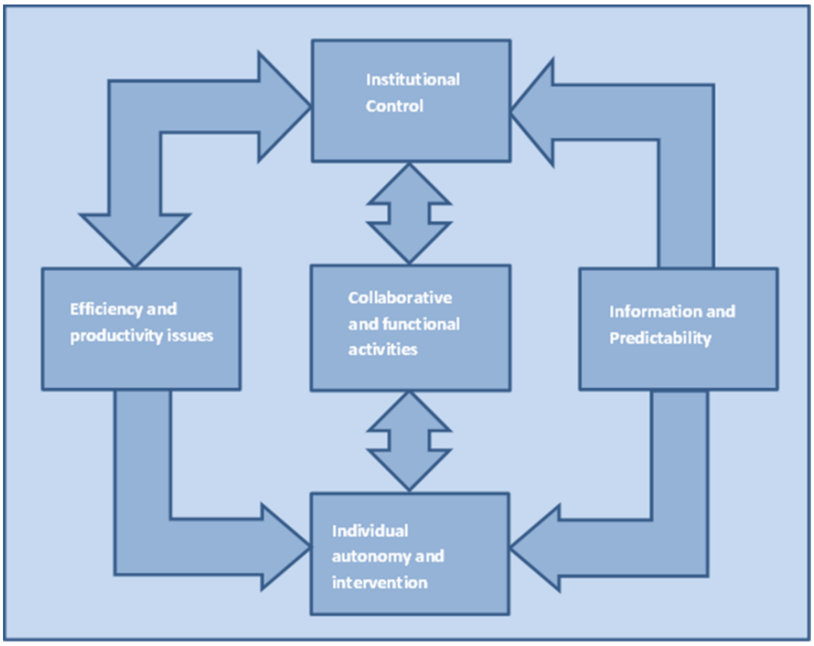

Figure 3: Main conceptual categories and their relationships

This illustration represents the linkages between each of the main categories drawn from the participants' narratives as they described their activities and thoughts about safety. The central concept of control was arrived at through a careful and detailed analysis of the data on a sentence by sentence basis. On the face of it this pattern of classifications may not be immediately obvious from the interview dialogue and the participants seemed to find some difficulty being explicit in their definitions about safety, but once these various descriptions, explanations and personal accounts were set out as a body of words representing the selection of their experiences, beliefs and values about the phenomena, then the pattern of underlying categories became evident. Most of the coding categories emerged in groups of overlapping clusters, so it was logical to combine the narratives in each of these groups to create more distinct superordinate categories. The following sections describe how each of the main categories was determined.

5.2 Institutional control

This category was derived from interview dialogue coded into the following classifications;

(i) Standardisation

(ii) Rules, regulatory and management controls

(iii) Technical controls

(iv) Monitoring, checking and surveillance

Each of these labels designates the components within an institutional process that prescribes operational safety actions, standards, rules and limits. The idea that safety is understood as an activity of control certainly resonates with a profession whose fundamental role is to execute individual control over an aircraft and there are many examples of this aspect of control, but equally as common are those narratives that refer to either regulatory control or organisational management. For example, one informant states right at the beginning that safety is about the structure (Appendix A-A1);

"Safety (.) as I see it in the- (.) in my position (.) is an effective SMS which (.) is the abbreviation for Safety Management System (1) which is a structure in place approved by the authority (1) where they agree that it conforms to the (.)European (1) Safety Agency's requirements for a safety management system (0.5) so long as there is a safety management system in place that everybody is aware of (.) and the principles are followed (.) that to me is (.) is safety at work (.) safety in place." **Steve A003, Captain Boeing 757**

This piece of dialogue opens by defining safety as a structured set of rules known as a Safety Management System (SMS). But then the point is further qualified by stating that this structure rests on a set of principles that are to be followed. The suggestion is that an SMS creates safety by impelling behaviour through compliance somehow. The participant then elaborates further, explaining how it creates accountability by formalising authority into a structured system with nominated posts, legal responsibilities and set procedures (Appendix A-A2, A3).

> *"a safety management system is a structure which is set up within an airline (1) which (.) is a system whereby (1) the oversight of safety in the airline is the responsibility of the airline rather than the Civil Aviation Authority (.) it has nominated post holders (.) nominated procedures (.) nominated departments"*
> **Steve A003, Captain Boeing 757**

In other words it is the airline managers that make safety happen. Authority is given to them through the regulatory system, which places a responsibility on them to ensure that the regulatory standards are met. Another informant explains that this legal authority is necessary in order to compel the actions of others so that everyone operates to the same high standards. The example shows how the informant distinguishes the performance of the individual from that of the group as a whole (Appendix A-A4);

> *"It really doesn't matter what the individuals do (.) I could be the safest and best operator pilot there is (.) if I don't have (.) you know- behind me (.) leadership (.) or safety management in the airline to back that up and support me (.) so the others are like me (.) you know (.) if it's just myself (.) what am I going to do (.) just one drop in the rain (.) I'm nobody"* **Pascal A013, Captain Boeing 737**

The individual is naturally confident about his own standards, but recognises the potential for variability within the group as a whole. Underneath this statement is an implicit concern about the effects that each individual's level of diligence can have on the whole group. This could derive from competitive pressures being felt by some people to cut corners, or it could just be that some individuals are less diligent, but whatever the reasons there is a sense that standards have to be led and managed from above. Narratives with this sort of sentiment are fairly common throughout the data. If safety involves a degree of control over individuals then perhaps one reason why it is voluntarily accepted is because the object of governance is believed to be others in the collective group rather than one's-self.

5.2.1 Implementing regulatory policies

While this acceptance of a regulatory and management structure is expressed clearly within the data, how the authorities actually translate their demands into action is less plainly articulated. One informant suggests that in reality, the way that regulatory demands are actually implemented through an SMS probably varies between different airlines (Appendix A-A5). So while the significance of the regulator's importance is very well understood, the data suggests that there is some uncertainty about whether these policies are implemented in a consistent manner across the industry. In any case, structure is an important aspect of safety that seems to have been internalised. However, the participants are much more confident in explaining how the safety management structure operates within their own particular airlines, where it is generally described as a systemic process that is managed by a specific flight safety department within the airline. The function of this group is to collect reports about possible threats, and to implement regulatory directives and the other safety actions that have been prescribed and documented within the SMS (Appendix A-A6). Many of these accounts draw directly on personal experiences of interacting with the department, and some of the things that are described, like the flight safety reporting system clearly come from personal encounters with the required actions. But other things like ones knowledge about the organisation of the regulatory structure, or the functions of various international agencies, appear to have been experienced indirectly (Appendix A-A7). This knowledge of regulatory function and the various international agencies that work to develop aviation safety policy appears to be an intrinsic part of the participants' safety definition even though they generally have little immediate contact with these bodies. One participant describes it in the following way (Appendix A-A8);

> *"I don't see effectively the regulator playing any part in my normal life (.) they obviously do at a higher level because they issue instructions and guidelines to*

the airline (.) but the airline then interprets those things for me (.) and then issues instructions from themselves on whatever- (.) I guess the guidance that I've received from the Civil Aviation Authority(.) from JAR or from EU-Ops (.) so it's the regulators (.) as far as I can see have become a bureaucratic organisation (.) working in the background and interacting primarily with higher levels of airline management" **Russell A016, Captain Boeing 737**

Although these references to regulatory structures are typical they appear to function at a level that is somewhat remote. As the last account suggests, any substantive effect on safety is said to be achieved using bureaucratic controls. These typically take the form of directives or rules, prescribed standards the setting of measureable objectives. Certainly, the data carries descriptions suggesting that the perceived function of the regulatory authorities is to formulate rules and set minimum standards in critical areas. Some examples of this relate to descriptions about aircrew licencing and airline operator certificate (AOC) requirements (Appendix A-A9, A10).

But the narratives cannot always easily be classified into simple categories, because they flow through topics or they make more than one point at the same time. Some of the meaning can be lost when it is abstracted into a particular coded classification. For example, when talking about the regulations for professional licencing standards, there is a natural flow between the topics of the institutional or legal structure and individual competence.

5.2.2 Setting standards and rules for individual action

So it is often the case that the sub-category of *rules* and the sub-category of *competence* can be connected together within the same narrative. For example, competence is said to be defined by the regulator in terms of experience, through the number of flying hours (Appendix A-A9). But as well as this competence is defined in terms of technical knowledge, with the regulator setting minimum standards for exam pass rates (A- Appendix A-A10). These are all regulatory criteria have been directly experienced by the participants as hurdles for entry into the profession. These standards are said to be important for safety, not only because they sift out incompetent candidates, but because they give value to professional competence within the safety concept. The recognition of this by the authorities is met by an implicit understanding throughout the airline that standards should not merely be met, but ought to be surpassed. This drive to exceed standards permeates downwards (Appendix A-A11);

> *"the company will tell you=they tell us (.) that there are several levels of of standard required (.) both from a technical (.) and and skill level er (1) to to to all manner of er (.) of things and there is a minimum standard which is required by the civil aviation authority (0.5) the company's standard of=that they require is above that (.) and most individuals* <u>*own*</u> *standards are above that"*
> **Steve A003, Captain Boeing 757**

It suggests that the purpose of these rules is really to define the lowest limits, that they are a threshold for safety to be exceeded. This principle extends beyond the individual, and is also evident in narratives regarding the whole structure of the industry from the national authorities, to the airline, and right down to the individual (Appendix A-A12, A13);

> *"each individual nation (.) and then below that (.) each individual company (.) then sets its own standards that its happy with (.) and that may be close to those minimum standards or it might be much higher than those minimum standards"* **Russell A016, Captain Boeing 737**

So within the data is this suggestion that the whole purpose of rules and standards are that they are there to protect against the worst cases, while more reliable safety standards derive from a collective motivation towards much higher levels of performance. It is evident that there is professional pride in working for an airline that exceeds the standards set by the authorities (Appendix A-A14).

5.2.3 Standards thresholds, rules and values

So it appears that safety is described, not in absolute terms, but as a continuum, and how far the airline is along this continuum also communicates something to the pilots about the true aims and priorities of the airline. It is a clear that the participants closely identify with airlines that set much higher standards than those prescribed by the authorities (Appendix A-A14, A15). How far above these standards the organisation goes is a choice that depends on the culture of the airline. But culture depends on what the motivation is, which to a degree depends on its values. In this regard, there are many expressions of concern about how competitive pressures could drive some of the more critical aspects of the operation increasingly towards the lowest standards. Some participants suggest that the values of the airlines are getting ever increasingly skewed towards productivity and profit. Indeed this concern forms a whole category of narratives within the safety dialogue[2]. But from this point of view it is easy to see why talk of rules is an important part of the safety narrative. Even if these narratives are taken as a discursive act they still signal the need for regulatory thresholds to be monitored very closely. However, although these regulatory rules are setting the limits for certain activities, some participants' state that their effectiveness as a control over behaviour depends on the degree to which they are imposed (Appendix A-A16, A17). This suggests that rules are only relevant to safety when they are enforced, and without enforcement through sanctions for non-compliance, then rules are simply no more than an instructive resource. In such circumstances they would be categorised as information rather than controls. But there are other problems with categorising dialogue as rules. For example, some narratives question the extent to which rules can apply in a diversity of circumstances, and when rules fail to prescribe sensible actions in unusual or unforeseen situations, then this typically alters the narrative so that it moves it into a category that is more suitably classified as personal autonomy or discretionary control. It is this sort of drift between semantic categories that illustrates the difficulty in trying to classify the semantic content of a concept which is based essentially on actions. However, it has to be remembered that

[2] See the section on the category labelled *Efficiency and productivity issues*

concepts not only help individuals to classify experience but they are also used to communicate something about those experiences. Therefore verbal descriptions of this kind are the very substance of the concept.

So while there are narratives about rules, there is also dialogue about the conditions or circumstances for legitimately breaking those rules. This includes accounts that refer to the responsibility of the individual, as well as their ability, to recognise and act on those exceptions to the rule (Appendix A-A18). Once again there is this overlap between organisational control and personal autonomy. So on the one hand rules are acknowledged as a limit to personal autonomy, but there is also a dispensation written into those rules, permitting the individual to act beyond the normal constraints of those rules so long as this non-compliance can be justified. In this regard the rules are also a prescription for personal autonomy, as well as a constraint to it. From the data it is clear that the critical feature of this apparent contradiction is the requirement for a subsequent justification of those actions. It should not just be that it produced the safest outcome, but also that it should have been the safest choice of action as perceived at the time of the event (Appendix A-A18). The point is that behaviour is normally shaped by the rules, unless something dangerous is likely to occur by following those rules. Then there is freedom to act in whatever way is decided but the legitimacy of this alternative course of action will depend upon whether the reasoning is sensible. In that situation safety is not just a set of actions, but it also becomes a moral justification for non-compliance.

5.2.4 Standardisation and standard operating procedures

Despite some of the overlapping categories that can be found in the narratives there is, on the whole, a fairly coherent connection between the categories within most of the dialogue. For example, rules, procedures and standardisation often link together when pilots talk about safety. But while rules and standards typically refer to requirements and permissible actions, standardisation is used in a way that depicts harmonisation and invariance. Most examples of this include references to standard operating procedures (Appendix A-A19, A20). These procedures are prescribed by the airline, but are mainly based on the aircraft manufacturer's operating guidance. Because of the technical origins of these procedures they are accepted as valid directives about how to act when operating the aircraft. But there are also cases where there is an implied suggestion that such detailed and prescriptive procedures might actually limit the development of an individual's professional skills, with the implication that this works against safety (Appendix A A20);

> *"most airlines want you to do certain things at certain times with certain procedures (0.5) so it's all very procedural (.) we're not encouraged to explore the- (.) the limits of what the aircraft can do"* **Russell A016, Captain Boeing 737**

By constraining and limiting the boundaries of performance through standardisation the pilots are exchanging some of their personal autonomy for operational consistency. This consistency is determined through the technical parameters set by the airline, the aircraft manufacturers, and the regulatory authorities. But in one or two cases there is a feeling that discretionary judgement is being stifled to the extent that it undermines personal autonomy (Appendix A-A21).

> *"there's a real dumbing down to the lowest common denominator (0.5) so you have the set of rules that cater for the most- (.) if you like (.) benign situation (.) and you therefore remove that sense or perception of being able to make that judgement call (.) even though it is quite clearly stated in our operations manual (.) the commander can do whatever he wants if it's in the interests of safety"* **Aiden A014, Captain Boeing 737**

This use of the term '*dumbing down'* suggests that there is a feeling that technical skills are being eroded, and while the importance of the captains ultimate authority is emphasised, there is a concern from some participants that the spread of standardisation is moving into non-critical areas of the operation. There is no doubt that the procedures are detailed, and many participants describe the precision with which they are executed, and there are many accounts that explain how perfection is sought by flawlessly sticking to the script (Appendix A-A22);

> *"we have a book that is our bible (.) we say exactly what it says=or we should say exactly what it tells us to say (.) and we should do exactly what it tells us to do (.) each minor point (.) and it's to the point of=you know (.) perfection would be saying <u>flaps</u> instead of <u>flap</u> (.) you know (.) that's what guys are aiming for now"* **Charlie A015, Senior First Officer Boeing 737**

So in many cases, rather than complaining about this apparent subordination to the rules, there is a pride in being able to conform to the requirements of what amounts to a distinctly structured operational system. There's a clear sense of professional satisfaction in being a part of a tightly integrated, accurate, and reliable system that achieves safety by minimising variability, reducing instability, and minimising error. (Appendix A-A23);

> *"the checklists are written out (.) and you read them out from the checklist (.) and if you don't get the exact words back you're expecting (.) then you look at the guy and say (.) you know (.) and get him to say the word back (.) so the interactions on the flight deck (.) on the specified parts of the checklist (.) and specified parts of the approach are very formal in terms of the words you have to use are specified"* **Phil A004, Captain Boeing 757**

One participant describes the closely scripted interaction between the two pilots on the flight deck as like a stage play, where the captain says one thing, and then the first officer responds with some action before stating something back to the captain, as if it is all part of a predetermined sequence of events (A-A24). This initially seems as if the crew are like automatons working within this bigger technical system. But their narratives don't come across in this way, because it is more like the precision of a military operation, a coherent collective endeavour that is ever vigilant towards a possible attack from the enemy.

5.2.5 The motivation to comply with standardisation

Standardisation creates high levels of expectation and anticipation. These are vital qualities for producing transparency and facilitating checks, which in turn results in much greater levels of reliability. For example, one older participant recalls the early days in his career when it was the accepted role of the First Officer to effectively assist the captain rather than operate as a member of a multi-collaborative crew. He described how the lack of standardisation meant that as a young co-pilot he was unable to anticipate events, making it difficult to monitor the performance of the flight or check for errors (Appendix A-A25).

> *"one of the things I found (.) when I was a young co-pilot that used to drive me barmy (.) was everybody used to do something different=used to use different procedures (.) different calls (.) different=everything was different (0.5) and so monitoring of the other guy's performance was difficult (.) knowing what was coming next was a real pain (.) if you didn't know what this particular individual was likely to do (.) and that meant (.) without that monitoring it was very difficult to actually enhance the safety of the situation (.) because it was always a bit of an adventure to see what would happen"* **Russell A016, Captain Boeing 737**

It seems that the balance between the use of standard operating procedures (SOP's) and personal autonomy is more complicated than would first appear. The technical basis of these procedures is very well respected, and they provide a consistency of operation that is said to enhance the crews' ability to monitor the situation. So they are generally considered to be an essential component of safety that covers most eventualities, yet there is still an awareness of the need to step in and improvise on those very rare occasions if needed (Appendix-A26). Most participants have spoken of the way that aircraft manufactures continue to engineer their systems to make flying consistent and reliable, and the issuing of standard operating procedures is an extension of this technical process. This technical reliability creates trust in the manufacturer, along with an expectation by the airline that the pilot's actions will conform to SOP's. So the participants speak of having to justify their decisions and explain their performance if any non-standard actions are detected, whatever the outcome. (Appendix A-A27). In this regard, the choice of whether to follow procedures or not appears biased towards acting in accordance with SOP's because of the high level of scrutiny involved in not doing so. But actually, it is clear that most participants follow these procedures because they believe that they are the most efficient and safest way of flying the aircraft. In any case, even though the airline is effectively dictating the pilots' choices of action at every stage of the flight, those individuals on the flight deck are always going to be strongly motivated by their instincts to take a different course of action if it is needed. Nevertheless, the participants' tell us that following an incident or a performance violation, the airlines will usually begin their investigations by looking at the documented operating procedures as their starting point (Appendix A-A28).

Some participants suggest that the airlines themselves have a strong motive to enforce adherence to the operating procedures that have been recommended by the aircraft manufacturers'. The level of expertise that has been involved in developing those operating procedures, from engineers and test pilots to other experts in flight operations, produces a strong legal incentive for them to follow this advice. The implication is that in the event of an accident then liability could more easily be placed on the airline if they failed to operate strictly within the bounds of the manufacturer's recommendations (Appendix A-A29);

> *"if we're operating a jet according to Mr Boeing's procedures (.) and something happens (.) we say (.) well this is Mr Boeing's prescribed procedures (.) sue him"*
> **Chris A021, Captain Boeing 757/767**

A proposition of this nature highlights the role that formal accountability and legal liability can play within the safety concept, further emphasising the structural dimension of the concept. It also demonstrates the link to other safety narratives involving principles of cost-benefit, which underlies all risk evaluations. Generally, the aircraft manufacturer's operating procedures are seen as the gold standard of operating; they can be enhanced, but must not be altered in any way that could be construed as reducing safety (Appendix A-A30). This probably means that performance thresholds and margins of error can be tightened up, or additional checks included, but the technical actions themselves should remain as specified. The suggestion is that the airline feels legally compelled to follow this advice. Certainly, by looking at the documented procedures, it does seem that the airlines mentioned in this study have implemented SOP's that are closely based on those recommended by the aircraft manufacturers.

5.2.6 Checking and monitoring

The use of two pilots on the flight deck cross-checking each-others performance was spoken about frequently. These narratives were placed in the category of monitoring and checking along with other dialogue that described the collection and analysis of flight performance data. Both of these processes are described as routine safety activities (Appendix A-A31, A32);

> *"Everything that we do (.) one person will be flying the aeroplane (.) and the other person will be monitoring (.) and we swap around from flight to flight and sector to sector (.) and the person monitoring is a constant cross-check on the person who is flying (0.5) for example (.) if we're cleared to- (.) if air traffic control clear us to another altitude or flight level (.) the person flying will set the autopilot altitude selector to the level that he's been cleared to (.) and will say it (.) that flight level is set (.) and the other person will look at it and then say- (.) repeat exactly the same flight level to say that flight level is checked (.) from what he's just said to air traffic control on the radio (.) so that there's a cross-check there (.) that the correct thing is set"* **Iain A020, Captain Boeing 737**

Both pilots know in advance exactly what they should be doing at certain stages of the flight. The task has been pre-determined and broken down into steps so that each step can be systematically checked. This is why *standardisation* and *checking* are coherent categories. Indeed, the earlier example describing how difficult it was in the days before mandated standardisation provides a good example of why the link between these two categories is strong (Appendix A-A25). Other examples also illustrate the importance of prior expectations when checking performance (Appendix A-A33).

5.2.7 The importance of limits and margins

When the participants describe the cross-checking of different flight indications and specified boundaries they are drawing on their technical knowledge about the performance margins of the airframe and its various aerodynamic limits. The principle of limits, boundaries and standards thus fits within a technical model of safety that is based on critical operating requirements. There are many examples of narratives that include this notion of optimal performance and margins of error (Appendix A-A34);

> *"Well safety, as an old saying says is (.) safety is no accident (.) and it means operating the aeroplane as safely- (.) in other words as far away from danger as possible (0.5) we have a saying in aviation (0.5) middle of the envelope (.) which you may or may not understand (.) but you don't get near any limits…I always try and avoid working against hard limits=not least because it makes it hard work to operate (.) because you always then have to watch that parameter (.) so if you try and operate in the middle of the envelope (.) that being the flight envelope (.) but it actually applies to many other parameters"*
> **Peter A011, Captain Boeing 757**

This participant makes his point by recalling something he described as an old saying. The statement that "*safety is no accident*" connotes safety as a considered or deliberate act of control in order to achieve an accident-free outcome. He advocates avoiding hard limits to create distance from the point of greatest risk. This naturally draws on the concept of a flight envelope, where the further away one departs from the point of optimal specified performance then the greater the risk. The middle is described as the strongest point of safety, a fairly common way of illustrating risk for this group (Appendix A-A35);

> *"if you visualise the picture of the flight envelope of an aeroplane (.) you know (.) there could be the low speed at one end and the high speed at the other end of the high altitude (.) and all the rest of it (.) and a fighter pilot (.) by the nature of his job is going to keep- (.) he wants his plane to be right at the edge of that envelope (.) so that he gets an advantage over his adversary (0.5) my passengers (.) I feel (.) pay me to keep it right in the middle of that envelope (.) if things start going a bit wrong I'm still in a very strong position (.) I've still got the ability to get a bit out of line but the aeroplanes still going to look after me (.) it's that sort of (.) rather conservative look at it (.) which is at the heart of what makes civil aviation as safe as it is"* **Simon A009, Captain Boeing 787**

This shows that safety is seen as a dynamic technical process involving specification and adjustment; a functional activity for tracking deviation away from the point of a maximum safety and re-correcting to regain stability and control. This principle of feedback-and-control is also the basis for some of the other safety activities that have been talked about. For example, the collection of flight data and incident reports provide the airline with feedback about the operational system as a whole. This information about general performance and behavioural trends, as well as incidents and near misses are analysed, and then suitable procedural or rule changes are applied back into the operation in order to alleviate potential displacements. This idea of margins and limits is therefore one justification for the imposition of rules, if those rules are used to specify optimum performance (Appendix A-A36).

In most cases these safety margins are unambiguous. They use clear and measurable parameters that can be monitored and checked using data collection and technical analysis. These technical methods can look at all the criteria to see if any specified performance limits were breached during the flight (Appendix A-A37, A-A38);

"That's through the entire flight from starting engines (.) basically from the door closing to the door opening (.) all parameters are recorded (.) it's something like a thousand parameters that the- (.) and it records it once every half second or something like that" **Henri A007, Captain Boeing 737**

These criteria are clear-cut. The process of post-flight data analysis checks if each flight operated within the specified performance envelope. But most importantly, this monitoring is accepted by the pilots not as intrusion, but as a useful mechanism for providing feedback to the airline.

5.2.8 The acceptance of performance monitoring

This acceptance is based on the formal social processes that underpin the use of this technology. These are agreed mechanisms for following up on any performance violations, and which guarantee that all the data monitored is used to identify trends and improve aggregate performance. The social process itself involves using a pilot representative as an intermediary between the airline management and the pilot. In this way the anonymity of the pilots is ensured during the investigation process, where the broker liaises with the crew to collect important circumstantial information surrounding the incident (Appendix A-A39). The level of trust in this process seems high with participants explaining that the airlines refer to their response to these non-conformities as "*non-jeopardy*". It is this social process, along with the support given by the airline that gives the monitoring processes its legitimacy amongst the pilot community. A number of narratives outline the social protocol that is involved following a violation of specified the flight parameters (Appendix A-A40);

"everything you do with the aircraft is exceedingly visible because they have (1) well (.) there's flight data monitoring … if you've operated the aircraft in a bad way (.) or like in a non-standard way (.) or in a way that shows decreased safety=if you like (.) then you'll get=there's a certain- (.) there's a certain protocol to follow (.) where the flight data analyst will talk to the union representative (.) who deals with that (.) and the union rep will then phone the

pilot in question and say (.) hey <u>what happened here</u> (.) and generally treat it as a learning exercise (.) make sure that an air safety report is submitted if- (.) you know (.) that would shed more light on the situation" **Phil A004, Captain Boeing 757**

In many airlines the flight data intermediary is a member of the pilots union. This involvement signifies to pilots that the ownership of the data is with their professional group, even though it is used by the airline to monitor the performance of individual aircraft (Appendix A-A41). So this professional control over the data means that there are strict conditions over its use by the airline, and it is purpose is primarily limited to the identification of trends. As a consequence the pilot community are in agreement with the objectives of the airline and are very relaxed about this detailed monitoring of their performance (Appendix A-A42, A-A43, A-A44);

"I genuinely believe (.) in our company we use the flight data monitoring for exactly what its meant to (.) its overseen by BALPA very closely as well (.) but I believe it's used exactly for what it's meant to (.) which is detecting safety trends" **Dave A012, Captain Boeing 737**

However, although this agreement appears to move scrutiny away from the individual, it is still used to pick up on a drift towards bad habits, or a tendency towards careless or rushed operation of the aircraft (Appendix A-A45). It is therefore important that the quality of feedback throughout the airline, either through company communication or recurrent training, is recognised in order to maintain the credibility of the system as a safety tool (Appendix A-A46, E11-E12).

So the overall process of checking is described as a very important aspect of safety. In this regard, the participants reported two primary elements in this process. First and foremost there is the immediate cross cockpit checks done by individual pilots during the flight, and then there is the longer term data monitoring which is fed back to pilot community (Appendix A-A46);

"you've got the two pilots checking each other immediately (.) and then the flight data monitoring system will be checking for something that might have just deviated out of the norm …that's like a third monitor effectively (.) but it's a more long term thing than the immediate thing of the two crew" **Iain A020, Captain Boeing 737**

So aside from its principle safety function in picking up on any errors that occur, one other outcome of these checking processes is the effect that it has on reducing the variability of performances across the group. In this way it improves both the reliability and the stability of the operation. There is this interaction between checking, monitoring and standardisation which works to compresses variability in performance, not only by ensuring compliance with the prescribed limits but also by concentrating the behaviour of individuals through their awareness of being monitored (Appendix A-A47). So if it flattens or narrows the variability of performance across a group of professionals whose levels of experience and ability are naturally varied, then the benchmark has to be set at some point within this variance. The participants suggest that these performance limits are set at the level of the average pilot (Appendix A-A48).

"certainly in criteria like stabilisation, you are looking at where would the average Joe be able to put the aeroplane sensibly- where would the mere mortal human being be able to operate the aircraft, you're not looking at the steely eyed Sky God's who really are really are steely eyed Sky God's, but equally you're not looking at the complete inept, you know, person who's there by the grace of God. You're looking at the guy who's the average pilot. Can the average pilot get in" **Henri A007, Captain Boeing 737**

5.2.9 Specified flight performance and the problems with standardisation

Some experienced pilots argue that these flight data criteria are overly cautious and are too restrictive. Indeed one participant with many years of flying experience said it reduced flying to the lowest common denominator and was deskilling the profession (Appendix A-A49). Nevertheless, these prescribed operating margins exist precisely in order to constrain the pilots' performance. But when it comes to the setting of personal safety limits, and the choices to be made in operating within those parameters, then these will be set differently depending upon the individuals perceived level of control over the task. Experienced pilots have said that they are more likely to spot problems earlier and so they can control the aircraft within a much tighter tolerance. This more finely tuned performance means that narrower margins of error will be tolerated and ones assessment of risk will be more generous, since they are able to understand exactly where and when they can take more chances. In fact, some of the more experienced pilots have been critical of the rigidity of some of the standards and rules, which they argue as being too restrictive. However they do still acknowledge that they are an effective component in safety when it comes to the less experienced operators (Appendix A-A50);

> *"as you get more experienced you can be a little bit frustrated sometimes by the sheer regiment of your operating regime (.) but it is necessary with inexperienced pilots (.) that you work within the company and manufacturers parameters (0.5) it's a little bit like painting by numbers (.) but it undoubtedly does work with crews who don't have any other building blocks to build on (0.5) obviously as you gain more experience (.) you can devise a more comfortable and non-conformal style"* **Peter A011, Captain Boeing 757**

While the various sub-categories that fall under organisational control, such as standardisation, rules, regulatory and management controls, and checking and monitoring form a large part of the narrative content across the whole body of data, other factors concerned with professional ability are also important. These narratives describing how more personal skills and interventions produce safety have been classified into groups of similar categories, which taken together form another significant cluster across the whole data set. All of those narratives form a separate super-ordinate category that has been labelled as *individual autonomy and intervention*.

5.3 Individual autonomy and intervention

This category was derived from narratives that were coded into the following classifications;

(i) Professional competence, ability and experience.

(ii) Personal character and engagement.

(iii) Autonomy, flexibility and resilience.

(iv) Accountability.

(v) Perceptual factors.

These classifications form a collective group that depicts safety in terms of a more immediate and reactive function involving competent individuals who are able to intervene and take control. Each of the sub-classifications overlaps with the others in much the same way as they did for the organisational control category, so it is probably the case that these overlaps are an inevitable consequence of producing hard coding labels from narrative data. Nevertheless, these narratives do form a fairly coherent category describing the various skills, actions, and interventions taken by knowledgeable and experienced operatives in order to stabilise a situation that has moved into areas of difficultly. But these descriptions are usually of problems that haven't been anticipated or they involve failures that aren't initially recognised. So some perceptual aspects of safety are also included within this category. These narratives include talk about the difficulties of recognising emerging complications. It includes accounts describing how personal feelings of control effect safety, as well descriptions about experience and the repertoires of possible actions and responses that have been gained through experience. Another factor that is also included in this section is insight. This concerns the relationship between ability and risk, and as we saw in the last section, it is important because those individuals that have a higher level of experience often feel that they are able to take greater risks. In some cases this creates a misguided perception of being in control, and there are some narratives that recognise this danger and warn that it is wrong to assume that experience is always associated with safety, it can also be associated with risky behaviour as well (Appendix A-B1);

> *"Because I've got a larger amount of experience to bring to bear on any given situation (.) I can see a lot more ways out of it (.) than perhaps the standard route (0.5) now that may lead me (.) for instance to be more risky (.) because I know that I can get out of it (.) but that doesn't stop me from- (.) if I don't appreciate where my own limits are (.) of allowing that risk to develop (.) and therefore suddenly finding that I am out of my depth and we do have a problem"* **Russell A016, Captain Boeing 737**

So the categories of experience, action, and risk perception are all linked. Experience produces a sense of command over events so that the margin of accepted risk can be narrowed. But the narratives also indicate that it is a lack of self-awareness about this danger that is the critical thing. That is to say, it is a personal insight into ones limitations that is of importance to safety. The participants describe this as a process of continual self-monitoring of performance in relation to actions, so that they are always implicitly assessing their sense of control as they edge closer towards the point at which they feel that would soon be out of their depth. It is a topic that again refers to margins, and in this respect is similar to the setting of organisational limits, but it instead refers to personal adjustment rather than organisational adjustments (Appendix A-B2, B3).

> *"know your own limits (0.5) and that philosophy (.) I think is something that you don't necessarily have to have a lot of experience (.) because if you know that you don't have a lot of experience (.) then you know that your limits are small (.) if I could put it that way (.) then you'll fly the aircraft safely"* **Russell A016, Captain Boeing 737**

For many participants, personal insight is more important than technical ability as regards safety. This is because it involves the capacity to accurately interpret the situation and act appropriately. It could therefore be considered as a perceptual process.

5.3.1 Perception, sensitivity and attention

Some narratives describe other perceptual issues that relate to the sensing of problems, difficulties or even things that don't feel right. This sensitivity is said to come from experience, and it is linked to heightened awareness and increased attention on the details of the situation. There are many accounts that describe this as a process of intuitive awareness (Appendix A-B4, B5);

> *"You know there's something wrong (.) but you don't know what it is (.) and it's almost like the hairs on the back of the neck start standing up=it's that sort of thing (0.5) that comes with experience- (.) I'm not happy (.) and years and years and years ago (.) when crew resource management first came in they went in this- (.) I'm not happy=are you happy (.) I'm not happy either (.) why aren't either of us happy"* **Rob A002, Captain Airbus A330**

These narratives usually refer to a sensitive quality about safety. It is an implicit factor that operates at a subconscious level and signals the need for greater attention and more caution. They describe something akin to unease or discomfort and operate in a way that resembles a sort of biological attunement to threats. One participant talks about the perception of risk as an implicit reaction (Appendix A-B6). But this sensitivity probably derives from the personal exposure to the risk experienced by pilots. They are at the front of any accident and know very well that their exposure is what motivates them to be safe and to act in such a way that the risks are proportionate to the level of control that the pilot feels they have over the situation. There are many accounts that point out this personal investment in safety (Appendix A-B7, B8). As one participant stated;

> *"Safety is not just an abstract concept for me (.) because <u>I'm</u> actually on the aircraft…I'm thinking about my own little pink body and I want to try and keep*

that safe (.) and therefore as a result of that I try to keep everybody else safe" **Phil A004, Captain Boeing 757**

This personal exposure appears to trigger a not entirely conscious response when something goes wrong. The participants have described the way they pick up on the subtle cues that signal to them when somethings isn't right. It is described as an emotional response (Appendix A-B4, B5). They talk about how their awareness intensifies so that they become more attuned to the environment. But at the same time there is a rational or cognitive element described by the participants, as they focus their attention on solving the initial uncertainty of the situation (Appendix A-B9);

"it's not just a feeling (.) but there's a number of things that come together that make you start to think- (0.5) so I might use the word's (.) I feel uncomfortable (.) but what I'm doing is thinking about the various factors and scenarios …so you can't separate out the feelings from the state of mind" **Sam A017, Senior First Officer Boeing 757**

These responses describe this subtle perceptual process as a trigger for more focussed attention and analytical thinking. The underlying physiological response is fear and it is recognised that this can inhibit the more rational processes of thought if it were not for the training (Appendix A-B11). There are some accounts that explain how this sensation can hinder safety (Appendix A-B10);

"you're experiencing fear (.) real fright if you like (.) it might be an environmental threat (.) it might be thunderstorms (.) or a really bad problem with the aeroplane technical system (.) and- (.) one of my colleagues calls it monkey brain=because you literally- (0.5) what you were thinking clearly five minutes previously (.) all of a sudden (.) your capacity is absolutely- (0.5) you know (.) your capacity bucket is absolutely full" **Nigel A001, Captain Boeing 757**

But the whole purpose of safety is that the individual should intervene when there is an emergency, so the participants describe how their training provides them with additional skills for use in controlling these natural emotional reactions (Appendix A-B11);

> *"the fear is there and you- (.) but in order to be able to suppress the fear (.) and literally not freeze up (.) you have to have a crutch (.) you know a stick to lean on (.) and that stick is all your training around the human factors side"*
> **Nigel A001, Captain Boeing 757**

So while proficiency is important for safety, it seems that this extends beyond the technical aspects of flying to include conscious control over ones emotional responses. Safety requires intervention that is rational, and this is reflected in narratives that talk about enhancing this ability through training. Some of the narratives illustrate this with examples of how this has actually been applied in real situations (Appendix A-B12).

Narratives of this type place the individual and their problem solving capabilities at the very heart of safety when things go wrong. Other examples explain the sort of techniques that are used to help to focus attention. For example, the use of dialogue and a running commentary on ones actions seems to provide a method of logical detachment that can benefit rational thinking (Appendix A-B13).

5.3.2 The last line of defence

Many examples describe how levels of alertness are stepped up when difficulties are recognised. Much of this is attributed to experience, but the importance of personal ability, good judgement and discretionary control are particularly relevant in emergency situations. Frequently the skilled professional is framed as the last line of defence (Appendix A-B14);

> *"I'm the goalkeeper…the industry is a system (.) so everyone's doing their job (.) the load sheets' being prepared (.) the engineers are signing the aeroplane off (.) and my job is to spot that fast ball coming in at the last minute (.) and catch it (0.5) and hopefully (.) catch it in good time (.) so the earlier I catch it (.) the less dramatic the catch will be hopefully"* **Peter A011, Captain Boeing 757/767**

Stories about this type of professional involvement appear consistently in the data, but as many narratives suggest, the individual has to have discretionary control and that must be accompanied with good judgement (Appendix A-B15).

Because aviation is a very structured environment it creates a general inclination towards procedural conformity, it therefore takes a certain quality to recognise the point at which to break away from those rigid organisational prescriptions and apply whatever discretionary actions are needed in order to rescue the situation. The exercise of personal autonomy in this way is said to be significant because good safety is about recognising that rules don't always cater for everything (Appendix A-B16). However, the judgement and the reason for departing from the rules must be sound, since the rule were applied in the first place to ensure safety (Appendix A-B17)

> *"As a captain you have the authority to depart from the standard operating procedures (0.5) but there had better be a good reason (.) you know (.) you can do it (.) but you need a <u>damn good reason</u> (.) and it's got to be understood between both captain and co-pilot what you're doing and why you're doing it"* **Steve A003, Captain Boeing 757**

The exercise of this difficult judgement call carries a weight that is institutionally recognised. The responsibility placed on the Captain is high. If the decision is wrong the consequences could be catastrophic. It is not just the lives of the passengers and crew it also has financial implications for the airline and all its employees. This is illustrated through the extensive training given and the financial rewards paid to the Captain who makes these decisions (Appendix A-B18). Individual intervention is said to be a vitally important component of safety. For one participant it is the dividing line between safe and unsafe, the critical point at which something is either an accident or a close call. Their positive intervention is the key (Appendix A-B19).

Although organisational safety measures such as SOP's are put in place as preventative controls, it is the flexibility and the resilience of competent and skilled human practitioners who are able to instantaneously monitor and alter the course of events when things don't go according to plan. In a sense, this summarises the two core conceptual categories most discussed in the safety interviews. So, these narratives have been grouped and categorised as either *institutional control* or *individual autonomy and intervention*, but the way that these seemingly contrasting categories are made sense of and are semantically organised has also been established through the analysis of the data. The primary class of narratives that intermediate between these main categories contains dialogue about the availability of information or the predictability of possible causal factors for any situation that might produce an accident.

5.4 Information and predictability

Apart from the talk of standardisation, regulations and rules, there are other narratives that portray safety as an institutional search for threats and hazards. This includes descriptions about past accidents and their causes, and recognised sequences of events, as well as the known impact and origins of past errors and defects. It also contains talk concerning the details of any other displacements that are likely to disrupt normal operations. But in this regard, safety is more than just a process of organisational vigilance and research; equally important are those accounts which refer to situations where there appears to be an absence of useful information. These narratives describe the gaps in procedures, the failures to predict, and the sense of surprise when real incidents take place. All of the participants accounts that refer to these topics, in whatever form, have been grouped together to form a main category labelled *Information and predictabilit*y. It is a category that has been distilled from narratives that were originally coded in the following sub-categories;

(i) Anticipation and predictability.

(ii) Incident reporting.

(iii) Accident causation.

(iv) Risk.

So the contents of these sub-categories are effectively the foundation of all of the narratives collected within *Information and predictabilit*y. It is essentially a category containing dialogue about the presence of information, including details and evidence which is useful for understanding threats to safety, the origins of those threats, and the causal mechanisms or accident aetiology. Much of the dialogue therefore speaks of past accidents, and this is conveyed with reference to accident or incident reports and other published findings about these events. In most cases the details behind these occurrences are reported as objective facts, and some accounts explain this using scientific discourse or technical terms, which give the narratives a definitive quality to them. These narratives are mostly told from the standpoint of an objective observer, which detaches the speaker and positions them away from their own unique experiences, and it places them at an institutional standpoint. These are the main sorts of narratives within this category, but there are also a few examples that speak of the gaps in the available information. So, when there are these other accounts that describe events from a more personal perspective, then these are often linked with talk about the absence of information, with the operation being described as less predictable or more surprising. There is therefore this additional connection from this category, which links to the category termed *Individual autonomy*.

But it is the institutional perspective that is associated with dialogue that speaks of safety with a sense of epistemic certainty, and sometimes these narratives also contain an underlying theoretical structure to them. It is thus the presence of information, data, and all the details about the operation that gives the concept the propositional content through which relationships between each of the parts of this knowledge can be established. In this way theories are produced which give the concept some sort of structure to hold it together. But whether these theories or systemic connections have been worked out implicitly through the individuals' activity and their immersion within their professional environment or whether they are derived from scientific discourse is not wholly clear. But we can see through their narratives that there is evidence of scientific discourse and the use of technical terms to describe certain aspects of safety (Appendix A-C1);

> *"it's what we call the proactive safety and the reactive safety (.) because there are two types really (0.5) the proactive (.) which is the one we really want (.) proactive safety is the one that can foresee possible or potential issues (.) and set up the rules and the procedures to avoid them"* **Pascal A013, Captain Boeing 737**

This proactive component refers to a process of anticipation, where potential problems are predicted and the possible points of failure are dealt with through changes to procedures or updates to the system. It appears from the narratives to be based on a model of safety that views accidents as sequential events that follow a trajectory through time. This gives it its predictable character which leads to this proactive philosophy.

5.4.1 Theories of accident causation

The most commonly described theory of accidents, are composite sequential models, where events are said to begin with latent failures at remote organisational levels, moving through time and social space in an increasingly critical direction towards front line operational activities. It has been described as an error chain, and there are often references to cascading problems that line up over time like the holes of a *Swiss cheese.* This particular description and the terminology used, derives from a scientific explanation developed by James reason (Reason, 2000). Of course, other academic safety theories, accident models and risk management practices are used as functional resources during the planning and design of aviation operations, but it is this particular model that is most often referred to in the participants' narratives (Appendix A-C2, C3, C4, C5, C9). There is therefore this influence from the scientific literature, which disseminates down into the way the actual activity of safety is understood. The following example illustrates the use of this model to explain how concurrent problems produce the conditions for an accident (Appendix A-C2);

> *"Accidents never ever happen because of one thing (.) one causal factor (.) it's a combination of factors (.) and you can liken it to five or six slices of Swiss cheese (.) all with the holes in (.) and when the holes line up (.) that's when an accident will happen (.) you know (.) there's always something there to catch you- (.) to prevent the accident from happening (.) but occasionally all the holes in the Swiss cheese will line up (.) and that's what happened in- (.) with the Air France aircraft in the South Atlantic"* **Steve A003, Captain Boeing 757**

This explanation of how congruent failures combine to create a composite cause is used to explain past accidents like the Air France AF447 accident over the Atlantic Ocean. It is based on a visual image, where the operation is viewed as a sequence of concurrent actions, each of which is represented as a separate slice within the whole event. Each slice in the system is represented as a layer of defensive opportunity, from the back end to the front line. But if those defensive layers contain flaws or holes, like the holes in a Swiss cheese, then these can align together to create an imaginary pathway through which problem or errors can progress towards the sharp end. These problems eventually reach the last line of defence, but if there are flaws at the front end then they can pass through to become a critical failure or accident. This model implies that the various causes of an accident follow a linear progression through a series of discrete events, each of which could have averted the impending accident if these flaws could have been predicted and corrected (Appendix A-C3);

> "*it's a well-known picture (.) where the guy sliced one of those Gruyere type Swiss cheeses…and every accident that you look at (.) once they've eventually analysed it=it's not normally one prime cause (.) any number of effects that have built up (.) it's gone through all the holes in the Swiss cheese and they've all lined up (.) and so the protections that you've got in the system have suddenly not been there"* **Simon A009, Captain Boeing 787**

This model was widely referred to by this professional group as a framework for understanding how accidents occur. So it is an explanation, which has been developed through past academic research into accident causation, and it has been given back to industry as an explanatory visual model that now shapes the way this professional group conceptualise safety (Appendix A-C4);

> *"So these holes in the Swiss cheese do occur (.) now hopefully they don't all line up on an individual day"* **Matt A010, Senior First Officer Boeing 737**

Safety is about avoiding an accident, which means that it is seen as an ongoing process of identifying these defensive weaknesses (Appendix A-C5). This image appears to motivate individuals to look out and report anything that might be described as a defensive weakness and it suggests a reason why data monitoring is welcomed and why there is support for incident reporting, even when the incidents have involved personal error.

5.4.2 Incident reports, human error and the Swiss cheese analogy

The objective seems to be to identify weaknesses in the system, particularly mistakes. This requires individuals to be candid about their own performance, and the participants are clear about this. They describe how the collection of information in this area requires a more general acceptance of human fallibility, so that details about the circumstances and causes of error can be known (Appendix A- A-C6)

> *"The thing is though (.) <u>everybody makes mistakes</u> (.) the trick is to catch the mistakes (.) before the individual mistakes made in different parts of the organisation=or different parts of the system (.) all line up (.) and create the conditions for having an accident (.) you know (.) there's always- (0.5) if you read an accident report (.) there's always a chain of errors and contributory factors and things like that (.) and if one of them wasn't there (.) then the accident would have been averted"* **Phil A004, Captain Boeing 757**

Dialogue that talks about the detection of human error describes it as a natural progression in this ongoing search for the potential causes of an accident. As the reliability of aircraft equipment has advanced with improved design, and there is more knowledge about possible failure paths along with better training to deal with these problems, the search then for possible causes has shifted towards gaining a better understanding of the human component (Appendix A-C7, C8);

> *"as the science of aviation has progressed (.) technically the aircraft are 99.9% reliable now (.) they very (.) very rarely fail catastrophically…it's now the personal and human failures that are causing this still high accident rate"* **Rob A002, Captain Airbus A330**

Removing the failures that come from the human aspect of the operation are thus seen an important part of the safety concept, and they are understood by the participants through the framework of the Swiss cheese accident model. This then appears to orientate individuals towards a more self-reflective approach in the collective search for possible causes (Appendix A-C9)

> *"So these holes in the Swiss cheese do occur (.) now hopefully they don't all line up on an individual day (.) and thankfully on the vast majority of flights across the world that obviously doesn't happen (.) but there still is things that get through some of the layers of cheese (.) and if they're not being picked up and fed back to the company then obviously they know no different"* **Matt A010, Senior First Officer Boeing 737**

The participants thus describe this relentless pursuit of information in order to identify possible causes. Those possible causes are understood to be hazards or threats to safety that need to be resolved. But these triggers or circumstances that pose a probable threat to safety will have a degree of likelihood attached to them, and so what they are effectively talking about are risks (Appendix A-C10).

5.4.3 Risk evaluations

The main process of operational risk detection is not generally performed at a local level, it is said to mainly function at a much higher level than the individual (Appendix A-C11);

> *"We have a risk register with the safety review board (.) they look at all the things that are occurring (.) and they look at the most common things that are occurring and try to then drive down into (.) why (.) how (.) and then how to fix"* **Aiden A014, Captain Boeing 737**

According to the participants, it is the function of a more specialist team, as part of an organisational process, who actually evaluates those risks. The main role of the individual is then to feed the information into that system (Appendix A-C12). At the organisational level, what the narratives describe is a formal process involving a calculation based on scores for the probability and severity of the risk, and the use of a formal matrix is used to compute the value of each risk. It is a representation of risk as a value-free data-driven process of measurement, yet it is effectively based on causal inferences based on judgement. However, despite this some narratives do contain roundabout references to the judgement involved (Appendix A-C13). Once a risk has been identified, and it is established to be of a sufficient magnitude that it warrants defensive action being taken against it, then an appropriate response will have to be found within a certain timescale (Appendix A-C14).

> *"There is a formalised risk assessment matrix where it's the likelihood times the severity (.) and its assigned as (.) you know (.) a score (.) and then if the product of that is- (.) reaches a certain value (.) then they have to take action to mitigate it within sixty days (.) or within (.) you know (.) thirty days (.) or immediately (.) you know that sort of thing (.) so that's the sort of formalised procedure for that (.) but the trick really is to get people to report the problems in safety terms (.) if you like (.) on the non-operational side of the airline"* **Phil A004, Captain Boeing 757**

When this evaluation of risk is seen through the framework of the Swiss cheese model, the purpose of this activity becomes translated as a search for the holes in the system. At one level there is this basic process of linear causal attribution, looking for front line dysfunctionalities, but the Swiss-cheese model provides a much broader emphasis, drawing in activities and events throughout the wider organisation and beyond. This includes long standing systemic problems that are sometimes referred to as latent failures. These are more difficult to identify because of the indistinct relationship between the cause and the effect. Problems are nominated as candidate issues that ought to be on the risk agenda and some of the participants describe these sorts of remote physical or social issues in their narratives (Appendix A-C15);

> *"it could actually be something that causes harm over a long period (0.5) something that maybe is a stress (.) that would potentially put that person (.) or that thing at risk further on down the line (.) and so if you're continually working earlies (.) that might put you at risk of being fatigued …then potentially further on down the line (.) all the Swiss cheese holes could line up (.) and we end up with a real problem"* **Henri A007, Captain Boeing 737**

These examples illustrate how the concept of risk links to other possibilities. In this case, it is both a genuine concern about the way fatigue can trigger a sequence of causal events and also a rhetorical tool for addressing local concerns. Within the data there are many narratives involving risk that question the balance of organisational assessments in these matters and there is frequently a tension between the airline's commercial objectives and the legitimate safety purpose of risk control;

> *"They look at the risks from a different side of things (.) and there (0.5) risk is likelihood of the event (.) you know(.) not many aeroplanes crash (.) in the grand scheme of things (.) but the potential reward to them is more important (.) and that's the financial reward (1) to some of these airlines (0.5) so no doubt that=that=that balance (.) between safety and commercial (.) could quite easily*

go towards the commercial aspect without regulation in place" **Mike A005, Captain Boeing 757**

In many cases the concepts of risk and safety are often used interchangeably during normal discourse. The participant defines organisational safety as a balance between the ongoing risk and the pursuit of commercial objectives. This point is about the cost of safety and it distinguishes those narratives that talk of risk as an objective assessment and those that describe using a more explicit reference to the utility of its cost and benefit. The following are illustrations of this more pragmatic assessment;

> *"The perception of safety for the man on the Clapham omnibus (.) and corporate concept (.) as in (.) airline management perception of safety (.) they're going to be quite (.) quite different (0.5) the airline management is probably going to be looking much more at things statistically (.) they're probably going to have=just like the military does- (.) though we probably don't broadcast it (.) an acceptable level of risk for a number of things"* **Russel A016, Captain Boeing 737**

> *"So it is trying to minimise the risk for the appropriate level of expenditure I suppose (0.5) so to me (.) in an ideal world (.) money would be no object to meet training requirements (.) design requirements (.) those two requirements to protect life (.) however (.) the reality of the world is (.) it's what people are prepared to pay for (.) or give up (.) or risk (.) to achieve what they want to achieve"* **Jamie A018, Captain Boeing 737**

Safety is frequently described as the minimisation of risk. But this means that in an absolute sense of the word safety will be the end point at which all possible actions to reduce risk have been exhausted. This is something that, according to the previous narrative is only ever achieved in an ideal world. The reality is that it requires some general agreement on how to collect information on the causes of an accident, how to classify the data, and a motivation to invest in and develop suitable defences. In most cases the causes of air accidents have been very thoroughly investigated and widely disseminated. There is also a notable consensus amongst the pilots interviewed for this study as to the sort of model that is most effective for explaining how accidents happen. They also appear to freely submit to organisational control over the safety process and are able to identify with the system of recurrent searching for weakness and variability and then operational adaption. However, there is a point at which many narratives depart from these portrayals of predictive operational pathways and describe instead the ambiguity of real failures. In these cases the safety discourse shifts away from the activities of the organisation to emphasise the role of the individual.

Other occasions when the individual is prioritised as a significant part of the safety definition is when the discourse tells of disagreements between the informant and the airline over the balance between commercial objectives and the resolve to reduce risk. The following category contains many narratives that describe these conflicts.

5.5 Efficiency and productivity issues

This category contains quite a lot of dialogue about commercial pressures and production targets. In an interview that is asking about safety, it seems that these are cautionary narratives that are warning about the risk of such pressures. This is probably not surprising since the process of discursive action often involves the use of contrasts. But this is a category that has quite a lot of overlap with the risk category. Indeed, in one sense *efficiency and productivity issues* could be classified as one of the many threats or hazards that could actually be subsumed within the risk category. However, there are so many narratives about this that it warrants being classified as a separate category on its own. It also has some unique characteristics because it is not only seen as a risk but is also a category that includes narratives about the tension between front line professionals and managers with individual pilots pushing back to yield control over safety in many areas to the airline. Most illustrations seem to relate to two specific operational areas. They involve disagreements over the airline's decision to set their margins at levels which the participants argue is too hazardous. The two most common examples of this refer to the amount of fuel that is loaded as a contingency and the amount of rest and flight duty time that pilots are required to take. Many of these accounts are warning of the dangers of taking too many competitive risks involving cost savings in critical areas. These narratives typically outline why higher regulatory controls and localised personal autonomy are necessary for both limiting and challenging organisational decisions in these areas. The role of individual pilots, and their responsibility for overruling organisational directives when they feel that their own sense of personal risk has been exceeded, is frequently stated. There are many narratives citing these sorts of production pressures as being some of the biggest risks within the industry (Appendix A-D1). Within critical environments like aviation, what might otherwise be a viewed as an operational target naturally carries a much heavier burden of responsibility because of the severity of the consequences when things go wrong. Conflict can also arise from the pressure to get the job done if a decision has to be made to abandon or modify these tasks when difficulties arise. The competition is fierce but the stakes are high. As we saw in the risk category, the balance between cost and benefit is often mentioned because of the compromises that have to be made (Appendix A-D2, D3);

> *"it's a balance of commercial responsibility I suppose (.) against the risk (.) so if it's very minor and it's acceptably within the boundaries I don't see there's an issue (.) but if there is clearly a risk issue (.) then I would challenge it (.) so if it were something that the company felt was ok to accept and go with (.) and I didn't feel happy (.) then I would say so"* **Jamie A018, Captain Boeing 737**

It is a typical example of how individual pilots see their personal responsibility for challenging questionable decisions if they are thought to be too risky. This is justified, not just because of the motivation to avoid dangerous situations from arising, but also because local judgement is better than remote analysis if the circumstances vary, and pilots will make their decisions based on the most current information. This also includes appreciating the commercial demands (Appendix A-D4);

> *"you're always having to balance what is a (.) commercial pressure with (0.5) and commercial pressure is <u>real</u> (.) you're balancing that against the probability*

of a situation arising (.) so (.) on a really nice day when the forecast is done (0.5) and we knew what we'd planned to bring back to destination would be the flight planned fuel (.) but on a day when it's likely to be fog (.) or there's likely to be thunderstorms (.) and we think it's likely that we're going to have to hold for a little bit (.) and that everybody's going to get held up (0.5) then we would take extra fuel (.) and we make that decision (.) there and then on the ground" **Sam A017, Senior First Officer Boeing 737**

So the participants are aware that the pressure to meet objectives will always be there, but how this is felt and dealt with depends on the individuals own level of self-confidence. Most participants say that pressures don't affect them, but they do have an effect on others (Appendix A-D5).

5.5.1 Decisions related to cost and safety

Many narratives describe how the setting of safety margins, like the margins for fuel reserves, can directly cost the company money. For the airlines, fuel is therefore a major commercial cost that is under continuous analysis. The managers look at this as a variable cost and try and manage it remotely, since taking excess fuel increases weight, and this in turn will mean that more fuel in needed for the flight. But individual pilots see this as a pressure on them to take short cuts that create more risk (Appendix A-D6, D7, D8, D9);

"when you put fuel on a plane it costs you fuel to carry it because it has a weight (.) so they encourage us to take-off with absolute minimum amount of fuel to get to where we're going" **Chris A021, Captain Boeing 757**

"the company would like us to take less fuel all the time (.) they always want us to take less fuel (.) that's what companies do (.) all commercial aviation companies are like that these days" **Sam A017, Senior First Officer Boeing 757**

So when there is talk about safety, it includes a lot of dialogue about who makes the decisions and the motives that influence those decisions. In some cases people find that resisting these pressures is a battle, particularly when institutional safety limits are relaxed. When this happens there is, in reality, a hidden reliance on safety through personal intervention. The regulator would normally place legal constraints on the airline, but some participant's complain that this form of control over the industry is being weakened when it comes to things like fuel contingency (Appendix A-D10);

> *"well commercial pressures are always there (0.5) we've just had a new change to our procedures that I'm reading up on now (.) as to how much fuel we can take (.) they've cut back <u>fur</u>ther on the fuel that we're allowed to take …the company have got the civil aviation authority to <u>agree</u> that we can cut that back to <u>three</u> percent"* **Steve A003, Captain Boeing 757**

It shows that there is a political dimension to safety, and there is a suggestion that the airlines lobby the regulator to get them to reduce regulatory constraints, which in this example is to do with the minimum legal fuel requirements. Now the *institutional control* category contained narratives about the regulators role in structuring safety by setting the legal standards for the airlines, but the narratives in this section follow this up by explaining why this is important. There is therefore this close connection between these two categories (Appendix A-D11);

> *"I think having a regulator (.) an <u>external independent</u> regulator(.) I think is a good thing for safety (.) because the airline's all driven about money (.) obviously it's a very costly business (.) airlines (.) and I think sometimes the regulator would- (.) can push them into doing things which are good for safety but which aren't necessarily good for the economics of the airline (.) so I think having a regulator is a must"* **Phil A004, Captain Boeing 757**

So there are these expressions of support for the rules set by the regulator because they are seen as limiting some of the more aggressive commercial threats to safety. This curbs the power of managers, and in this regard it has some influence over where the balance of control over safety lies between managers and professionals. This is relevant because there are also narratives which raise objection to interference by the airline management in decisions that are felt to belong within the professional domain of airline pilots. Sometimes these narratives involve speculation about how cost and safety decisions are being made further up the organizational chain (Appendix A-D12);

> *"experience tells you that often (.) that's <u>not</u> a safe amount of fuel (.) but they seem to have this spreadsheet again (.) it's a spreadsheet mentality which say's (.) if we reduce the amount of fuel (.) on every flight (.) to this amount of reserves=they put it in the spreadsheet (.) and they show that they can save (.) I don't know (.) a hundred kilo's or two hundred kilo's every flight (.) and they do the same mathematics (.) and <u>bingo</u> (.) they save (.) you know (.) two million litres of fuel and a million pounds worth or whatever (.) and I get the distinct impression that this counts towards ((laughs)) their bonuses (0.5) I don't know that's correct (.) but this is how it's perceived from where I'm sat"* **Chris A021, Captain Boeing 757**

These are narratives that are really about the division of labour and the struggle for control over critical aspects of the operation. They are manifested in these safety narratives as challenges to the management about their motives. For example, there is some speculation about the use of underhand techniques for controlling fuel upload behaviour. It is explained that the process involves planners calculating the most efficient fuel levels for the anticipated flight conditions. But legally the Captain has the final authority to modify those levels on the day. However, some have suggested that subtle methods are used to bias personal decisions towards conformity with what the airline wants in terms of commercially relevant actions. For instance, suspicions have been voiced about the publication of fuel efficiency league tables because it invokes a competitive mind set (Appendix A-D13);

> *"for instance there's a <u>league table</u> type of thing (.) of who takes the most fuel and who doesn't take the most fuel (.) who's the best at saving fuel and money*

and (.) that can backfire because you sort of get into a sort of competition mind-set" **Ron A019, Captain Boeing 737**

Other examples show how some commercial pressures tap into some people's anxieties about being monitored by the airline management.

5.5.2 Social pressures to conform with management decisions about safety

Crews know that there is the recording of flight data and this generates an implicit concern about systematic surveillance in other areas, creating suspicion that individual productivity is also being discreetly monitored (Appendix A-D14, D15);

> *"It's very subtle=it's very subtle and it's very interesting (.) I mean for example on the fuel policy- (.) so the company- (.) what the company will say is it's monitoring something (.) so the company will say (.) you know (.) we want everybody to take flight planned fuel unless they've got a good reason for taking more (.) and we want you to account for every bit that you take over and above (.) so that's kind of good (.) and people will say- (.) you know (.) people- (.) if you ask (.) nobody will say that they've been rung up and challenged about the amount of fuel they take for places (.) <u>but</u> there is a sense of being watched that has changed over the time that I've been with the company (.) because fuel has gone up and is massively more expensive (.) and all airlines are far more conscious about the cost of fuel than they used to be"* **Sam A017, Senior First Officer Boeing 757**

> *"eventually you start reducing the amount of fuel you're putting on because of the nagging (.) you know ((laughs))"* **Chris A021, Captain Boeing 757**

Some of these fears will be linked to changing social conditions within the industry. For example, recent increases in zero-contract employment for pilots, lead's to anxiety about exercising discretion in a way that runs contrary to what the airlines would like (Appendix A-D16, D17);

> *"they're on zero hours contracts most of them (.) and if they go contrary to the company (.) it would seem in almost any respect (.) the first thing that happens is they have a month's roster with nothing at all on it (.) therefore they earn nothing"* **John A008, Captain Boeing A320**

> *"if people don't extra fuel when the weather is particularly bad (.) and there are extra risks (.) and they're doing that because they're afraid of a letter they're going to get from their fleet manager (.) that isn't very safe"* **Simon A009, Captain Boeing 787**

Despite these strong but very implicit commercial pressures, there is also a suggestion throughout the data, that it is individual pilots who actually produce safety by closely evaluating the local circumstances and resolutely resisting demands that they believe are unsafe (Appendix A-D18);

> *"the only thing that stops that becoming a real hazard to our flight safety is the fact that the Captain's look at the fuel and think- (.) no (.) I'm not going flying with that thank you very much (.) we'll put more on"* **Chris A021, Captain Boeing 757**

Along very similar lines to this is the question of fatigue and its effect on performance, and therefore its impact on safety. Most of the narratives on this topic describe the airlines pursuit of increased productivity through maximising flying hours and reducing rest times (Appendix A-D19);

> *"when we argue that it is fatiguing=or it's not safe=or its unfair (.) the answer that we get nearly=invariably is (.) but it's legal (1), so it doesn't actually matter whether it's safe or not (.) it's legal"* **Russell A016, Captain Boeing 737**

In this example, the participant is suggesting that when it comes to definitions about safety, there is this distinction between documented rules and legal directives, and what is meaningfully accepted as being safe in practice. In this case there are contentious disagreements about the risk from fatigue because it is linked to different costs and benefits for the different interested parties. At the time of the interviews there were some regulatory changes taking place that would allow the airlines to increase duty times. The airlines had already introduced computerised rostering systems, and this had produced more efficient use of pilot resources, resulting in some increase in their duty time to the absolute maximum allowable (Appendix A-D20);

> *"flight time limitations are changing under EASA ((European Aviation Safety Agency)) (.) if you go back to the CAA ((Civil Aviation Authority)) ones (.) the CAP 371 ((CAA document)) (.) <u>that</u> was designed as sort of like a <u>book</u> (.) and it was never designed to go to all the limits (0.5) and I think over the years (.) with computerised rostering (.) computers have obviously worked out ways and patterns to push things more to all the limits (.) so now you're bouncing off all the limits (.) so what will happen is you'll get something- (.) or you'll get a run of flights (.) and you'll look at it and go (.) oh (.)I know that's going to be fatiguing (.) or knackering (.) but actually within the bounds of the rule book (0.5) it's within the <u>rules</u> (.) within say five minutes"* **Jamie A018, Captain Boeing 737**

Under these circumstances safety becomes a competing value judgement, because the risk is differentially balanced. For the airline, commercial gains offset the risk of an accident but for the pilots the balance is tipped even further negatively in the cost-benefit equation. For them, the likelihood of an accident through fatigue-induced error is higher, the social cost of increased working hours is higher and they're only indirectly connected to any benefit. So the risk is contentious because the beneficiaries of the gain are not the same as those exposed to the costs. It seems logical that pilots would include this particular example as part of their safety narratives, but whether this is rhetorical or not is difficult to establish. In any case, the point is that safety has a social dimension, and safety can overlap into social categories such as industrial relations for example (Appendix A-D21). This means that the pilots union does get involved in safety issues, and it provides some support to the individual's in their continual struggle with challenging what are perceived to be risky commercial decisions. Certainly the individual needs this support in trying to resist the natural tendency of the airlines to increase their commercial value, particularly if the regulatory safeguards are being reduced in the way that some of the participants describe. Indeed, the overall level trust in the regulatory authorities generally appears to be diminishing. This is because the very low accident rates in aviation have motivated some airlines to negotiate with the regulator over their proposals to change some of the rules, and this seems to have aroused a degree of suspicion amongst some pilots that the regulator is getting too close to the airlines (Appendix A-D22);

> *"My personal feeling is that the authorities work hand in hand with aircraft manufacturer's (.) and the airlines (.) and I don't think they have the right balance between safety and efficiency (.) I think they're looking at efficiency a little bit <u>too much</u> (.) and they're <u>definitely</u> more reactive than proactive (.) so they will push it as far as they can (.) they will try to cut out as much fat as they can (.) until something happens that reveals that this was the wrong thing to do (.) and then they back-off (.) and we've seen that in the United States"*
> **Pascal A013, Captain Boeing 737**

So, on the whole, commercial objectives are seen as a major threat to safety. But some narratives instead suggest that safety is actually maintained because of commercial incentives. These narratives highlight how that the cost of an accident and all the effects that this has on public confidence can severely damage the business (Appendix A-D23, D24);

> *"there's nothing quite so crippling <u>financially</u> (.) to an airline as a crash (.) crippling financially (.) you know (.) it's- (.) serious accidents finish airlines off …because as soon as the flying public gets the idea that that airline is <u>not</u> safe (.) for whatever reason (.) they don't fly with you (.) so all of a sudden you've got these very expensive assets (.) and no one's using them"* **Simon A009, Captain Boeing 787**

> *"if people <u>don't</u> think you're safe (.) then (.) you know (.) you'll lose your market and you'll be out of business"* **Phil A004, Captain Boeing 757**

So these are incentives for investment in safety measures, but they depend on how comfortable the airlines feel about existing safety levels and it depends on their degree of anxiety about the possibility of an accident. It has been suggested that the industry's record on safety is sufficient enough to motivate airline managers to take a more relaxed approach with safety, shifting the balance of risk in the direction of reduced operating margins to pursue financial gains from these conditions (Appendix A-D25).

A large degree of confidence in the current safety levels is said to be down to the progress that has made by the aircraft manufacturers in developing technologies to improve reliability (Appendix-D26). Many of these measures are technical or engineered solutions that have been designed into the aircraft. But there will naturally be attempts by the airlines to use their investment in this updated technology, to find longer term productivity gains. As flight operations become routine and reliability is improved, and as the accuracy of aircraft and pilot performance is also improved, then this will drive attempts to re-calibrate operational margins in line with these changes. This will inevitably result in a continual adjustment, and readjustment of the margins, through the system of feedback that is in place. In most cases the participant's describe these commercial pressures in cautionary tones. But they also articulate the importance of the regulator as well as the individual in pushing back against these organisational threats to safety.

5.6 Collaborative and functional activities

This category comprises those narratives which describe organisational activities that are aimed at enhancing individual autonomy. They are accounts of systemic processes or organisational structures designed to boost individual competence. It also includes discourse about activities for improving human interaction between individuals and their technical interfaces at the front-line. This main category is comprised of a smaller group of the following similar sub-categories of dialogue;

(i) Training and feedback.
(ii) Teamwork.
(iii) Human factors.

The provision of a structure for formal training is a common topic found throughout the data. It is an area that links in very closely with issues relating to personal ability and professional competence (Appendix A-E1). But it isn't just professional skills that the participants speak about; it also includes specific training in the recognition of problems, as well as practice for emergency situations. There are also narratives describing the importance of training in human factors, which is taught to new recruits right from the beginning of their career (Appendix A-E2, E3). Training in the development of these non-technical skills is therefore an important component of safety according to the data. These are various social, behavioural and cognitive skills useful for improving the reliability of human actions. The suggestion is that these are skills that are planted and grown from the bottom up. It is widely accepted that mistakes are normal human characteristics which should be acknowledged.

But training in these sorts of soft skills, which are known as Crew Resource Management (CRM) training, is mandated by the authorities, even for very small airlines. However, there are some suggestions that the quality of this training is not universal. So although it is a regulatory requirement under flight crew licensing regulations, it can either be done very well or it could be delivered in order to just meet the requirements. But there are many explanations of how this training is given by some of the airlines used in this study (Appendix A-E4, E5). In most of these examples, a collaborative format for this training is used as a means of strengthening the co-operation of the crew. It is a unifying objective that is stated in many accounts and the importance of people working as a team is explicitly linked to safety.

Personnel are classified as vital parts of the whole operational system, and so the functional coherence between the aircraft and all the crew members is important for reliability and thus the avoidance of errors or wrong actions, particularly when dealing with an emergency. It has been suggested that people are considered as a resource whose individual abilities should be combined into a single problem solving entity, and the CRM training is a part of this (Appendix A-E6);

> *"the training in this crew resource management is really to treat everybody as a resource (.) the first officer (.) the cabin crew (.) air traffic control (0.5) the engineers on the end of the phone back at base (.) you know (.) in operations (.) as a resource to- (0.5) if there is a problem (.) to use those resources to solve the problem and come up with an appropriate response (.) appropriate actions"* **Phil A004, Captain Boeing 757**

Another aspect of CRM, which often appears in the narratives, is the way in which it improves co-operative functioning in flight. In this regard it is used to organise the social relations of crew members by re-defining the authority and status of the Captain as a facilitating executor rather than an authoritarian commander (Appendix A-E7);

> *"you know it's a team game (.) although I'm a captain (.) you know (.) its- (.) there's not a- (.) there shouldn't be a really big gradient= authority gradient (.) between myself and the guys sat on the right and seat"* **Phil A004, Captain Boeing 757**

This relationship is shaped through training in order to achieve this shallow authority gradient between the Captain and other crew members. This encourages communication and co-operation, but it requires continual evaluation, and in some cases organisational intervention is necessary to make sure that the desired relations are structured in this way (Appendix A-E8);

> *"I think the CRM aspect is now embedded so heavily into the airline that (.) you know (.) we get six monthly simulators (.) and we get annual=perhaps more of-*

ten (.) line checks (.) where you- (.) you know (.) line checks is where do a normal flight with passengers (.) and you have an instructor watching your every move (.) checking your compliance with SOP's (.) and how you interact with the crew (.) and everything else like that (.) so you know- (.) the actual scoring system for the line checks (.) and also for the simulators (.) has CRM included in those (.) so you know (.) if you're not coming up to scratch on the CRM (.) then you know they're going to do something about it (0.5) re-training (.) or counselling (.) and things like that (.) so although there are guys that like the prestige of being a captain and feel they deserve respect (.) they don't necessarily bring that to their (.) sort of work persona if you like (.) once they're on the aircraft.
Phil A004, Captain Boeing 757

So these behaviours are carefully shaped through training and monitoring so that they are enacted by front line personal as part of their normal operational repertoire. Quite a number of narratives describe how formal organisational activities, like the provision of training and the use of interventional actions, are used to influence individual behaviour in this way (Appendix A-E8). So there is a connection between the categories of *Institutional control* and *Individual autonomy and intervention* that are linked through the activities described by narratives contained within the category of *Collaborative and functional activities*. These activities form a structure that operates downwards on the individuals as a collective group. But equally, this connection also moves in the other direction. For example, there are personal encounters with problems that are fed back into the organisation for wider dissemination through training (Appendix A-E9). So there is a natural overlap of dialogue about the organisation's structural process and individual and collective experiences. What in some cases is described as a distinction between organisational control and individual control often involves collaborative activity involving the interchange of information in both directions. One example is in the way organisational knowledge about individual incidents or errors across the airline, which have been fed into the system by separate individuals, is then collected and given back out to everyone as composite information for wider learning across the group (Appendix A-E10);

> *"we've probably got getting on for fifty or sixty aircraft all over (.) plus (.) you know (.) the wider group airlines as well (.) where you can't make all the mistakes yourself (.) but if you learn from everybody else's (.) then you're not going to make them (.) but you've got to promote it (.) and the company have to- (.) it has to come from the company first"* **Charlie A015, Senior First Officer Boeing 737**

In this way individuals not only learn from their mistakes, but this learning is amplified by pooling everyone's experiences and disseminating these insights widely through a structure of feedback and training (Appendix A-E11, E12). So there is an ongoing reflective process of feedback and training. But it is a process of reflection that occurs at an organisational level.

While some of the narratives in this category were originally coded under a *training sub*-category, others were coded as *teamwork*. But through a process of comparison of all the content of these various coding categories, was the emergence of a common theme. This was that all of these sorts of dialogue expressed a *collaborative and functional* aspect with the safety construct.

5.7 Safety as control, stability and reliability

The categories outlined in this chapter were derived from individual narratives about safety. This drew on the participants' portrayals of their activities and socio-technical transactions within their professional environment. Safety is a concept that centres on the core category of control but although the purpose of this control is rarely stated explicitly it is very clear that the intention for this group is to avoid an accident during flight. As we saw, the participants often referred to formal structures of institutional control involving regulatory standards, licensing rules and other legal prescriptions as well as organisational systems and processes for standardising operating procedures and checking and monitoring performance. But the narratives also revealed how the locus of this control sometimes shifts between levels from an institutional or organisational level to the level of the individual. Where these descriptions positioned control with the individual, the narratives were typically about professional competence and personal technical ability, emphasising the importance of skilled and experienced operators who are able to recognise and react quickly to emerging problems. The mediating factor between these two levels of control was the availability of useful information for predicting potential problems and the sense of certainty about future events. Where there were descriptions of routine and regular sequences of events, consistent actions, engineered systems, and stable or invariant standards of performance, then these narratives described a high degree of information with the dialogue often denoting a high level of certainty about the possible actions available. Past incidents were recalled and explained with reference to particular models of accident causation. Risk was normally described as an empirical process involving data collection and calculations of probability and severity. When the dialogue moved within this category of information and predictability then the discourse represented safety as an activity of institutional control for maintaining order, stability and reliability. Other cases included dialogue recalling the uncertainties of real unfolding events, or the ambiguity of information during non-normal situations. These narratives were evident when the focus of the story changed from a more general aviation-wide footing to more specific individual accounts. In these cases the discourse appeared to alter qualitatively, changing from an objective depiction of the larger organisational system of safety towards a more subjective rendering based on their unique personal experiences and exposure at the sharp end. These examples were usually accompanied by a shift in the locus of control away from institutional agency to the individual and are reflected in the use of narratives about professional competence, personal involvement and individual autonomy. This change in perspective may signify an adjustment in the participants' orientation as they act to construct their narratives about safety within the research context. So, on the one hand the story centres on an idealised certainty of information, drawing on a technical process of operational intention, the collection of data, the prediction of outcomes and adjustment of procedures. In this case the participant aligns himself with this prearranged model of systemic safety, and the speaker is positioned as a representative of the aviation industry. Control is thus voluntarily handed over to the organisation as the participant more closely identifies with these superordinate agencies. On the other hand a more subjective orientation is produced when the participant recounts their own particular experiences of dealing with non-routine situations or when they identify collectively with their professional group to describe the skills and abilities needed to take the difficult decisions required to fulfil their legal and professional obligations as the commander of the aircraft during flight. Organisational control in these circumstances is contested and the narratives centre on the need for individual autonomy. This position is most noticeable when they are expressing disagreement with organisational decisions that seek to erode critical operating margins for commercial gains. In these circumstances the participants define safety in terms of individual intervention, highlighting the tension that exists between the airline and front line pilots over their differences in evaluation of risk. Risk is a significant factor in the category of information availability comprising assessments of the various costs and benefits of each alternative course of action. But what is categorised as a cost and what is deemed a benefit will depend on the values of each particular social group. Once the probability of an accident is below a certain point, and the link between cause and effect is disputed then the risk becomes a matter of social dispute. We can see this in these findings because the narratives categorised in the efficiency and productivity code feed into discursive acts that verbally seize control away from the organisation and prioritise professional discretion. In these cases the need for more regulatory controls over organisational decisions is also argued.

But this apparent dichotomy in relation to the locus of control is not always present; there are also instances in the dialogue where control co-exists with collaborative arrangements between the organisation and individual front line pilots. These narratives tend to describe functional behaviours such as training, team-working and communication. They involve organisational direction with the intention being to empower individuals at the front line so that they are able to operate flexibly and resiliently as autonomous crews in non-routine situations. In essence safety is described as a fundamental process of control over outcomes whether it is through the use of a proactive set of actions involving the collection of information, the prediction of probable events, and the specification of procedures and processes, or through a reactive contingency involving resilient responses by individuals in order to stabilise events and restore control.

In summary the core category of control is fundamental to the safety concept for this group although the locus of that control can shift between institutional and individual levels depending on the degree to which circumstances are said to be predictable and the certainty of risk is high.

Chapter 6

The Medical Concept of safety

6.1 Introduction

In aviation, the concept of safety is essentially about the avoidance of a crash, and as we saw from the narratives of pilots in the last chapter, this primary objective is the foundation for sets of social activities, which are reconstructed within consciousness as a well-ordered system of institutional control for; (i) identifying the causes of accidents, (ii) defining suitable individual and collaborative behaviours conducive to the transfer of information, (iii) defining and monitoring acceptable performance limits, (iv) and for specifying the boundaries for autonomous action. It also includes an ad-hoc conception of extemporaneous individual control based on experiences of real events not fitting the more idealised category of institutional control. The question is, whether this conception has some universal qualities to it, or whether it is a unique construction based on the collective social experiences of the participants within this professional group. To be receptive to a top-down implementation of systemic safety interventions, it follows that the safety concept must include a degree of understanding about safety that will accommodate these interventions.

A separate analysis of the medical narratives was carried out to see if the medical profession held any similarities within their concept of safety. Would there be enough correspondences between the two concepts so that some of the institutionally structured safety processes that have been so successful in aviation could be combined with existing medical conceptions. In this chapter we shall review the grounded theory analysis of the data from the medical sample in the same way as we did for the aviation group earlier in order to produce a model that illustrates the safety concept for this group. These two models will then be compared in the next chapter.

To begin with, some numerical information concerning the sample and associated transcribed data is reported as follows; 20 interviews were carried out with hospital consultants in a range of different specialities across two NHS trusts comprising of a total of 5 hospitals, the average interview duration was 47 minutes, and the average transcript was 68,897 words or 14 pages in length. The table below outlines the raw data for each interview and its associated transcript.

No.	Description	Time	Duration / mins	Words	Pages
H001	Consultant Physician - Endocrinology	0:38	38	4878	9
H002	Consultant Vascular Surgeon	0:30	30	4661	10
H003	Consultant Radiologist	0:23	23	3811	9
H004	Consultant Orthopaedic Surgeon	0:28	28	4395	10
H005	Consultant Interventional Neuro-Radiologist	0:40	40	5788	12
H006	Consultant Anaethetist /Medical Director	0:44	44	6761	13
H007	Consultant Paediatric Neurologist	0:48	48	7689	15
H008	Consultant General Surgeon HPB	0:45	45	7261	14
H009	Consultant Urologist	1:06	66	8635	21
H010	Consultant Paediatric Intensivist	1:04	64	8546	25
H011	Consultant Paediatrician	1:00	60	9881	24
H012	Consultant Physician - Geriatric Medicine	0:41	41	7044	21
H013	Consultant General Surgeon HPB	0:45	45	6087	11
H014	Consultant Cardio-Thoracic Surgeon	1:02	62	9610	16
H015	Consultant Paediatric Cardiologist	0:34	34	4114	8
H016	Consultant General Surgeon Lower GI	0:52	52	8458	13
H017	Consultant Emergency Medicine	0:55	56	10172	17
H018	Consultant Orthopaedic Surgeon	0:42	42	5744	10
H019	Consultant Orthopaedic Surgeon	0:40	40	6329	10
H020	Consultant General Surgeon Lower GI	1:09	69	7913	13
Totals		15:26	927	137,777	281

Table 3: Source data for GT analysis of medical safety concept

The initial open coding pass of all 20 transcripts produced 153 categories, containing a total of 2,181 references. Each of these categories and their references were then reviewed in turn and related to each other as part of the process of axial coding. Each reference within each of these initial categories was typically re-read within the context of its original section of the relevant transcript to establish relationships between each of these various categories. This lengthy procedure resulted in an abstraction of the initial coding categories by combining these as sub-categories, along with their references, into sets of higher order linguistic coding categories. This produced a more parsimonious coding set. These 35 meaningful categories were then re-examined for further refinement. Successive passes during this axial coding phase eventually created nine main categories describing the primary content of the whole body of data in terms of the participant's expressed consideration of their concept of safety. The core category of clinical success was finally established through a further process of selective coding by examining the main categories and their contents and with reference to the various tentative theories built up during the coding process. Table 2 shows the product of the selected coding phase with the number of references for each core category.

category	Refs
Clinical Success	1142
Avoidable problems	674
Bureaucratic output	313

Table 4: Core categories and references

This list of core coding categories indicates the salience of each topic, but it is the relationship between each of these categories and their sub-categories that tells us more about how the concept fits together as a collective means of understanding within the group. Part of the ongoing process of Grounded Theory coding involves the writing of theoretical memos and in order to produce tentative theories about what is going on within the dialogue. These theories are recurrently tested against the data during the activity of coding. The final process of selective coding takes the evolution of these ideas and uses it as a theoretical framework to develop the core categories and their relationships. Figure 1 outlines the resulting conceptual model of safety for the medical sample;

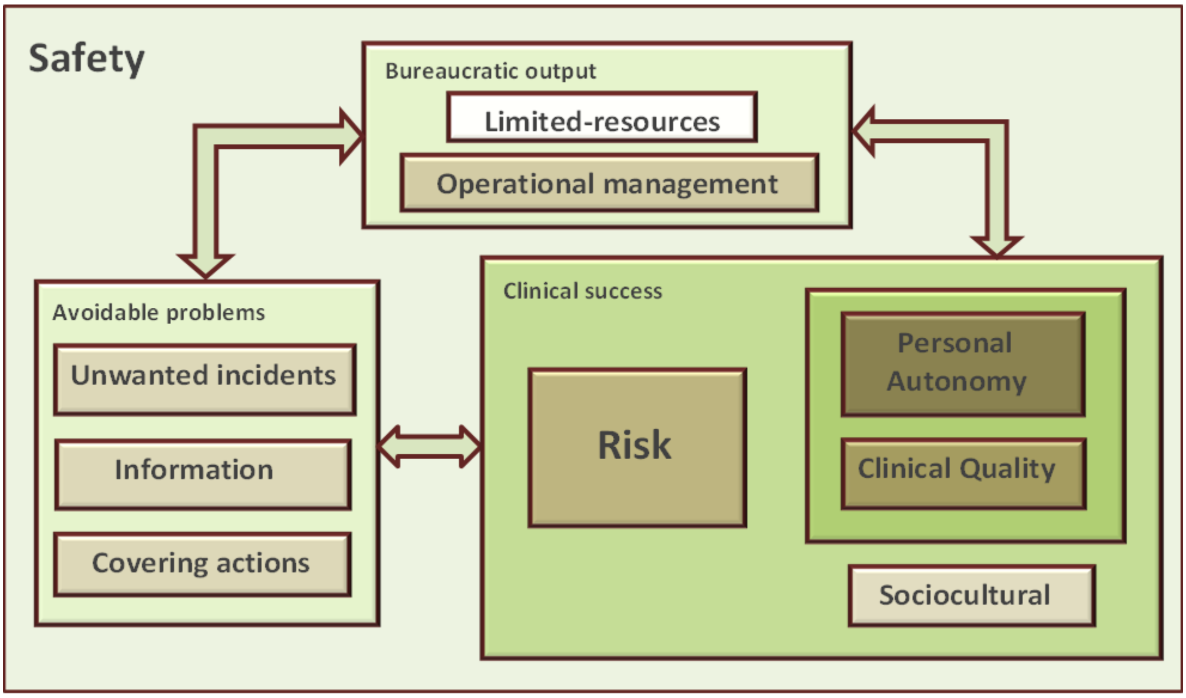

Figure 4: Main conceptual categories and their relationships

This illustration provides a visual depiction of how the various designated coding categories link together. The core categories contained within the larger shaded boxes contain their various sub-categories presented in smaller boxes. The degree of shading reflects the amount of dialogue recorded within this category. So, the darker the shading, the greater the number of narrative references in that category. The graphic shows how the sub-category of personal autonomy contains the greatest number of references within the data (415), followed by clinical quality (289), risk (280) and operational management (256). The sub-categories of unwanted incidents (238), information (226) and covering actions (210) are also important narrative categories along with sociocultural (158) and limited resources (57).

The important aspect of safety from the point of view of the clinicians interviewed in this sample is that while patient safety is considered to be important there does not appear to be a clear delineation of safety. It is generally defined as one element within the wider context of the patient's clinical experience and the successful outcome of their treatment. The cornerstone of safety dialogue for this professional group is the category of risk, which is a central feature of the primary objective of clinical success.

As the analysis will show, there is a great deal more uncertainty within the clinical setting and each case has to be individually evaluated. The various factors that go to make up the risk category mean that it requires a balance of specialist judgement, and this is expressed throughout the data. This is very closely tied to narratives about personal autonomy and the need for professional competence, accountability and a sense of clinical duty, not only to the individual patient but also to future patients, with the provision of the next generation of clinicians and the innovation of new treatments being included as topics within the safety discourse. It is clear that a large part of what is being communicated is about clinical quality and the balance of multiple risk elements in this area. What might intuitively be considered to be the central category in any safety construct, the issue of unintended harm or avoidable problems, are recounted as one aspect of a more central concern with clinical process, and this serves the core category of *clinical success*. The risk of an unwanted occurrence during hospital treatment is one factor within the overall balance of risk, and any covering actions to alleviate such adverse events seem to be weighed against their potential impact on wider clinical objectives. While there is dialogue that refers to these types of adverse events, it is often accompanied with narratives outlining in some detail, the difficulties that exist in creating the right information for assessing causality and disentangling those events that could be avoided from the inexorable complications which sometimes occur due to the uncertainty of existing medical knowledge. Several respondents have described the complexities of both data collection and interpretation, and despite a proclaimed recognition of the importance of accountability as part of safety, any practical implementation of such measures is described with cautionary language. For example, the measurement of clinical performance using statistical data is typically cited, with the problems of identifying suitable indicators, and the setting of meaningful limits for small sets of data being described as just some of the difficulties inherent in both the operationalisation and administration of such schemes in specialist clinical areas. Of course, these issues naturally overlap with narratives about clinical quality and personal autonomy, although for simplification, in the graphical illustration they are shown to one side of the core category of clinical outcome.

Healthcare operates within the reality of finite resources, and although there is an acknowledgement of this in some of the narratives, it is generally referred to as an implicit part of clinical quality and as a factor in the balance of risk. It is categorised as part of the bureaucratic output but it is only a small sub-category compared to the factors coded in the operational management category. Although this includes narratives about guidelines, pathways, and procedures, very few of these protocols are actual directives. Instead, they are usually documented guidelines concerning best practice, which in many cases have been formulated by clinicians at varying levels of oversight, ranging from the local clinical area up to national bodies such as NICE (National Institute of Health and Care Excellence). However, within a hospital setting there is no single operational objective other than the successful treatment of the patient, and the natural diversity of clinical services creates a huge variation in the many specialised activities required to meet this very broad based remit. It explains the high level of importance placed on the personal autonomy of consultants and their teams for ensuring the safety of their patients. For this reason, operational management is categorised as a bureaucratic output rather than a form of operational control, and there are a number narratives which even suggest that this output can create interference with local safety attempts. So, while personal autonomy is described as a primary theme for clinical success, the focus on patient safety within these narratives offers up the inclusion of dialogue referring to both culture and the need for multi-disciplinary collaboration in order to achieve good outcomes. This sociocultural aspect is included in the core category of clinical success due to the overlapping nature of the narratives but it also links with the issue of avoidable problems. In the following sections the various categories within this overall safety conception will be reviewed in more detail with relevant narrative extracts illustrating the main points.

6.2 First, Do No Harm

When they were confronted with the question asking them what safety means, quite a few participants responded by saying something about them not doing harm to the patient (Appendix B A1-A4, A7). In using these words they were suggesting that safety is fundamentally a personal obligation or a duty to avoid any action or any deed that results in harm to the patient. In a few cases the wording used was quite specific;

> *"doing no harm (.) that's what it ((safety)) means (1) how you achieve that I suppose is a bigger question (.) but it terms of what it means (0.5) it's ensuring that at all times (.) that in terms of patient safety (0.5) that their safety (.) is not compromised in any way"* **Charles, Consultant Orthopaedic Surgeon**

It seems a natural response to cite the avoidance of harm, which fits in with what could be considered as an almost universally understood sense of the word safety. It agrees with what might best be described as the surface meaning attached to that word. But when we look deeper within the data to examine exactly what is meant by harm, how it is defined, and what actions are appropriate in order to avoid harm, then the picture becomes a little more complicated. It is only then, that the social meaning of the term safety becomes apparent, and it is precisely because there is a specific pattern of situated behaviour associated with that particular linguistic symbol, that the concept is given a particular sense. This is what distinguishes *safety* as a concept or recognised category, from the actual word. For this professional group the phrase *'do no harm'* has a particular cultural significance attached to it. The origin of the phrase is even cited in one of the narratives (Appendix B A3) although it may be slightly inaccurate compared the original wording[3]. The Surgeon, who referred to this phrase included within his narrative, an example of what it means to *'do no harm'*. It is an example that he has constructed. It tells of acting only within the limits of one's speciality, keeping within the boundaries of medical competence, even when in life threatening circumstances (Appendix B A3). This necessity to understand the limits of expertise in order to avoid harming the patient through misadventure is as much about trust as it is about safety. It is part of the social contract between the doctor

[3] The phrase is not present in the Hippocratic Oath, although a similar phrase is translated as; "I will keep them from harm and injustice". The actual phrase "first, do no harm" comes from 'The History of Epidemics", which is part of the Hippocratic corpus. See John Hopkins Sheridan library page on bioethics; http://guides.library.jhu.edu/c.php?g=202502&p=1335752 accessed 19/3/2016

and the patient, and it surrounds the issue of trust that is so fundamental to this relationship. Even though the patient has most likely suffered, or is already suffering from harm as a result of their disease process, the doctor has a duty not to *make* their condition worse because some action on their part. It is an example of one of the effects that culture has on people's conceptions. In this instance, the oath is part of a personal pledge, and the personal responsibility that it signifies also reinforces the professional status of the practitioner and their duty to act as fiduciaries in their relationship with the patient. The centrality of the patient-doctor relationship becomes more evident when the cultural significance of this phrase is understood. But it also aligns the meaning of safety very closely with issues of competence and professional obligation, and this will become more evident as we explore the findings throughout the chapter.

The data is also filled with narratives that are ultimately posing the question of how this objective of safety is to be achieved. For example, in the narrative shown above, the participant says; *"doing no harm (.) that's what it ((safety)) means (1) how you achieve that I suppose is a bigger question"* (Appendix B A4). The significance is clear from the assertion that it is a bigger question than the one asked by the researcher. In a way it emphasises the more practical focus occupying the participants

It also hints at the many risks involved in modern healthcare. The nature of these risks and the difficulties involved in trying to identify and then evaluate them is a major theme within the data which will be examined in greater detail at the end of the next section. But it is generally recognised that many of these risks originate from the hospital environment. For example, the following narrative is also a response to the opening question;

> *"I only work within a hospital environment (.) but we recognise that (.) that environment carries numerous risks for patients (0.5) and understanding those risks (.) and trying to control them (.) and minimise them as much as possible (0.5) contributes to patient safety (.) or lack of it (.) so it- (.) I suppose it's really understanding the risks that the patient is exposed to at each step of their journey=their sort of pathway"* **Miles H020, Consultant General Surgeon**

The environment is emphasised, and it hints at a disclaimer suggesting that his subsequent response will be limited to this environment. This is almost an implicit statement about the situated nature of safety. But note also that the patient's treatment is described as both a journey and a pathway (Appendix B A5, A7, B5), which creates an image of a sequence of events, or a progression through distinct medical encounters. This is the treatment environment which, according to testimony is provided by the clinician (Appendix B A6). It follows their evaluation of the information they have about the patient and their condition, and the various possible options that are available to them and it is along this pathway that the various risks will distinguish themselves at each point where there is opportunity for some type of harm to occur as a result of this intervention (Appendix B A2). The consultant suggests that his role is to understand and control the many unstated risks that could present themselves to the patient as they go along this treatment path. So, the patient enters and begins to use the service and there is this stated objective of improved health (Appendix B A6). But there can be set-backs along the way and it is claimed that safety is about reducing the risks to the patient as they go along this journey. The participants admit that this involve the reduction of personal errors (Appendix B A7). This again re-emphasises the importance of professional competence and the ability of medical staff to perform whatever diagnostic and treatment activities are required.

However, it is also the suggested that safety isn't just about doing things right, and avoiding faulty actions, but is also about ensuring that the things that need to get done, actually do get done (Appendix B A8). In other words, for this group, an in-action or the absence of something, is classified as an error;

> *"its errors of commission (.) errors- (.) and errors of omission as well (0.5) I mean you can- (.) you can commit an error (0.5) but if you don't do something (.) it has the same impact on- (.) in terms of safety"* **Richard H009, Consultant Urologist**

Now, we are used to the non-existence of harm being a part of the definition of safety, but it seems that the non-existence of action could also be included in this definition if it hinders the patient's journey. Indeed, this aspect of safety seems to be particularly important for the medical profession who frequently refer to the presence of this continuous background risk to the patient (Appendix B A8, D1, D19), which is waiting to be discovered, requires treatment, and will cause harm if nothing is done. Safety is therefore tied up with an ambition that also includes controlling the disease and its natural progression. It is a purpose that depends on making correct decisions regarding medical diagnoses and treatments. But it also depends on the efficiency of processes for handling the clinical journey of the patient so that clinicians can recognise and arrest the pathology of the disease in the quickest time possible. It is expressed as necessitating the timely and appropriate interventions required and as involving the careful balancing of risk at each stage of the treatment (Appendix B A9). Ultimately the purpose is to produce an improvement in the patient's condition, and this objective was very clearly expressed in response to the opening question;

> *"patient safety (.) essentially- (.) I mean- (.) means (.) when they come=when they use our services (.) they- (.) their- (.) whatever interventions or treatment they require (.) results in an improvement in their condition (.) and no adverse consequences of our intervention (.) so that we provide an environment (.) in which they can achieve the maximum potential health (.) with no adverse consequences from being in that environment"* **Gerry H010, Consultant Paediatric Intensivist**

He is saying that patient safety is about the result, or outcome, which should involve health improvement. This corresponds to the professional obligation to minimise harm because of the patient's illness. In this respect, it is outcome that is the primary concern, with safety as a sub-set of this objective. Indeed, this is what one participant said as part of their initial response;

> *"reducing harm is probably the most important subset of achieving any outcome (.) because morally that's the most important thing (0.5) somebody*

comes to me broken (.) the bare minimum I can do for them (.) is not do any further damage (0.5) so actually (.) therefore that is the definition of safety"
Ramesh H017, Consultant Emergency Medicine

It illustrates the principle focus on the outcome, but it also refers back to the moral responsibility of the clinician not to further harm the patient. So there is a sort of distinction between overall harm suffered by the patient, and harm that results from the hospital environment and the actions of the clinicians in deciding the course of that environmental pathway. But as we have seen in some of the opening responses, safety can be thought of either as a subset of the overall outcome, which is to do no further harm, or the minimisation of patient harm in total. Whatever, definitions may be ascribed to safety by the academic community it seems that when talking about safety as a concept, the participants in this study talk of safety in terms of the former much broader definition. This highlights the way safety is bound up with the many difficult decisions and potential harms that can occur during the patient's engagement in the clinical setting. In particular, the decision-making of the consultants, and their evaluations of the risks associated with the different treatments options available, are notable aspects of this. The following sections will examine selected themes within the main categories identified during the analysis of the whole body of data, and naturally some of the dialogue will refer back to the points made by the participants in this opening section.

6.3 Clinical Success

It is perhaps unsurprising that there is this primary concern with clinical outcomes in the medical sample, since this is the whole point of the doctor and their relationship with the patient. Furthermore, the complexity of the human body and our incomplete understanding of all the different biological and physiological processes mean that the achievement of a successful outcome requires considerable scientific knowledge. This explains why there is quite a bit of dialogue concerning the competency of the doctor and the requirement for clinical autonomy so as to ensure that overall patient harm is minimised.

6.3.1 Uncertainty, variability and professional autonomy

This sub-category contained narratives describing a set of related themes that were all broadly associated with professional autonomy. These included descriptions about personal duty, accountability, status, and individual discretion, amongst other things. But the majority of narratives coded under this label were about medical uncertainty and the need for localised decision makers with specialist knowledge, expertise and experience (Appendix B B1-B15). As is usually the case, most narratives overlap and move between categories as the discourse develops, for example shifting between topics of uncertainty, specialist knowledge and personal accountability (Appendix B B4). But it is the uncertainty that surrounds medical practice that is central to many of these narratives. Usually, this theme emerges when the participants talk about variation between individual cases, the way this influences their evaluation of risk, and the personal doubt that can surround these situations. So, things like the patient's general health, their particular condition, the various risks attached to the many possible treatments and their likelihood of success, are expressed as problems of uncertainty that have to be solved (Appendix B B2). If there is limited time available, this can also increase the pressure to act quickly, which further limits the degree of thoroughness that can be applied in collecting and assimilating all possible information about the patient;

> *"often you make a best guess (.) but actually (.) often you don't know the answer for sure (.) you just have to try and do it as best you can (.) in the circumstances you're faced with (.) often at very short notice (.) often in a state where you don't have much time"* **Andrew H002, Consultant Vascular Surgeon**

Much of this expressed doubt derives from the limits of current scientific understanding about biological processes and the way they combine or interact under different conditions. It is, as the participant describes, a best estimate which can only be based on whatever evidence is available. But the evidence is often lacking, and this is something which is also expressed through dialogue that talks about possible treatments, drug choices, guidelines and protocols (Appendix B B3, B4).

> *"I think for a lot of our patients (.) there's zero evidence (.) or there's the evidence of prolonged experiences (.) about as good as it gets=or there's pooled evidence (.) anecdote essentially (.) we use that"* **Olivia H015, Consultant Cardiologist**

In this context the absence of significant and substantive information involving; scientific data, the results of clinical trials, or any other treatment validations, mean that decisions are often based on anecdotal evidence, personal experience and clinician preferences (Appendix B B3). It is easy to see why the clinicians making these decisions declare that it is important to have the right sort of knowledge, be sufficiently experienced, and possess a reasonable degree of confidence, not only when prescribing treatments but also when monitoring progress and recovery (Appendix B B1, B3, B4). One example of this refers to the importance of specialist knowledge for detecting subtle prodromal signs of change in the patient's condition (Appendix B B1). In the same narrative, the participant describes a scenario emphasising the importance of the consultant's expert opinion, and of their availability to junior medics in sharing that knowledge.

But the participants are talking about patient safety in their interviews, and although there is this direct reference to treatments, and the concern with patient outcome, there is also the point being made that proscriptive guidelines or specified practices are frequently unsuitable in these circumstances because of this requirement for local clinical judgement and personal subjectivity (Appendix B B3). Part of the reason for this lack of solid evidence about best practice relates to the changing state of medicine, which is constantly evolving as new treatments and clinical procedures are being developed. Many of these new treatments are advanced by practicing consultants, who combine their clinical role with research into these innovative methods for treating disease. It is a point that is nicely illustrated by the following narrative;

> *"the problem with evidence in medicine (.) is (.) that evidence (.) is good only if you are performing medicine at an average level and below (1) if you go above that (.) the evidence has not been created yet (.) if you do unique procedures (.) and if you do procedures which are still parts of trials or anything (.) and if you have that sort of patient (0.5) the evidence has not been created yet"* **George H014, Consultant Cardiothoracic Surgeon**

By this definition, good medicine involves practice that is advancing new treatments and is pushing the boundaries of current knowledge. This again emphasises the importance of expert practitioners in possession of current *state-of-the-art* knowledge, and the ability to use that knowledge to generate new ideas and improvements to existing treatments. It is a description of unique actions, suggesting there is a dynamic nature to the safety concept. If the practice is constantly changing, then the potential for harm and the various risks must also be changing as well.

But the operating theatre and the hospital clinic is also a training environment, where this expertise and the required specialist skills are passed on to the next generation of doctors. This is recognised by the participants as a necessary part of the long programme of training and preparation that is required before these future specialists are allowed to practice autonomously (Appendix B B16). Although the participants are open about the risks involved in allowing these specialist trainee's to practice on patients, the deferred benefit is that future medical provision is secured. In this regard, patient safety is said to involve the specialist management of this risk by the consultant, in addition to the various treatment risks that are specific to each patient (Appendix B B16, B17). In some narratives, the participants refer to this aspect of the consultant's role to illustrate how their specialist knowledge and experience defines them as the principle authority when it comes to their particular specialisation;

"the traditional medical model is as an apprenticeship model (.) our people have a degree (.) they come and work as a team (.) they become an apprentice (.) and they learn from the master=and the consultant is always right"
Ramesh H017, Consultant Emergency Medicine

In this narrative (Appendix B B10) the participant is explaining how the relationship is structured between the trainee and the consultant, so that the particular techniques and methods, and expert knowledge are almost beyond question. In recent times this model has changed somewhat so that each trainee will learn from more than one consultant, but the point is that the image of the eminent and practically infallible expert-practitioner gets reproduced through socialisation;

"you just get indoctrinated into this school (.) and then you have this- (.) and then you set up these lofty standards for yourself that (.) I will never fail (.) I will be one hundred percent right (.) I will always do the right thing" **Ramesh H017, Consultant Emergency Medicine**

This creates a standard that is impossible to achieve, and when seen within its cultural context, the burden of this disconnect between the image and reality becomes apparent. The traditions of the medical profession, with its emphasis on personal responsibility and fiduciary duty could bear down on the individual in cases where there are patient safety failures unless the burden is diffused within the whole group. Some of the accounts that speak about dealing with the emotional effects when things go wrong are discussed later in the chapter. But returning to the narrative explaining how the apprenticeship training model operates, there is another point that is being made in this statement. This concerns the transfer of the skills, mode of practice, and particular style preferred by the consultant teaching the speciality. So these methods are internalised as *the* correct way to practice, and are based on the belief that the consultant, who is the source of this esoteric knowledge, must always be right. It is another source of the variability within this professional field, and might also contribute towards the difficulties that would have to be overcome if more standardised procedures were to be considered. But consider some of the dialogue that illustrates the different choices available to clinicians;

> *"surgery is still an art (.) or a craft (.) and at the end of the day (0.5) if you were to try and cut something right (1) you could use a knife to cut it (.) You could use energy to cut it (.) you could use energy as in electro-surgery (.) you could use harmonic to cut it=I do keyhole surgery where (.) when you have electricity going through someone the potential risks (.) though low (.) are there (0.5) but you sit down and choose what's the most cost effective way depending on your philosophy"* **Sunil H016, Consultant General Surgeon**

Even simple tasks like making cuts in surgery, can involve different techniques, and because of the highly skilled nature of the work, it is only natural that in order to ensure that they achieve the best results, clinicians will naturally select the particular methods that they feel most comfortable with. As the data shows, medical practices like surgery are often described as a type of craft, so it is entirely sensible that variation between clinicians is normal. When there is this level of variability in the environment, then the relationship between cause and effect can often be obscured by the ambiguity this creates. It is under these circumstances that the image of infallibility described in the earlier narrative (Appendix B B10) can be sustained for long enough to become part of the structure of social relations between medical staff. This ambiguity may also relieve some of the burden of responsibility described earlier, because without any standardised sequence of events linked to an action-outcome relationship, then the idea of an error becomes relative only to the intent behind that action. It is easy to deny, even to ones-self, the exact causes of a particular failure;

> *"<u>what is right</u> (1) unless you're measuring what you're doing every time (.) against the outcome (.) you cannot track whether you're right or wrong (.) so it's a mistaken notion (0.5) secondly (0.5) I will never come to an error=well <u>actually</u> (.) your errors are as good as your recording of what errors they are (.) in a follow-up of what you are doing (.) and what are your indicators for*

deciding what is an error (1) there is no standardisation on that" **Ramesh H017, Consultant Emergency Medicine**

It is an important point, which is examined in much more detail when the dialogue categorised as *avoidable problems*, is analysed later. But, where there is this level of uncertainty within the environment it reinforces this dependence on the professional autonomy of a local specialist. Yet, in that same example, there is this dilemmatic turn, where the participant acknowledges the fallibility of human behaviour along with the admission that there are good days and bad days (Appendix B B10). So not only is there variation in practice, but also variation in individual performance over time. Some narratives even illustrate how differences in people's character can influence their judgements (Appendix B B8), so people who are naturally more cautious will behave differently to those people who are less risk averse.

At this stage it is also worth referring to other dialogue that describes the progression of medical knowledge and the innovation of new treatments because this also creates a diversity of treatment choices. This variation also occurs when in some cases people develop their practice, whilst others remain working in more traditional ways. (Appendix B B11, B12). However, in an environment that is constantly evolving in this way, the participants claim that there is a responsibility to continue their professional development and keep up to date with the latest advances in medicine (Appendix B B18), or at the very least ensure that they have access to knowledge about the latest advances in medicine (Appendix B B11). In a way, this goes back to the principle of, *errors of omission,* where it is said that a failure to act in some way ought to be considered as a safety violation in those cases where there is harm to a patient because of this inaction. So if a new treatment is available for a condition, and the consultant doesn't know about it when they ought to have done, they have contributed to an avoidable harm to a patient. But the dilemma is, that the more cutting-edge the treatment, or the more recent the research about a particular physiological process, then the more tentative the results and the greater the risk attached to that treatment. So there is this trade-off between the use of more established and robust methods with a lower risk, and the newer techniques which could produce better results but with a greater risk. But there are other factors too, because the more innovative option also includes the prospect of medical progress and the corresponding benefit to future patients;

> *"If you take laparoscopic surgery as an example (0.5) when laparoscopic surgery came in (.) twenty years ago (.) a few general surgeons went from here to the States (.) to watch somebody who'd done (0.5) maybe (.) ten (.) or twenty (0.5) and came back (.) and started doing them=and our bile duct injury rate went up (0.5) but everybody took it on (.) because the perceived benefits to the patient looked good"* **Tim H013, Consultant General Surgeon**

In examples like this one (Appendix B B13), a retrospective evaluation of the costs and benefits is outlined in order to demonstrate how short term risks can be traded for a longer term gain. Of course in this example the technique is now well established, but it could have been argued, when it was first introduced, that the safety of these patients' undergoing the trials of this procedure was compromised because of their exposure to the increased risks. These are difficult issues surrounding the evaluation of risk, and narratives that talk about these issues are covered later in the chapter. But the point that followed from this particular narrative is that it demonstrates the problem of simply evaluating risk using predetermined processes or procedures without consideration of all of the details needed to make a proper informed judgement. In the narrative the participant speaks of stock bureaucratic processes involving things like mandatory mentoring, and these are framed as potentially inhibiting progress and it is this progress, towards the creation of ever improving outcomes that is given some value by the participants when they speak of patient safety (Appendix B B13, B14). However, the point about future innovations has two sides to it, and other narratives further illustrate how the uncertainty surrounding medical knowledge can create outcomes that unintentionally harm patients (Appendix B B15). The examples given show how the side-effects of new drug treatments can take years to emerge, and for this reason initial risk judgements require very careful consideration.

When there is both uncertainty and variability within the environment, then it is important that people making judgements under such conditions are able to learn from any mistakes or set-backs that occur as a result of this paucity of information. This is another point that is sometimes made by the participants;

> *"if there's been an intra-operative (.) perioperative death (.) major complication (.) most people will analyse=go through (.) look at the case in detail (.) is there anything I could have done differently=should have been done to- (.) different"*
> **Graham H008, Consultant General Surgeon**

It is a process of self-reflection that is said to be an important factor in avoiding any repeat of the mistakes that may have been made because of the consultant's inexperience with that particular set of circumstances. It is clear from the data that this 'self-correcting' of one's performance is vital, because in a lot of cases, the clinical decisions being made are often obscured from any form of external scrutiny (Appendix B B19). Even colleagues sharing the same specialisation cannot be sure why certain clinical decisions have been made, unless they've had access to all the same information about the patient as it unfolded during the clinical process. The onus is therefore on the consultants to self-monitor their own performance (Appendix B B7). But they also go much further than this to suggest that it is actually an essential aspect of patient safety, not just for learning but also in understanding where the limits of ones abilities are;

> *"being competent to do something is one thing (.) but it's also about having insight as well (0.5) so there are people (.) who may be incompetent (.) but they have insight into that incompetence (.) and so they know=it comes back to what I said about knowing their limitations"* **Christopher H011, Consultant Paediatrician**

It extends the definition of professional competence to include this self-awareness or insight into one's ability and knowledge of where one's limitations are. As the narrative above suggests, an incompetent clinician may be safer than a competent colleague if they have the insight to know when they are beyond their capabilities. Having this awareness of when it's not appropriate to intervene resonates with some of the narratives in the previous section, where 'doing no harm' was outlined as a foundational principle of patient safety (Appendix B A1-A4). In this regard, it assumes that the prevention of any harm directly resulting from the clinician's actions would be considered as the primary safety objective. There would then be the prevention of other causes of harm following after this. For example, any harm to the patient as a result of a failure in the treatment process, and then finally, there would be the harm occurring to future patients because of a failure to develop clinical practice sufficiently. But, whatever the order is in terms of statements about *being* safe, when it comes to safety *narratives* in general, it is the overall process and its eventual outcome that is of most importance (Appendix B A9, B20).

So this section has outlined some of the issues within the data, which have subsequently been coded into sub-groupings forming the overall category of professional autonomy. Many of these issues centre upon the problem of uncertainty that surrounds incomplete medical knowledge, and the variability in cases. It also includes dialogue about the diversity of treatments and the variations in clinical technique and consultant preferences. According to the participants, these various factors create a complex environment which cannot be easily distilled into a more simplified model. Instead, it is argued that the complexities should be recognised (Appendix B B5).

It is a concept of safety that includes much more than the identification and elimination of the causes of adverse events. Rather, the objectives are much broader than this, and although it encompasses typical concerns with the avoidance of harm, the definition of what harm actually means is much broader. But it is the uncertainty within this environment which marks the concept out as a process of navigating the patient's pathway, or journey through the various treatment options in such a way as to minimise their risk and create the best outcome. It is an image of an open system that requires expert judgements to be made within a difficult field of multiple possibilities. It illustrates the dynamic nature of practice, and also shows that at the heart of this seemingly complex network of judgements about safety is the concept of risk. In the following section this very important category will be examined in detail. But as this narrative demonstrates, it is a concept that includes a moral and ethical dimension, and this in-turn depends on contemporary social values.

6.3.2 Risk

This category contains extracts that are central to nearly all of the narratives, because when the participants talk of safety, they speak about influencing patient outcomes, and about the judgements that have to be made in order to achieve the best results for them. At the heart of this are the patient's options and the various risks associated with these different choices and it is frequently stated that the patient is seeking medical assistance because they already have an illness or disease which presents a risk to their health (Appendix B D1-D4);

> *"I will only ever see a patient who's got a problem of some sort (.) and that problem itself (.) will represent a risk to them"* **Miles H020, Consultant General Surgeon**

The risk of disease progression and its possible effects have to be weighed very carefully against a different set of risks for each of the available treatment options. The participants tell us that these treatment risks have to be specifically evaluated for each individual patient, taking into account their own unique circumstances and co-morbidities. One narrative illustrates this point by using the example of the decision to operate on a patient's carotid artery (Appendix B D2). He explains that even if the procedure is carried out to a high level of competence, there is still the risk of something going wrong. One possibility suggested in the narrative, is that the operation could induce a stroke in the patient. But his preceding statement about the risk of such events happening despite highly competent performances is telling us that on occasions these events are beyond the control of the surgeon. This reiterates the point about medical uncertainty and frames the problem as either a lack of information or as misfortune. The risk evaluation is therefore about estimating probabilities and the relative likelihood of each anticipated event. The use of phrases that talk of *weighing up* the risks, and by describing it as a *dilemma,* suggests that the participant wants to emphasise these difficulties involved in making such fine judgements, particularly for those individuals with very serious medical problems. In the same narrative, he makes a point, which is really about the choices available to the surgeon, when he admits that for very sick patients an easy option is to be risk-aversive in order to avoid making difficult decisions;

> *"it's not just about (.) what your operative mortality rate is (.) it's also about (.) <u>who</u> did you <u>select</u> (.) and <u>who</u> did you <u>not</u> offer surgery (.) and what happened to them"* **Andrew H002, Consultant Vascular Surgeon**

It is a statement that contains a comment about the current tendency to simply measure patient harm from mortality rates, which as we shall see from narratives in the next section, fails to capture the full complexity of the different risks involved for each patient. But these risks are really risks about patient outcomes and complications, rather than risk related to medical processes. Another participant offers his own simplified classification of the types of risks that he has to evaluate, and these also relate to the patients outcome, but it also includes risk associated with the anaesthetic process;

> *"the two main themes I would say=there's the risk related to the disease process (.) and the decision to operate (0.5) and there's the risk related to an anaesthetic (.) and co-morbidities (.) that the patient may have independent of the disease I'm focussing on"* **Greg H005, Consultant Interventional Radiologist**

In this extract, rather than distinguishing the risks in terms of; (i) the risk of the illness and its natural progression, and ; (ii) the risk of treatment, he instead categorises the risks slightly differently in that he includes the possibility of harm from the anaesthetic procedure as a distinct category. So, he sees the risks as being distinguished in the following way. There are; (i) the group of risks associated with the disease process and the various treatment options, and then; (ii) there are the risks associated with the general health of the patient and their physical capacity, given their current co-morbidities, to undergo the anaesthetic procedure. In a way it is categorising the various patient risks into groups that are consistent with different medical specialities, and there are some examples indicating that there is a degree of demarcation about this (Appendix B D18). But alternatively, it could be seen as recognising the risks from a secondary process that is not directly related to the disease and its treatment, which in this example it is an interventional radiological treatment. So, although it is not the clinical process that is the actual treatment, it is a necessary secondary requirement for that treatment to be possible. What is essentially happening during the anaesthetic process is that the anaesthetist is effectively taking over the normally functioning protective reflexes of the patient and artificially reproducing these physical processes in order to make it easier for the operation to take place and make it more comfortable for the patient (Appendix B D20). Perhaps this introduces a hidden ethical or a moral component which explains why risk is distinguished in this way. But it is not something that is classified as doing harm to the patient, in the sense of phrase *'do no harm',* because most treatments, like surgery for instance, or chemotherapy, do harm the patient in the short term, but it is done in exchange for longer term benefits and better patient outcomes;

> *"we're subjecting him (.) to a procedure (.) which has got a risk of actually causing more harm (0.5) but we're balancing that (.) with more risk of harm (.) if we don't do anything (0.5) and that's why we're going down the pathway of actually (.) causing harm (.) to prevent further greater harm (0.5) but we <u>are</u> causing harm"* **Ramesh H017, Consultant Emergency Medicine**

He is confirming there is no way of completely avoiding risk. So in the sense that most treatments create a physical disturbance of some kind, they are effectively causing a type of controlled injury to the patient. But it is the intention as well as the outcome that determines the meaning of harm, and the intention is to improve the outcome for the patient.

Because of the patient's injury or illness, some level of risk is always present and this cannot be avoided, and according to one participant, it can only be exchanged for a different risk associated with their treatment (Appendix B D5). This idea of an exchange of risk, where the risk of harm from the illness is transferred to a risk of harm from a proposed medical intervention, is interesting. It adds to the dynamic aspect within the medical safety concept, because there is no fixed reference for assessing the lowest acceptable risk. It will change depending on the nature and the severity of the illness, and thus varies with each patient. As outlined in the last section, good judgement and clinical expertise are required so as to ensure that when evaluating multiple treatment possibilities the exchange of risk is favourable (Appendix B D6). But sometimes, various other factors make the decision even more difficult. For example, some patients may have to have their treatments allocated in stages for various reasons;

> *"a lot of our patients have complex problems (.) some of them (.) you could do a lower risk procedure now (.) but that will make a subsequent procedure harder (.) and you have to try and balance those decisions"* **Olivia H015, Consultant Cardiologist**

It demonstrates the complexity of some of these decisions by outlining a process which appears to involve the aggregation of multiple risk estimates (Appendix B D7). It also includes anticipating the likely outcomes from alternate treatment pathways, so that the possible effects of each stage in the process can be factored into the patient's individual evaluation of risk. Furthermore, the need to allocate and prioritise limited resources across all patients is also acknowledged, adding an extra variable into the equation. So, in some respects patient safety is defined as a more general risk management process, incorporating both the individual patient as well as the broader clinical circumstances affecting all other patients. It includes not just the present and future treatment options for the patient currently being seen, but also the overall clinical outcome of the service as a whole. This suggests that the safety concept must also include an underlying theory that holds the various categories together, so there is a strategic focus on aggregate safety outcomes, rather than the absolute prevention of particular types of harm using prescriptive mechanisms. However, it seems that each particular risk is individually evaluated to determine the point where the outcome is at an optimum in terms of its utility, and this can be seen in another example where the participant describes a common intervention for preventing blood clots during surgery (Appendix B D8). In that example the participant talks about appropriately balancing resources across different risks. He gives an example which demonstrates why a sense of proportion is needed when assigning time and effort into achieving certain aim;

> *"there's an acknowledgement (.) that clinical systems either <u>can't</u> (.) or <u>shouldn't</u> (.) perform at a hundred percent (0.5) because the effort expended on the one case (.) that gets you from 99.9 (.) to a hundred percent (.) will be disproportionate"* **Dimitris H001, Consultant Physician**

The evaluation of risk includes choices about whether the scope for reducing that risk will yield effective returns for the amount of effort being put into the task. It is therefore a subjective assessment involving probabilities, possible outcomes as well as clinical efficacy. But, as this participant is aware, and he tells us in his narrative, these evaluations are always going to be limited to the personal horizons of the consultant making these risk judgements. They are bounded by the rationality of their particular clinical perspective (Appendix B D9). Of course, it demonstrates that there is at least some insight into the way the classification of risks can change depending on the vantage point from which the assessment is made, and there are other examples of this broader awareness of the differences in risk perspective (Appendix B D10, D13). In one statement, the participant describes how the low probability of something dreadful happening means that it would perhaps manifest itself to a particular clinician maybe once every ten years (Appendix B D10). But from a higher vantage point, like the department of health where they look at the figures from a national perspective, it could be more visible, occurring as frequently as perhaps once a year. This statement demonstrates not only the relative nature of risk, but it also shows how the participants are alert to the interpretative aspect of these concrete physical occurrences. In that example, the number of objective or physical occurrences of the event is the same, but the evaluation of how the risk is classified or weighted depends on the social level from which these events are observed. From a local perspective the subjective evaluation of a rare event is interpreted as a stochastic abnormality. While for those with access to a wider field of view, where these small patterns of regularity, albeit rare, begin to reveal themselves, they are more likely to view such events as a significant risk. But even though the data shows that clinicians are aware of this interpretative aspect to their risk evaluations, it may not always be evident in their behaviour. This is according to the testament of one participant working as a medical director for one of the NHS trusts. He stated that clinicians are limited in their judgements by their immediate concerns with the patients around them (Appendix B D11). In a way, this emphasises the earlier point about the influence of context on peoples risk judgements. While clinicians have indeed demonstrated an awareness of the bigger picture, the relative weighting of their risk assessments will, in all likelihood, be biased in favour of their own patients because of their particular outcome objectives. At the same time, the medical director will similarly orientate his risk weightings more towards the achievement of aggregate outcomes for the whole hospital. These differences when each viewed from the other's perspective will appear to be subjective distortions that fail to properly account for either local or strategic concerns.

Other differences relating to risk and context have also been vocalised by the participants. For example, some respondents described what they saw as idiosyncratic differences in risk across geographic areas. These were not necessarily related to the breadth of strategic perspective but instead appeared to reflect the way different groups identify and select those risks to be singled out for policy change (Appendix B D12). In other words, differences in patient safety directives will relate to interpretations of the most salient risks based on a combination of factors representing national and public values. But these were criticised as being arbitrary policy selections, because when they are looked at and compared from a local perspective using the *ceteris paribus* assumption, of all things being equal, then naturally the most inconvenient policy differences will stand out. But other statements demonstrate a more objective and pragmatic view about these differences in risk perspective. For example, some narratives draw distinctions surrounding this change in risk perspective, and show that the participant has an appreciation of the way their change in focus influences their behaviour (Appendix B D13). When this awareness is conscious then there is an appreciation of the need to manage risks at these different levels, and in some clinical settings, this is what the participants tell us that they do;

> *"balancing individual risk against system risk (0.5) I think that is something we constantly do in the Emergency Department" "* **Ramesh H017, Consultant Emergency Medicine**

So there is the risk to the individual patients and a concern for their personal outcomes, but also, at the same time is this generalised risk related to the overall outcome of the particular clinic. This refers to the combined safety of all patients within the department, and it resonates with the earlier point about proportional allocation of resources.

But the data shows that when the focus is on the individual, there is a human element that has to be taken into account, so that risk becomes much more than a straight forward calculation of the different types of harm. Because that harm relates to ongoing human experience, rather than a single event. For this reason, risk judgements about healthcare matters can include all sorts of qualitative and moral factors affecting those patients undergoing their treatment. One interesting example of this comes from a narrative that offers a rich and meaningful illustration of the sorts of real life risk decisions that have to be made (Appendix B D14). In the first part of the example, the participant explains how the medical definition of success and failure has changed over the years, so that it is no longer simply a matter of biological outcomes, but also includes the social and experiential quality of a person's life. He shows how these functional and qualitative aspects are balanced against, what is implicitly suggested as the anticipated life expectancy for someone of the age and condition of the patient. The example tells of how an elderly lady's very independent life, albeit with perhaps just a few estimated years remaining, was transformed into a short life of social dependency, when she was moved from her home into a nursing home following a decision to operate on a very slowly progressing cancer;

> *"we cured her from her cancer (0.5) but she never went back home again (0.5) she went to a nursing home (1) <u>and</u> (.) she had to be cared for by people around her (0.5) plus she had a permanent bag"* **Sunil H016, Consultant General Surgeon**

Perhaps the quality of her life in her remaining years would have been better without the physical and emotional stress of the operation. These are difficult issues to call, and they are said to depend on each individual patient and their particular quality of life, both before the proposed treatment and its anticipated outcome afterwards. Personal factors, like their relationships with friends and relatives, the types of hobbies that are enjoyed, are all weighed up along with physical and mental issues as part of the costs and benefits considered during an evaluation of the risks. Of course, these qualitative estimates are combined with the known quantitative data regarding the different risk factors for each treatment in order to arrive at some estimation of the likely impact (Appendix B D15). These can be deeply personal issues and so it is no surprise to find that the data contains lots of reports telling of how the risk decision is shared with both patients and relatives (Appendix B D16, D17, D21, D22, D23). In general, it seems that the consultant estimates risks, communicates the alternatives and advises the patient (Appendix B D17), and where there is a life threatening illness the prognosis is accentuated (Appendix B D16). It highlights the importance of strong communication of risk, and shows how patient safety narratives extend into areas that could be described more as quality of care than say accident prevention.

While safety is made up of particular topics or categories like risk, these categories move and blend into one another during the course of a person's narrative. So an account that begins by describing risk will sometimes end up making a point about communication or decision making. It therefore makes sense at this point to re-emphasise the overall importance of the risk category to the medical concept of safety before moving on to the next section. Risk not only links the other categories together, but it also channels these narratives, both to and from, the primary safety objective, which is the minimisation of harm. So things like personal autonomy, clinical competence and professional judgement, are all important because of the need to locally assess risks under conditions of uncertainty. As the data shows, it is this variability and uncertainty with the medical field that makes risk such a key feature in the core category of clinical success.

6.3.3 Social and cultural issues

This category contains narratives that have been coded into sub-groups involving both social and cultural themes that the participants have loosely associated with the safety concept. In most cases, the dialogue is about social interactions and collaborative relations between the medical staff in order to pursue the best outcome for their patients. In this respect, the focus is on medical knowledge and the sharing of opinions rather than the things that might be expected in a safety narrative, such as teamwork or a quest for more coherent operational relations. This category also includes some narratives about local culture, but in this section we will concentrate on one of the main themes from this category that emerged during the interviews. It is about the social relations between clinicians which occur for specific purposes relevant to issues about patient outcomes and potential harm. These narratives are recounted because of their value in providing support to the consultants who have to make these difficult decisions about high risk cases.

We previously examined some narratives that emphasised the role of local decision-making because of the variability within the clinical environment, and some of the participants reported difficulties in having to make judgements about their patients' treatment options and their evaluations of risk. They also explained how there was often a lack of solid evidence on which to make these assessments (Appendix B B4). Elsewhere in the data were some narratives describing how difficult and complex risk evaluations were sometimes shared with other colleagues by discussing these cases at multidisciplinary team meetings. These gatherings are part of a formal structure that has been organised in order to assist clinicians with their decision making when evaluating the relative risks of the treatment options for patients with serious illness such as cancer. Descriptions of this sort of clinical cooperation appeared throughout the data (Appendix B C1, C2, C4). In one example, the participant refers to the moderating influence that these meetings have on the decision-making process:

> *"you look at all the scans (.) and you say (.) what do we all think (0.5) it's <u>not</u> (.) necessarily one surgeon's decision (.) because you can have one surgeon (.) who'll be very aggressive (.) and one surgeon who'll be more timid (.) and you'd hope that the MDT[4] (.) would bring a consensus judgement to what's sensible (.) and what isn't sensible (.) to tackle surgically"* **Tim H013, Consultant General Surgeon**

It suggests that any extremes within the usual diversity of opinions will be balanced out, so that a more moderate agreement about the acceptable level of risk can be achieved. This implies that the attitudes of different surgeons towards risk and risk aversion, might otherwise bias their decisions, and suggests that individual differences in personal factors such as risk perception or self-confidence, could create variations in judgements about the severity and prognosis of both the illness and the surgical intervention. It is generally agreed that there is a significant benefit in sharing the responsibility for these decisions (Appendix B C1, C2), with benefits to the consultant as well as the patient. The patient gains because of their access to a wider range of expert opinion, and this in turn protects the consultant from criticism over the decision. Collaboration of this type, where responsibility and judgement are shared, has also been reported in other situations as means of safeguarding against wrong diagnosis or treatment recommendations (Appendix B C3). It is important not just for sharing knowledge and experience, but is also a means of cross checking thought processes and is an opportunity for critical appraisal;

> *"a lot of the big decisions we make (.) are made in a formal Multi-Disciplinary meeting (.) where a fair amount of critical appraisal goes on (.) shall we say*

[4] MDT – Multidisciplinary Team

(0.5) and you could call it (.) brain-storming (.) or floating ideas" **Olivia H015, Consultant Cardiologist**

This example describes how the same clinical information is interpreted and compared by the different members of the team. Each person's opinion is openly discussed within the group so that a range of ideas can be included in the process of assessment. In this way it provides concurrent feedback on the consultant's initial clinical reasoning about their case, and so it could easily be categorised in functional terms as a process of checking. In other narratives, some less formalised meetings between colleagues are also described as useful encounters for improving patient safety through this same mechanism of collaborative reasoning and the sharing of opinions (Appendix B C9). According to the descriptions about these more informal meetings, these sometimes include discussions about difficult cases before the diagnosis or treatment recommendations have been made, but there are also some discussions about post-operative problems as well;

> *"we might review challenging cases (.) either for a point of view (.) to tapping into colleagues expertise for this particular case (.) what approach would you use (0.5) and learn from that (0.5) or (.) if there have been misadventures (0.5) to feed them back (.) and share with each other (.) so that is relatively informal though"* **Douglas H004, Consultant Orthopaedic Surgeon**

It is apparent from these accounts that the support of fellow clinicians is vital, not only for helping to contextualise events, but also for exchanging information and facilitating learning. This sort of retrospective analysis is an important point in the safety narratives because it facilitates learning and so gradually helps to reduce the uncertainty described earlier. This type of collegial activity involving a post-operative review of those cases where there has been a death or serious complication can be traced back to the ritual mortality and morbidity meetings held by surgeons. These meetings are named in present-day safety narratives as being useful forums for the analysis of recent adverse events, so that any deviations from accepted protocols or best practices can be identified and the reasoning explained, and to establish if protocols require updating;

> *"our main quality assurance processes are (.) mortality and morbidity meetings (.) where all of these (.) <u>incidences</u> (.) have been analysed (.) by all of the major clinicians involved in the care of patients (0.5) and that we identify (.) not just (.) some that deviate from what is the accepted protocol (.) but (.) we identify if the accepted protocol did not really take into account the scenario (.) and if we need to change it"* **George H014, Consultant Cardiothoracic Surgeon**

It is a part of the culture within the surgical community that has also been extended into other areas by other medical specialities (Appendix B C17). The dialogue describes what would ordinarily be categorised as a retrospective process, but at the same time the participants themselves, even the surgeons, explicitly describe it as a quality assurance process (Appendix B C10). Whilst safety is usually thought of in terms of accidents, adverse events and the like, in this context, as we saw in earlier examples, the distinction between safety and quality is quite blurred. This is despite the obvious reference in the narrative above, to things like incidents and deviations from protocols. So these meetings are on the one hand, a functional activity for sharing knowledge, for checking and validation of decision making, and also for retrospective learning. But they are also a social process where independent consultants come together as professional colleagues to share their collective experience and therefore establish professional norms and local protocols. One aspect of that social process could be the provision of informal collegial support if there are complications because of errors or mistakes, or any other harm to patients because of medical intervention. So for people working under conditions of uncertainty, mistakes will inevitably happen. This is recognised by the participants (Appendix B C12, C13, C15, C18, E4), but it raises a question about how is this situation is dealt with. One narrative has suggested that in a medical situation, where there is this strong culture of personal responsibility, it can create either a tendency to blame the consulting clinicians, or alternatively there can be, perhaps a sympathetic but misguided agreement to cover up such events;

"you can say there's a tendency to (.) blame people (.) when things go wrong in healthcare (.) but equally historically (.) doctors have tended to cover up for poorly performing colleagues (.) and things like that (0.5) so and I'm hoping that doesn't go on" **David H012, Consultant Physician**

This is not an area which was spoken very freely about, but there is a cautionary point being made in the statement, and this probably draws on one or two past scandals involving rogue hospital consultants exhibiting deviant behaviour in their practice. In the most high profile cases, like the Bristol heart scandal[5], the Alder-Hey organ retention scandal[6], and other cases involving poor surgical practice with weak governance, senior consultants were allowed to continue using dangerous and unethical techniques. Some of these reports highlighted a strong culture of conformity at that time, resulting in the covering-up of poor practice through an unwise sense of collegial responsibility. Some of this culture probably originated from a need to support doctors who found themselves in challenging situations whilst trying to gain experience with new treatments or surgical techniques. Blame and cover up are both compatible with personal accountability, rather than environmental cause. But other narratives describe the social support given to both colleagues and more junior staff when things go wrong. In some of these examples the consequences of being responsible for an error leading to patient harm is described (Appendix B C5, C6, C7, C8, C18). In many cases the importance of discussing these events with colleagues or others is stressed;

"in terms of your personal response to error (.) or bad outcome (.) whether it was error related or not (0.5) that's very (.) personal (.) we're all different (0.5) I think it's very important (.) to be aware of the impact it has on you (.) and to be open (.) and to be able to discuss it" **Gerry H010, Consultant Paediatric Intensivist**

[5] For details on the Bristol Heart Scandal see the report by Sir Ian Kennedy, published in 2001.
[6] See Michael Redfern's Report, published in 2001

Of course it's the patient who is exposed to the risks, but as this narrative reveals there are also these unwelcome emotional consequences for clinical staff if things go unexpectedly wrong. The implications for patient safety are clear in that it creates an important motivation to accept any ideas that might help to avoid these situations. On the other hand, it could also create an aversion to any detailed examination of events for fear that it creates too much anxiety (Appendix B C6, C7). Throughout the data the need to balance a sensible level of reflection without being too overly critical is a difficult path that has to be very carefully negotiated;

> *"there is a temptation (.) which has to be resisted (.) I think (.) to wallow in guilt and self-pity after something's gone wrong (.) and you have to be as professional as you can (0.5) and calm and collected (.) and logical (.) and break it down into (.) how much of this can I actually beat myself up about"* **Gerry H010, Consultant Paediatric Intensivist**

Some narratives have explained the dangers of too much self-reflection (Appendix B C7, C8) and this side of things, where there are these descriptions of the personal cost of patient safety failures, is an important consideration when evaluating the cultural aspect of safety. In these situations, where the effect can be emotionally very difficult for some clinicians, it requires the right sort of reasoning to be able to deal with these things. Now, there are examples that openly tell of the absence of any formal mechanisms for dealing with these events (Appendix B, C8), and so the provision of the type of support that is required has to be left to more informal social processes otherwise it makes it personally very challenging for the doctor to look back and critically evaluate their own actions without creating anxiety. It is likely that during specialist training doctors are exposed to a process of socialisation that helps them to deal with these things in the correct way. Indeed there are narratives that describe how errors and mistakes were traditionally considered as an inevitable part of the training process, where clinicians were expected to learn from their mistakes (Appendix B C12, C13);

"you've got to get in there and get your hands dirty (.) yes (.) you can make rules (.) and you can make mistakes (0.5) but some things you do (0.5) and experience (0.5) each surgeon has to make some mistakes" **Kumar H018, Consultant Orthopaedic Surgeon**

In these circumstances, it is easy to see the dilemma within the medical field. This is the necessity for trainees to be exposed to real life situations in order that they can develop not only technical skills, but also the reasoning skills required for them to do the job on their own, since consultants are expected to be independent practitioners. It is easy to understand that any adverse consequences would have been very harsh lessons for the trainee's. As some participants explain, so long as the right approach is followed with all the information available taken into account it is difficult to apportion blame for someone doing the best for the patient (Appendix B C18). It is important that juniors learn from this process and get protected from what could be unreasonable blame; "

"I think we tend to=consultants tend to (.) defend their juniors (0.5) people tend to defend their colleagues" **David H012, Consultant Physician**

So the culture of forgiveness might be a sensible response to the particular difficulties of uncertainty and variability within the environment. Many narrative shows that the traditional apprenticeship model of medical training still applies, but in recent times it has been presented in a more structured framework.

Most of these accounts, and the others within this section, describe the social processes that lie behind the issues. Most notably, there is a professional duty to do no harm, to minimise patient distress, and produce the best clinical outcome possible. In this section some of the collegial and social processes to ensure that these objectives are best achieved as described by the participants, were outlined. These are included within the core category of clinical success, along with the issues of professional autonomy and the evaluation of risk.

6.4 Avoidable problems and the difficulties of measurement

This category contains those narratives that more closely resemble the sort of dialogue normally associated with safety. It involves descriptions of the different types of harmful events or accidents that are considered to be avoidable occurrences, along with an exploration of different methods for detecting these problems and defending against them. The topics of discourse within this category fall into the following three general areas;

1) Unwanted incidents.
2) Information and measurement.
3) Covering actions.

As with all the categories, they each contain further subordinate categories and these in-turn are themselves made up of sub-categories. When taken in total they form a taxonomy or conceptual network that represents the sematic structure for the super-ordinate concept. The methodology involved coding at the lowest level of abstraction and then combining codes into higher-order classifications through the Grounded Theory method of axial coding; the part of the analysis where all primary coding classifications are cross-related to each other. Following this process, three main sub-classifications emerged as a relevant grouping to establish the main category called *avoidable problems*. The first sub-classification termed, *unwanted incidents,* contains narratives about complications, errors, misdiagnoses, hospital infections and any other types of adverse event. The sub-classification labelled, *Information and measurement*, is a category containing dialogue that talks about indicators and surrogate markers useful for measuring levels of performance and detecting poor outcomes. It also contains dialogue that describes the difficulties involved in interpreting these measures. Finally, the sub-classification designated as *covering actions* contains narratives that refer precautionary measures aimed at reducing these unwanted outcomes. Many of these classifications overlap and descriptions of unwanted incidents are often accompanied with dialogue describing the difficulties of discriminating between avoidable events and normal stochastic complications. The narratives that talk about unwanted incidents include things like complications, side-effects, hospital acquired infections, and the mistakes or errors made by medical staff. This latter category is one that we would most typically associate with safety, and it would usually be the focus for safety management interventions. However, the participants describe the problems in establishing what exactly constitutes an error or mistake for clinicians working under conditions of uncertainty. This section will focus on those narratives that talk about these difficulties, since they offer some valuable insight into one of the fundamental differences between the aviation and medical environments.

Doctors have long been used to the presence of difficulties, and outcomes that have not turned out as expected. These set-backs have often been classified as complications and typically involve things like infection and poor recovery. Such problems were usually described as being infrequent-but-normal consequences of the procedure and explained as being stochastic events, or bad luck. For example, the problem of infection is often mentioned by surgeons as one type of complication that can result from surgery. It is an unwanted problem that is sometimes described in terms that suggest that it can be difficult to control. In one narrative the participant describes it as a '*real albatross*[7]', which is a way of saying that it's something inexplicable, it's bad luck, or it's a curse. (Appendix B E1). It reflects the incomplete understanding of why this should occur in some patients but not in others. Of course, there is some knowledge about the problem, and certain groups of patients can be identified as higher risk than others, but in other cases the cause is simply unknown;

> *"some people (.) sadly (.) are just that little bit more pre-disposed (.) so for instance (.) frail rheumatoid patients are known to have a high risk of infection*

[7] The term originates from Samuel Coleridge's poem, *The Rime of the Ancient Mariner*. In this poem the Captain of a ship shoots an Albatross, which is traditionally a symbol of good luck. The ship subsequently encounters a series of difficult events, which the crew attribute to the Captains actions. The dead Albatross is symbolised as a curse hanging around the Captains neck.

(.) and sometimes (.) there's no special rhyme or reason" **Douglas H005, Consultant Orthopaedic Surgeon**

It is generally accepted in this field that sometimes these events can happen, and they cannot always be explained because of the many different physiological and environmental factors that can uniquely combine to produce the problem. However, the data also includes more optimistic accounts describing recent achievements using containment measures to control the spread of certain types of hospital acquired infections such as MRSA[8] (Appendix B E2). So while participants talk about the general side-effect of infection following surgery, there is also an environmental aspect involving the spread of infection between patients while they are on the ward. This is just one illustration of the types of narratives about unwanted harm, where on the one hand, something like an infection it is referred to as bad luck, but at the same time in other narratives, those aspects of the same problem which can be influenced are also talked about as successes. So whilst it is framed as a problem that cannot be controlled directly, there is still some talk about influencing other outcomes related to the same category of problem. In this case, shifting the number of overall cases in the right direction by controlling dependencies, like the environment. The lack of direct control over specific problems or events is accepted because of the uncertainties, indeed it is classified as bad luck. So the focus shifts away from trying to fully understand every single step behind those unknown mechanisms causing these problems, and instead the focus is more on the outcomes and the things that might influence them. Instead of control, there is influence.

But this isn't the only example of narratives in this category where issue of uncertainty and a lack of control can be found. It also comes up during talk about clinical errors and poor performance. In this area, the biggest difficulty is said to be in identifying when there is actually a problem, because it is generally acknowledged that operations and interventions will occasionally go wrong (Appendix B E2), and mistakes

[8] Methicillin-resistant Staphylococcus aureus – is a type of bacterium responsible for infections in hospitals and other public facilities where there are often patient's with open wounds and weakened immune systems.

will inevitably happen from time to time (Appendix B C13, C15, E4, E9). When these events transpire they are usually described as sporadic but inescapable occurrences;

> *"having an operation that goes wrong (.) or a procedure (.) or an intervention that goes wrong=and whilst you can't completely ever eliminate that (.) because things do happen (.) what you can do is minimise it"* **Graham H008, Consultant General Surgeon**

The use of the phrase *'things do happen',* suggests that these problems emerge without any real explanation rather than being the result of a definite causal sequence of events. Again, the dialogue also suggests an intention to influence the number of these events and minimise them, rather than control or eliminate them completely. There is acknowledgement of an inability to fully control events, either because of patient variability or medical uncertainty. For this reason there will always be a small proportion of adverse outcomes. But establishing which bad outcomes are due to an unusual combination of hidden circumstances, the so called bad luck, and which are due to incompetence is very a difficult thing to achieve;

> *"It's very difficult to actually say that one particular doctor is under-performing (.) because of the way that errors are identified (.) they're quite sporadic (0.5) so that (.) we might <u>not</u> (.) be able to say that one particular doctor is poor"* **Sarah H003, Consultant Radiologist**

The seemingly random nature of the clinical case-mix means that it is possible that any consultant could have a run of difficult cases that don't turn out as expected. This makes it is extremely difficult for anyone other than the clinicians themselves, to distinguish between unacceptable poor performance and bad luck. Since, the only way to pick up on poor performing colleagues is to notice a consistent pattern of failure, then the difficulty is to establish beyond a reasonable level of doubt whether that run of bad results is because of incompetence or simply unlucky. In most circumstances individual case-loads are relatively small, so it is statistically possible that an apparently large failure rate can occur within the normal limits of acceptable practice.

That it could also appear to be a problem is because of the relatively wide margins of error that are a feature of the uncertainty attached to high risk cases. Similar problems about these sorts of statistical inferences are also found in other narratives which question the wisdom of demands for the publication of outcome data (Appendix B E6, E12). These sorts of argument demonstrate the scientific reasoning that lies behind some of these accounts, and for professionals used to working in conditions of uncertainty, they and are naturally cautious about jumping to serious conclusions, particularly when it can be career damaging for either party. In this respect, there are some accounts which indicate reluctance within the profession to bring any personal suspicions of poor performing colleagues to the attention of clinical directors (Appendix B E7). The lack of clarity in the evidence would partly explain this position, but there are also other reasons;

> *"the whole process (.) about what you would do if you had a colleague (.) who was (.) very clearly (.) <u>woefully</u> under-performing (.) is difficult (0.5) the whole culture (.) unfortunately (.) has been that (.) if you stick your head above the parapet and raise an issue (.) it doesn't often- (.) it often backfires on you (.) and you don't get- (0.5) things don't get properly looked at (0.5) nobody wants to know there's a problem really (.) is the bottom line"* **Graham H008, Consultant General Surgeon**

This general unwillingness to deal with cases of underperformance is attributed to a culture within the profession which tends to deny the problem, and instead turns its attention towards the clinician breaking ranks. In one sense there is a need to protect the integrity of fellow professionals trying to do their best with incomplete information, so it is probably that this culture stems from a well-intentioned collegial bond that shares an understanding of these difficulties. It makes sense to suggest that there could be a collective sense of vicarious discomfort about clinical failures, not least because the potential consequences of some medical errors can be fatal. In that regard it could be a culture of empathic acceptance that has created the situation described by the participant, where nobody wants to look too closely at any particular individual's level of success. There are some circumstances where anyone could feel exposed to the real possibility of making a mistake. For example, in situations involving emergency treatments at unsociable hours there is greater uncertainty and severe time-pressure, which will all contribute to an increased likelihood of misjudgements (Appendix B E8).

These are descriptions demonstrating the participants' awareness of human fallibility, particularly in high pressure situations where the patient's condition is unstable, and there's a critical need to act quickly. Other examples of this refer to the effects that tiredness or mood can have on human performance. If the consultant is having an off-day then this could have a negative influence on the quality of care received by the patient (Appendix B E10). In one respect it demonstrates a general awareness of the inconsistency in human behaviour, and while there are some narratives that argue very strongly for some type of check against clinical performance (Appendix B E3), there's also a reluctance to champion any measures that are unable to accurately discriminate malpractice from normal performance that lies at the outlying ends of the distribution. To do so would require the inclusion of contextual information, which is why currently, the most effective method for monitoring performance is actually self-monitoring and professional insight (Appendix B B6, E3). However, the concern is that this dependency on self-evaluation can, in some cases, leave a gap in safety that exposes a few patients to poor performance when the clinician fails to exercise their responsibility in this regard;

> *"you have a <u>not</u> <u>insignificant</u> (.) level of consultants around the country (.) who are totally insight-less into their own performance and their own shortcomings (0.5) I think most surgeons are slightly reflective (.) and very self-critical (.) and I don't think you have a problem with those people (.) it's the people who aren't that you have a problem with"* **Graham H008, Consultant General Surgeon**

One solution that is frequently mentioned in the data concerns the use of outcome measures, but these are usually accompanied with the same warnings about probability distributions and statistical inferences that were highlighted earlier (Appendix B E11). So this involves, not just internal monitoring of performance indicators, but the open publication of selected outcome measures. However, some sort of comparison would have to be made in order to establish the outcome norms, and once again the small numbers of cases is said to make this difficult;

> *"the case experience you need (.) to demonstrate (.) with any power (.) the difference between one operator or another=when they're doing forty procedures a year (.) makes it very (.) very difficult (.) for any centre to say (.) my operator is better than your operator (.) because the case load isn't big enough"* **Greg H005, Consultant Interventional Radiologist**

With such small numbers it makes it virtually impossible to compare data between consultants without knowing all the details that lie beneath the numbers. Additionally, the medical field is diverse and in some specialities these differences between individual cases can fluctuate enormously. For example, in some specialities the clinicians have to deal with the much higher levels of uncertainty because of the combined effects of multiple co-morbidities (Appendix B E6). The concern has to be that crude monitoring of performance data could draw lots of attention to the low points in the peaks and troughs of normal medical results. This would skew the focus onto the negative part without understanding the full details behind it. Exactly these sorts of anxieties have been voiced when participants have spoken about the publication of outcome data for their clinical services (Appendix B E11).

> *"if you just get a whole lot of crude data (.) and just publicise it (.) it can be <u>extremely misleading</u> (.) and also (.) almost fear invoking within the population"* **Christopher H011, Consultant Paediatrician**

In this example, the participant goes on to express a worry about the possibility of public confidence in the service collapsing, undermining the reputation of the unit and perhaps even creating longer term funding problems. This unease about the potential for misinterpreting the headline numbers is also evident in many other narratives, some of which suggest that it could alter the way clinicians decide about their patients' suitability for surgery. One example suggests that some consultants, who may be results-driven, could even start to reject very high-risk patients because of the effect it would have on their outcome data (Appendix B E12). Similar warnings about the possible unintended effects of using mortality statistics as a measure of performance occur throughout the data;

> *"this is my mortality rate (.) <u>improve it</u> (0.5) <u>yeah</u> (.) I'll just stop people from coming into hospital (.) <u>or</u> (.) I'll move them out before they die (.) and <u>guess what</u> (0.5) my mortality rate ratio will improve=you know it's just a silly way of looking at it"* **Ramesh H017, Consultant Emergency Medicine**

There is this suggestion that in a complex system like healthcare, the use of simple bimodal measures will subtly alter the behaviour of consultants by creating a bias that favours everything to do with that measurement, and probably in ways that were neither intended or nor anticipated. And while the use of more specific indicators might seem like a better option, there is still the possibility that setting improvement measures in one area can produce unwanted effects somewhere else (Appendix B E13). This is based on the theory that, simply specifying something to be measured, is all that is required to create an incentive for people to act in such a way as to make the numbers look good. It could be framed as a subtle prescription for certain types of action. Normally any decisions about specific outcomes are made by the clinician on an ad hoc basis depending on each patient's specific needs, and no doubt that would be the case whatever the demands, to a certain extent. But they could nevertheless be subtly influenced by the gentle nudge of this systemic priority, created by the simple act of specifying which data to collect. This has been expressed as a dilemma, because the problem of finding the right indictors for measuring and improving overall clinical outcomes is difficult when there are competing priorities and limited resources (appendix B E14). For this reason, it is easy to see why there are claims that in complex systems like healthcare, it is always the easiest measures that are eventually selected;

> *"the healthcare system (.) measures (.) the things that are <u>easy</u> to measure (.) not the things that <u>actually</u> matter"* **Olivia H015, Consultant Cardiologist**

The use of mortality in particular is criticised as being very black and white, and too blunt to deliver any meaningful understanding about treatment outcomes (Appendix B E15). The point is made again about the significance of the contextual details which tell the story behind the data. The differences between operating within an environment that is highly specified, and one that is more ambiguous and fluid is emphasised by the participant. She contrasts the sorts of information required to make sense of the two processes, comparing on the one hand black box flight parameters, with the more elusive cues given off during a doctor-patient interaction;

> *"we don't have a black box data recorder= or two (.) or three (.) or a voice recorder (.) <u>nothing</u> (0.5) to capture everything properly (0.5) you'd have to have this enormous audio-visual monitoring (.) I mean talk about Big Brother (.) and the data stream from that would just be vast"* **Olivia H015, Consultant Cardiologist**

Once again it highlights the multifactorial nature of clinical work, demonstrating just some of the difficulties in navigating towards good treatment outcomes. Because of the sorts of behavioural and human communication signals involved during the clinical process, it is easy to understand why these claims are being made. So without good indicators, the measurements and therefore the data is open to interpretation, and this makes any attempts to mark out poor outcomes open to challenge. This problem operates on many levels. At a management level, critical comments have been made about and the publication of hospital mortality statistics, using similar arguments about the difficulties of interpreting raw data. In this instance, the obligation to present mortality data in simplified tables for the purposes of comparison was used to illustrate how hospital trusts in the lower quartiles can object to the way this data is represented (Appendix B E16). The problem with data indicators in healthcare, which sets it apart from other industries, is that there is a lack of objectivity in the way that inferential data is interpreted. This point about trying to simplify complex activities into a single measurement is a common theme. The simplification process removes important information and leaves the data open to multiple claims about what it really means. For example, in the hospital mortality dialogue, the participant explains how coding methodology can be used to explain away poor data (Appendix B E16). In this narrative, the participant states that it is a problem that sets it apart from other businesses;

> *"the problem that's always been felt (.) within the health service= which really does set it apart from a lot of other businesses (0.5) is the metrics (0.5) what do you measure"* **Adrian H006, Consultant Anaesthetist / Clinical Director**

It is probable given the research question, that he is alluding to technological environments, where there is much greater specification of operating parameters, lower levels of ambiguity and the evidence is stronger. Judgements are less subjective in those settings, whilst in clinical settings, because the evidence is more equivocal, then the opposite is true. The level of subjectivity is therefore greater, and as a consequence the conclusions being drawn are more questionable. For example, there are narratives that suggest that the argument about case-mix variation is used by all clinicians if they have to counter difficult questions about to their outcomes (Appendix B E6). Even so, there's no doubt that there's a reality to the variability between cases, and these types of statistical difficulties make it very hard to detect the required differences in safety. This doesn't just apply to outcome measures and the detection of adverse events; it is also used to oppose changes to existing clinical practices (Appendix B E17). This is significant, when considering the implementation of any safety policy that requires changes to current practices within the clinical area. In the example just given the participant demonstrates the problems of trying to influence change when it is based on inconclusive evidence. In general, there is a level of scepticism about any claims that are made purely on the basis of statistical data. In some cases there is even outright mistrust surrounding data use and its potential to mislead (Appendix B E18).

> *"I don't want to sound very extremist by saying that (.) surely you know there is (.) lies (.) damn lies (.) and statistics (.) of data (0.5) you put in rubbish (.) you get out rubbish (0.5) data can be manipulated the way you want it to look"*
> **Kumar H018, Consultant Orthopaedic Surgeon**

There is considerable mistrust being expressed about the intentions behind some of the uses of data. Further on in the dialogue, the participant goes on to explain. He argues that resources are directed at the collection of this data because it creates information as a product, which is useful for justifying the positions of managers and administrators, strengthening their position. This scepticism probably arises from the political context of the NHS as an organisation under continual change. The strategic direction of the NHS is decided by the department of health, and over the past twenty-five years the trajectory has been one of ever increasing managerial involvement. So whenever there are top-down directives demanding that data be collected, this is seen through the lens of political change rather than as a necessary safety measure. The following section looks at some of this data describing management activities in more detail, including those accounts that refer to management intervention as bureaucratic interference.

6.5 Bureaucratic output

This category encompasses narratives describing protocols, rules or other process controls that have been implemented with the intention of improving safety. But it also includes accounts that are critical of what is described as management interference. Many of these criticisms concern the lack of evidence supporting management directives for local changes. In particular, if there are demands for extra clinical effort without the provision of additional resources, then this is usually attacked by the participants, who might describe such demands as dictatorial (Appendix B F1). The choice of pejorative language is a way of signifying that these are policies that have been arbitrarily decided without proper consultation and imposed without general consent. The focus of this disapproval is the way that these top down directives are said to distract staff away from their primary clinical duties. In a sense it reflects a struggle over who should control the activities of clinical staff. The argument is that more junior staff responds to these organisational policies because they worry about being penalised for non-compliance. The narrative frames this as a bureaucratic exercise which doesn’t fit in with local requirements for staff variability under the direction of the consultant. It is an annoyance with management involvement that is expressed in other sections of the data. In one example, it was claimed that services led by managers rather than by consultants, could be associated with a greater number of patient safety incidents because of a lack of coordinated control between local clinical activities and supporting services (Appendix B F2). To illustrate the point, he contrasts his private practice with his NHS role. The suggestion is that management involvement creates confusing layers of administrative noise so the clarity of clinical purpose is lost. It is a claim which implies that essential support tasks don't get followed up in a timely manner because requests get bogged down in administrative bureaucracy. He doesn't explicate this fully, but throughout his interview he refers to the centralisation of supporting services and the way it creates administrative barriers. So within the NHS, things like the rostering of junior doctors, and the provision of operating instruments are criticised because they function as separate administrative departments outside the consultant's control. It is argued that this creates additional layers of bureaucracy which hinder communication and impede clinical progress (Appendix B F2). These criticisms concerning the way centralised supporting services function and the dependency this creates is also highlighted in other sections of the data. But in contrast to the previous example, where the cause of the problem was said to be too much administrative interference, other examples have stated that it is because of a lack of functional coherence and inadequate processes (Appendix B F3);

> *"one of the things which I find most frightening (.) about the way we practice (.) is that (.) there is no robust mechanism (.) to make sure that things get followed up properly (.) so if I don't pay my electricity bill after a week (.) I get a snotty letter (.) and then after another week (.) I get one in red saying (.) we're going to cut your electricity off (.) it's not that somebody will just (.) not notice (.) that I haven't paid it"* **Andrew H002, Consultant Vascular Surgeon**

It is an illustration of how other organisations deal with similar situations involving important overdue items. The point being made is that there are weaknesses in system, and it seems bizarre that more reliable processes haven't been designed in such life and death circumstances. In this respect it looks an argument for much tighter administration, yet the same participant also reflects on the days when consultants managed their own practice to a much greater extent than is currently described (Appendix B F15). Other narratives suggest that there is a disconnection between managers and clinicians, with participants complaining that local clinical concerns not being followed up by managers (Appendix B F4). It is an example that refers to the mandatory introduction of the World Health Organisation (WHO) surgical checklist, which has reluctantly been adopted by surgeons despite initial resistance to its introduction (Appendix B F5). It is generally described as, not an unreasonable safety change, but it isn't very highly valued in terms of the usefulness of its content (Appendix B F16). Its relevance has been questioned because it's claimed that the actions prescribed on the list were already being performed locally in a lot of hospitals anyway (Appendix B F18). But clinicians have come round and accepted the procedure and its benefit in heightening awareness is now recognised, even though the value of the actual content has been dismissed (Appendix B F17). But there is the charge, that even though clinicians have reluctantly altered their own practices to incorporate this additional task, the managers themselves fail to respond as they should do according to this process that they've introduced (Appendix B F4).

There is a sense of disharmony between clinicians and managers when it comes to organisational policy that strays into clinical areas (Appendix B F5). It is an account that comes from a management perspective and includes talk about resistance from consultants, as well as counter-arguments that are made against some organisational safety policies. Much of this narrative highlights the general sense of frustration felt by the participant over their lack of real authority (Appendix B F6);

> *"if I'm telling an orthopaedic surgeon that (.) I want to change the way they work (.) he can say (.) well what do you know about orthopaedic surgery (.) and I'll say (.) absolutely nothing"* **Adrian H006, Clinical Director**

It is an account that tells, not just of the power of expertise, but also about the high stakes involved in going against expert opinion. In a way it resonates with some of the narratives reviewed earlier in the chapter explaining the reasons why the operational structure depends on clinical autonomy to function safely. These issues, which relate to clinical evolution, patient variability, and the need for specialist medical knowledge give consultants a great deal of power that could be used to block organisational directives if there is a big enough will to resist these sorts of changes. There is at least some evidence of perfunctory resistance to things like the WHO checklist (Appendix B F5). These are social dynamics that derive in part from the consultant's traditional status as fully autonomous professionals. To a certain extent this autonomy has been challenged by managers working in strategic roles, so there will inevitably be some resistance from clinicians. It is a classic struggle for power because over the past twenty-five years there has been a gradual increase in management involvement within the NHS, along with gradually increasing limitations and tighter controls over resources. This notion of struggle is supported by statements made by one of the medical directors;

> *"there's also a resistance to leadership I think=you know (.) there is a natural resistance (.) which tends to come out to play quite often"* **Adrian H006, Clinical Director**

He claims that the consultant body have this natural resistance to leadership, which can sometimes emerge when there are demands for changes being made by the hospital management (Appendix B F7). The manner in which it is described suggests that it is a deep seated social response signifying some underlying insecurity over the current social structure. Of course this expressed struggle over consultant autonomy does indeed represent a genuine social confrontation, because it is clear that hospital managers would like to increase their authority (Appendix B F8). Indeed, there is clearly a degree of frustration on the part of managers over what is described as a sort of political impasse that inhibits changes that could improve patient safety

> *"in the health service (.) you have a great idea (.) but I can't say (.) we're going to do it on Monday (.) because I have six hundred consultants=okay (.) and, a*

> *similar number of senior nurses (.) but it's the consultant body that is particularly, challenging"* **Adrian H006, Clinical Director**

This is a hospital consultant in a management role, so his objectives have broadened out and he is now looking for clinical effectiveness across a range of specialist services within the hospital trust. He argues that consultants are too narrowly focussed with their own objectives. He talks, not just about patient safety policies, but policies in general, and the issue of organisational safety seems to be subsumed with this broader concern over strategic efficacy.

However, the consultants view things differently because they are looking at it from another perspective. This is an important point because it demonstrates the way conceptual categories tie in to specific social roles. They see their role as promoting the best treatment for their patients, and from their own local standpoint, some of these changes are seen as bureaucratic and without foundation. As the data suggested in the last section, clinicians will always refer to the evidence and if that evidence seems weak it will be challenged, particularly if it is seen as clinical intrusion. One example involves the mandatory wearing of short sleeves within clinical areas. It is a safety policy that has invoked some criticism because of the apparent arbitrary nature of its selection (Appendix B F9). This is a national policy within the NHS, which is aimed at reducing hospital acquired infection rates. The evidence has been widely questioned and it is said to bureaucratic. In the example given, the participant is saying that it's a purely administrative policy, done for the sake of consolidating power. He contends that it's an arbitrary decision and refers to international policy differences in this area in order to illustrate this point.

However, despite the obvious social tensions, most of the participants acknowledge that ultimately organisational safety interventions are sometimes justified;

> *"you've got to manage things (.) and run things (.) and sometimes just leaving it to the professionals isn't good enough (.) because (.) there are certainly examples of cases (.) where actually leaving it to the professionals has ended up (.) sort of (.) establishing quite poor patterns of care"* **David H012, Consultant Physician**

The narrative makes an implicit reference to some of the recent patient safety tragedies that have come to light (Appenix B F10). It is an admission that problems can occur if some professionals lose sight of the overall picture and their aims get distorted somehow. If there is too narrow a focus on local or individual objectives, then outcomes could become skewed away from the fundamentals of care. But there is an equal amount of cautionary dialogue levelled at the pursuit of management objectives as well (Appendix B F19). These are warnings about being too focussed on the financial targets which many NHS trusts have to meet nowadays. At the time that these interviews were conducted, this particular trust was striving to meet strict financial tests in order to gain the status of a foundation trust. But although the issue of financial resources is not something that is mentioned as often as one would expect, it is always present in the background. For example, earlier on in this chapter the point was made about problems with the centralisation of support services. Now, one of the main reasons for structuring services in this way is that it is much more efficient. So if it thought that there is too great a focus on efficiency savings, then the consultants can lose confidence in the managers' ability to respond to their requirements (Appendix B F11). For example, this sentiment has been expressed in relation to a continued discounting of medical recommendations for certain types of surgical instruments and other clinical equipment;

> *"I can tell you (.) that in all medical cultures (.) if you continue to complain and nothing gets done (.) you stop complaining (.) I'm sure you know that"* **Richard H009, Consultant Urologist**

The need for financial constraints is generally recognised, but there are differences in priorities between doctors and managers which, as the previous example demonstrates, can disrupt the working relationship to the extent that communication is weakened. This will have a detrimental impact on patient safety, so it makes sense to find these sorts of narratives in the dialogue. But they are also a discursive act being carried out in the context of the research setting, and this must be taken into account given the apparent social dynamics, where there is this tension between consultants and managers as they compete for power and resources. But as one participant points out, whether there is a battle with managers over safety policy or not, will depend on both the degree of bureaucratic interference, and quality of the evidence for the change;

> *"It's a balance isn't it (.) it's evidence and the bureaucracy (.) if you had such good strong evidence about (.) one particular action (0.5) was going to (.) improve safety in some way=but involved a level of bureaucracy that (.) in another situation (.) might not have been acceptable (.) you'd probably be obliged to actually do it (.) whereas (0.5) if there's something where the evidence is very weak (0.5) but there's hardly any bureaucracy involved (.) you might just take that on board anyway"* **Charles H019, Consultant Orthopaedic Surgeon**

The reasoning behind this evaluation follows a utilitarian approach, weighing up the costs and the benefits. There is a sense of obligation to the evidence, and a pragmatism which concedes that if the level of bureaucracy is low then it is sensible to simply go along with the change rather than waste time challenging a weak policy (Appendix B F12). So while many of the narratives coded within this category do describe a not too insignificant amount of management activity as bureaucratic there is also recognition of the need to continue to manage outcomes for the patients.

But to summarise the data in this category, it seems that those interventions that are described as successful are based on strong argument and collaboration rather than top down policy directives. This is also the approach to patient safety intervention that is preferred by managers (Appendix B F13). A more collaborative approach that involves working with expert practitioners dedicated to the best interests of their patients is described, because it is recognised that they each have their own methods and techniques for achieving these aims. But there are also difficulties in managing these senior professionals, and for this reason winning over senior consultants is said to be a key part of the strategy in encouraging more widespread participation in the proposed changes. This echoes some of the other accounts which explain that collaboration and argument are necessary factors for implementing policy changes, and it illustrates the social aspect of safety involving a struggle to either gain or retain power and Influence. Recruiting progressive clinical champions to disseminate new ideas across the peer group in a horizontal manner, rather than implement it as a top-down policy directive, is described as an important element in the successful implementation of safety policy (Appendix B F13). This less confrontational approach thus involves more collaboration and negotiation, which from the participants' perspective is said to be the preferred method of deciding policy in the clinical area;

> *"I like to think of myself as someone who's prepared to discuss (.) and negotiate and (.) sort of- (.) I don't think compromise is the right word (.) but who is able to (.) sort of explain where we are (.) from a clinical point of view (0.5) and also prepared to understand where (.) from a managerial point of view=or a business point of view (.) we are where we sit (.) as well (0.5) and then (.) we have to try and work through (.) how we keep the show on the road=if you like (.) but my role (.) as a clinician (.) is to ensure that clinical quality (.) and safety (.) is maintained at all times (0.5) and the managers role (.) is to ensure that budgets are met (.) and targets are maintained=and this sort of thing"* **Christopher H011, Consultant Paediatrician**

It is a good summary of the general attitude towards management involvement in clinical safety. There should be clear lines of demarcation between clinical quality and safety, and the management of the budgetary aspects of the service. This distinction is very clearly articulated (Appendix B F14). So the activity within the clinical domain is described as the consultant's territory, and although the participant defines himself as someone who is open to discussion, negotiation and compromise, he nevertheless discloses further on in the narrative that there are robust discussions and difficult negotiations with managers. Most importantly, there is some reference to expectations, which seems to imply that it is the public that decides where safety and quality standards are to be set.

So this section includes narratives about safety that are subsumed within dialogue about clinical standards involving a trade-off between quality and safety, and efficiency. It is managers who are responsible for the efficiencies, but there is also a social struggle for control over the selection of clinical priorities. This is described by the participants in terms of bureaucratic interference, particularly when those safety policies involve changes to clinical processes that are based on inconclusive evidence and the absence of general consent. In this way, it demonstrates how social values and functional objectives can influence conceptual knowledge about safety.

6.6 Safety as a process of navigating towards outcomes

At the beginning we reviewed some of the opening narratives that included the pledge contained within the Hippocratic Oath, to first do no harm. This provides the foundation upon which the remainder of analysis rests. The doctors who responded in this study are products of a long social tradition that goes all the way back to this ancient Greek period of time, where physicians were sworn to uphold the high ethical standards required of their profession. It is a culture of fiduciary duty towards the patient that is evident from the data and which sets these practitioners apart from professionals working in other sectors, where it is often the aims of the business that creates the primary focus. As the exploration of the data began to dissect the narratives into the various underlying categories and sub-categories, it gradually became apparent that the core category within the safety concept was clinical success. But the notion of this traditional doctor-patient relationship, where it is the individual patient-client whose outcome is prioritised, doesn't tell the full story behind the concept of safety. Instead, it is a more general notion of the term *patient* that provides the main focus within this concept. It is a category that is formed out of experiences related to the professional environment and the particular intentions that distinguish this professional group. Just as we found in the previous chapter, it is these intentions that underpin behaviour and in modern healthcare the need to progress treatment techniques, and provide healthcare services for the future, means that clinical outcomes are measured by these much broader standards. It is these results that matter, and safety in the sense that it refers to unavoidable or adverse events, is only one aspect that determines the overall outcome in the patient's clinical journey.

The medical field is characterised by uncertainty and variability, and this creates a need for experts who have both the knowledge and judgement to evaluate multiple possibilities for the different risks involved in each unique case. It is this balancing of risk which is talked about most within the data, along with descriptions of the need for professional autonomy and clinical expertise. In this context safety is about the minimisation of harm to patients, whatever the cause, and in this setting the most likely cause of harm is the progression of the patient's illness. The responsibility for reducing harm therefore rests with the consultant, and it is their judgements about the course of action to take during the patient's treatment journey, which will determine the overall outcome. This requires a great level of insight and professional reflexivity in order to continue to develop their clinical practice when things don't go as planned. Access to current knowledge, the latest treatments, and collegial support is crucial for ensuring that the patient receives the best opportunity for achieving the best outcome. These factors all depend on the performance of the consultant and his clinical team, but there are concerns that a sole dependence on the individual consultant can leave gaps in safety, which need to be addressed. However, the data is clear about the difficulties expressed by the participants in establishing measures for both performance and clinical misadventure. Some of this difficulty is said to arise because of the statistical uncertainty which characterises medicine and the need for extensive supporting information in order to correctly interpret simple data sets like mortality statistics. This is also compounded by an important social dynamic which means that there is reluctance by medics, to relinquish sovereignty within the clinical domain to anyone outside of the profession. Even the motives of clinical managers are questioned, and there is a general resistance to any top down policy changes that lack evidence or are seen as bureaucratic movements. In this respect, safety is generally viewed as residing within the clinical domain alongside issues of clinical quality. In those cases where organisational or national policy has determined safety practice there has usually been either negotiation or resistance along the way. But so long as the evidence is clear and patient outcomes are desirable then the data shows that it is these patient outcomes that matter most.

Chapter 7

Searching for causes and navigating towards outcomes

7.1 Introduction

It is clear that the meaning of safety is largely understood tacitly, since most participants took a little time before their narratives moved beyond the initial surface definition to get at the real meaning. Their responses were the product of self-reflection because the real detail emerged during the course of the interviews as they developed their narratives. In all cases the meaning of safety was explained through descriptions of individual and collective actions, along with accounts of abilities, and organisational activities. Those descriptions were drawn from the content of experience. But what distinguished those reflections above all else was the way in which the various actions being described all connected to an overall purpose that linked them together. So it was clear that the concept of safety was being used and selected as a category because of the way it served some practical purpose for the individuals within the group. The research initially set out to establish the meaning of safety for each of these two groups, to map out the various semantic sub-categories within the concept, and identify the latent structure holding those sub-categories together. Another aim was to see how the relationship between the concept and the professional setting matched up, to see if it was plausible to suggest whether large differences between the local concept of safety, and the changes being introduced using the justification of that category, might be a possible reason for poor implementation. As we have seen in the findings there are both similarities and differences in the concept. The implications of these findings will be discussed in the following sections, where the research questions will be addressed within a theoretical framework that examines the relationship between the professional context, the activity and its purpose, and local knowledge.

7.2 The status of the research data

In a study of this kind it is important to acknowledge that the actions and experiences spoken of by the participants are not exact representations of those experiences, but are instead the participants' descriptions of their actions as they recall them from the schematic organisation of those experiences within memory. In this respect it is fundamentally a process of recall and reconstruction. If we consider that this material is culturally formed, then it would be helpful to consider Bartlett's work in this area, which suggests that the contents of memory are reconstructed on the basis of an overall '*attitude*' or *'general impression'*. By his account, there then follows a re-construction which then serves to rationalise this overall attitude;

> *"when a subject is asked to remember, very often the first thing that emerges is something of the nature of attitude. The recall is then a construction, made largely on the basis of this attitude, and its general effect is that of a justification of that attitude"* (Bartlett, 1936 p. 207).

In the context of this study, we could say that this conscious reflection sets-up an overall general impression which precedes the process of verbal recall. In this case, the recall in question is the conceptual definition of safety, and just like the more general process of recall described by Bartlett, the expressed safety concept is re-constructed from existing organised experiences. In Bartlett's words; *"The attitude is literally an effect of the organism's capacity to turn around upon its own 'schemata', and is directly a function of consciousness"* (Bartlett 1936 p.213). But since it appears from the findings that the concept of safety derives from activity, then it could be argued that narrative data is a less reliable indicator than observational data. But the aim of this research is to examine the *collective* concept of safety within each professional group, and in order to understand conceptual thought one must first appreciate how social activity, and the needs and motivations that drive it, are mediated through social artefacts, including language. Once this connection is understood, then narrative data takes on a much greater significance, since it is through language and other artefacts that the meaning of this social activity is apprehended as conceptual thought. Narrative is therefore an important medium through which the concept of safety is shared.

7.3 Similarities between the groups

The findings reveal certain similarities between the two groups. These similarities relate to a common concern about management involvement in operational activities that are said to threaten safety. This derives from the division of labour and the tensions that exist between professionals and managers as a result of their different goals within the overall professional activity. These tensions can be seen in the participants' narratives, where the motives of some of the managers' actions are brought into question. This is seen as interference, and typically relates to operational short-cuts aimed at productivity or cost savings, or alternatively it concerns bureaucratic processes which stifle effective action. In all cases there is the suggestion that is a direct conflict between the goals of the managers and those of the professionals, at least in terms of their desire to achieve these goals to the level of care and attention expected. Because many professional actions are critical when things go wrong then these management goals are seen as a potential threat to safety.

This is most evident in the aviation group, where there are prevailing suspicions about the possibility of managerial misuse of institutional controls that have been agreed as part of a systemic process designed to prevent accidents. We saw this concern through narratives included in the sub-category of safety labelled '*efficiency and productivity issues'*. It involves doubts which centre on the use of operational tools that have been developed for achieving safety objectives. So things like flight data monitoring, documented procedures, incident and fatigue reporting mechanisms, and other devices for collecting information, are seen not only as instruments of safety, but also as surveillance mechanisms which shift power over to the managers. As we saw in the findings, this sometimes applies hidden pressure on the professionals to comply with the commercial and productivity goals pursued by managers, even when they erode operational margins and increase substantive risk. Now, these are subtle social processes, but it creates, within the concept of safety, a sub-dimension involving a sense of caution about the use of safety, by managers, as a moral justification for seizing control within operational domains normally belonging to professional groups. It is the same effect in both aviation and clinical settings, except that in the clinical context this interference by managers isn't accompanied with the same strong systemic or functional associations with safety that are present in aviation. Instead, there are caveats within the narratives warning about managers being motivated towards financial goals, but the relations of power are balanced more towards the clinicians because of the greater environmental uncertainty and specialist knowledge involved.

In both cases, these social tensions create a point of reflection. So when changes to local practices are proposed there is a questioning of the motives behind those changes. These doubts will invariably produce reflections upon those planned changes and their conceptual justification, and this will be compared with current practice and its relation to ones understanding of the concept.

But these sorts of contradictions can eventually be resolved through a dialectic process of evolution, resulting in a spontaneous or creative modification of current actions and instrumental conditions, thereby altering conceptual knowledge. Now, in the aviation group, although we see that these doubts about management motives are still present, the sociocultural history of the industry has formed the conditions for the development of this activity over time so that it has evolved to partially accommodate this contradiction between management and professional control over safety. This sociocultural background, which is essentially based on technological and engineering foundations, will be discussed in the next section. But specifically, the problem of this professional suspicion over management intentions has been diminished by supplementing the many institutional controls surrendered on the grounds of safety, with a legal guarantee of personal autonomy. This legal assurance gives ultimate and final discretionary control to the professionals.

Safety as a concept is therefore an important tool, not only for mediating sets of actions but also for the way it regulates the relationship between professionals and airline managers.

It is interesting to note that even though both of these organisations are structured differently in terms of their ownership credentials, they nevertheless share this same division of labour and the tension that this creates when the two groups talk about safety. So although the participants in the medical group operate within the publically owned NHS, they are still constrained by resources in the same way that a privately owned airline operating for profit would be. The need to prudently manage services funded by taxpayers is undeniable, but it was perhaps the creation of a managerial group within the NHS following the Griffiths report in 1983 that led to the current structure involving the strategic management of clinical services (Griffiths, 1983). This replaced the previous consultant led arrangement and created a more business like ethic, eventually leading to the current internal market where there is the purchase of services from NHS hospital trusts by clinical commissioning groups operating on behalf of primary care services. So when both professional groups talk about safety, this division between managers and professionals is equally evident. But the point of divergence occurs in the way in which this perceived managerial intrusion into front line practices becomes manifest.

In the medical setting the criticisms are primarily about managerial interference in clinical activities. This included references to the way that the financial and productivity goals of managers and NHS bureaucrats act against the safety of patients by trying to drive policy in clinical areas through the use of targets. These narratives were documented in the findings under the category of '*bureaucratic output*'. However, the amount of control held by managers within the medical setting was less than that of their aviation counterparts because of their inability to monitor events in the same way. Therefore clinicians have more power to act on the basis of their own conceptual understanding. Top down interventions are less likely to translate into action unless they are carefully attuned to clinical goals and existing practices.

7.4 Differences in conceptions of safety between the groups

Before going on to discuss the differences in more detail, it is worth noting that a general appreciation of how the conceptual networks differ between the two groups can be seen most clearly in the respective illustrations presented in chapter's five and six. The illustration representing the aviation concept (figure 3) is much more cleanly defined, with the main categories fitting neatly together as a well formed system of relationships. It reflects the strong collective understanding that exists within the group concerning its main purpose of control over accident causality. If we consider a concept as a 'thought-for-action' then the clarity of this illustration reveals the centrality of safety within the aviation activity. In contrast, the illustration representing the medical concept (figure 4) shows a much greater set of sub-categories embedded into the concept. The definition is less defined and the relationships between the sub-categories within the core category of clinical success were often overlapping. It shows how the participants' narratives were often nested in categories contained within the main purpose of their medical activity. The aggregate reduction of overall patient harm through the achievement of clinical success involved a strong concern with judgements related to risk and a combined emphasis on clinical quality and personal autonomy. What we would consider as the traditional functional topics related to safety were often separated out during the narratives as part of the discussion but then always linked back to this core category of clinical success. This illustration therefore provides a clear visual depiction of how the safety concept is much less distinct within this group, indicating a greater complexity within the medical activity. These unique patterns within the concept will now be discussed further in the following sections.

7.5 Discussion about the aviation differences

The findings from the aviation group reveal that the safety concept is founded on a core category of '*control*'. The category is formed out of narratives describing both individual and collective actions, whose central purpose is conveyed within the collective activity of safety. The purpose of this safety activity is principally the avoidance of an accident during flight. But this purpose is also a necessary pre-condition of the main institutional activity of air transport, which is to commercially transport passengers by aircraft to their destination. At the heart of this activity are important cultural artefacts; the aircraft, the technological systems on board the aircraft, the processes that support the operation, the infrastructure, and operating procedures, as well as checklists, and the specific language used. All this technology has been designed and engineered to operate within very highly specified parameters, which have all fundamentally been based around the aircraft and its operating environment. These usually involve technical limits to define the boundaries of normal operation, and the use of functional parameters and operating margins to constrain activity have gradually evolved outwards from the aircraft and its systems into the wider aeronautical environment. So things like, air traffic control, airfield operations and human factors have all developed operating margins that have come to be very closely specified. All these artefacts mediate between the professionals working in this setting and the objects of their actions. In this way it comes to form conceptual knowledge so that it is meaningfully consistent with those experiences and forms useful categories of knowledge that orientate the subjects towards the achievement their goals. We can see this in the narratives of the aviation participants, who outline safety using the language of specification, prescriptive standards and operating limits, reflecting the socio-technical environment in which these pilots operate. Of course, there is a historical and cultural aspect to the safety concept, since the artefacts that lie behind this knowledge have evolved during the socio-historical genesis of the profession and their activities.

Within the participants' narratives are descriptions of what could be viewed as social conditioning, involving comprehensive recurrent training processes for the rehearsal of both routine and emergency operating procedures. They describe how specific actions in response to anticipated circumstances are practiced so that they can be performed seamlessly when the situation demands it, carrying out the required technical procedures in the right sequence at the right moment. All of these actions and responses are developed and retained as an active organisation of past impressions and reactions. Even the use of routine tools and materials within this environment acts to form the various conceptual categories shared by the professionals in this setting.

Now the participants' narratives are assumed to be constructions based on their recall of these impressions which Bartlett's would refer to as schemata (Bartlett, 1936). But unlike schemata that evolve through spontaneous actions, these responses are more permanent and stable because they are strengthened through strictly prescribed interactions, which are shaped within a very structured operating environment. The participants describe an environment involving standardised operating procedures, cross-checking, and the monitoring of performance parameters to ensure compliance within selected operational limits. Viewed from an '*Activity'* perspective, we can say that the mediating artefacts and the object of the activity are well developed and fairly obdurate, and that spontaneous behaviour is partly constrained through strong rules and a division of labour that subordinates pilots as company employees. Some accounts even describe exactness in the almost scripted language being used during professional interactions on the flight deck.

These narratives reveal, not only descriptions of the participant's recall of these activities, but also something about the way each individual has chosen to organise these experiences when producing their narratives. In this respect the narratives are a formulation of the individual's current construction of safety and will reflect the manner in which the concept is typically used as an instrument for communicating these experiences through language.

7.5.1 Underlying logic and principles that hold the concept together

Most of the aviation narratives described actions that were based on certain principles and assumptions about the environment within which this activity is situated. These typically relate to the highly specified and technical nature of aviation and its historical legacy of progress through engineering. It assumes a high level of control and predictability over the products of this activity, since it is based on technological certainty, calculation, and careful design of each of the components as well as the completed whole. It assumes that the whole activity is the sum of each individual action or event. We can see this in many of the narratives coded in the category termed *information and predictability;* a category that centres on dialogue about the availability of useful information and the way such information can be used to make predictions about different causal events. Those descriptions typically included references to past accidents or incident reporting, and involved explanations based on clear causes, with a linear progression of the effects of those causes through time and space. In this model, causality worked in both directions from cause to effect, and then when retrospectively examining past accidents the effect was also traced backwards to find the cause. Thus a process of *causal reasoning* was evident in the way the participants' thought about, and joined up their actions as part of their safety narratives. Therefore the identification of the potential causes of an accident becomes a critical goal for avoiding an accident, which in turn is a necessary part of the motivation with the overall activity of air transport. What distinguishes this pattern of thinking is the level of certainty within the environment. One logical consequence of this assumption is that there is then an expectation that human performance should also meet the same standards of invariance as the technology. But there is also an historical legacy behind this assumption, with past accident reports attributing human error as a main cause. This reasoning creates environmental adjustments towards the reduction of variance within the activity and the strengthening of the philosophy of standardisation. But what is interesting, is the way in which many of these narratives were constructed by the participants from a social perspective operating at an institutional level. Indeed, in many instances participants spoke using the collective pronoun 'we' rather than the singular 'I'. So there is this primary orientation of the self towards an institutional standpoint, revealing a close and unified social orientation towards the activity as a whole. To return briefly to what Mead suggested about the identification of the self through interaction, he showed how the social actions of the community become internalised to form a '*generalised other'* through which the individual views themselves as a social object from the perspective of others;

> “*The organisation of the social act has been imported into the organism and becomes then the mind of the individual. It still includes the attitudes of others, but now highly organised, so that they become what we call social attitudes rather than roles of separate individuals”* (Mead 1934 p. 178).

Although Mead was speaking about group social interactions, he nevertheless outlines an internal process that explains the level of unity within the aviation sample. Once the various actions and social interactions associated with an activity are internalised they become a part of the individuals’ self-concept;

> “*The organised community or social group which gives to the individual his unity of self may be called ‘the generalised other’. The attitude of the ‘generalised other’ is the attitude of the whole community”* (Mead 1934 p.154).

We can imagine that the actions of all those involved within the activity are so closely aligned, that the community has extended outwards so that it functions at an institutional level. In other words, there is a social proximity within the whole aviation activity such that each individual closely identifies with, and is conscious of, not just their individual actions, but the overall motive that forms the safety activity. Furthermore, within the aviation setting there is frequent industry feedback through various media, including practical training, which mediates the individuals’ experiences so that their internal conceptual development is institutionalised. Through these various organisational systems, processes, and prescribed actions, the functional model of safety becomes internalised as an idealised image of safety, so that it acts upon each individuals’ experiences to shape their concept of safety so it reflects the broader institutional model.

7.5.2 Duality of perspective within the safety concept

But the picture becomes interesting when we consider a different set of narratives that were coded under the category of *Individual autonomy and intervention.* These were narratives that were told from an almost contradictory position, by taking an individual perspective. Some of these accounts began from a point of episodic recall where specific events falling outside of normal or routine operations were recounted. These were described as unusual deviations from what was expected, some of which were surprising encounters. This category also included reports of perceptual uncertainty, and there were other narratives that described emotional reactions. These contrasted with the narratives coded in the *institutional control* category in the way they focussed more narrowly on the individual and the event, rather than the whole system. In these narratives there was no consistent logical structure linking all the components together, instead it was more of a direct sensory relationship between the individual and their environment. In some of those situations they described a zone of uncertainty where they initially struggled to match the ongoing flow of sensory experience with a known category of experience that would help them to explain the situation. One inference is that the right schema was not initially available to them, since it was a novel situation. The reality of the moment was different from the idealised schema shaped through the psychological process of internalisation, and reinforced through training and other actions. The subjective '*self'* or 'I' thus has no reference for its action, and must respond in a more immediate, spontaneous and creative manner based on a flow of perception, judgement, flexibility and personal autonomy. It is a pattern of thinking that is immediate and fits with what Hallpike (1979) distinguished as '*primitive thought'*; a type of thought process that is perceptual, concrete and affective. It is distinct from what Hallpike termed '*advanced thought'*, which is the more linguistic, abstract, logical, and conceptual thought more evident in the narratives contained within the institutional control category. In other words, it is a direct level of human functioning. Zinchenko referred to this as a unit of consciousness he termed liberated action, which he illustrated by using the activity of flying;

> *"According to specialists in the prevention of aviation catastrophes, in complex flying conditions humans and machines turn out to be, as it were, outside of time (we have in mind here the 'time' of consciously controlled decisions and actions)…the separation of the personal 'I' from the situation and, consequently, its separation not only from the time of objects but from the time*

of the subject as well). This means that the 'I' is outside of time." (Zinchenko 1985 p.112).

By outside of time he is talking about pure sensuous-object action where the individual is observing beyond him or herself (Engeström 1987). So the ability to cope with these unexpected events, to moderate ones emotional responses, and to regain self-control in order to move back into the region of certainty has, through the repeated training, and all the other conscious activities described in the institutional control narratives, become a skill that is enacted in the moment of such situations.

It is clear then, that even anticipation of the unexpected, and the certainty of the uncertain, has become incorporated into the concept of safety, so the ability to act through instinct and intuition has become an important action within the activity. Furthermore, the direct exposure of the pilots to the danger that directly confronts them when normal procedures fail means that their motive to survive will trump the motive of the social activity. Autonomy of action is thus embedded deep within the concept of safety for the pilots in the aviation group. Since there is no way that this primal instinct to survive can be reasonably extinguished through the mediation of any form of cultural or historical artefacts, then under the conditions of a real and visceral threat of physical harm, the object of survival becomes the motivation and the goal for the individual, overriding all other concerns. This is naturally a part of the genesis of safety within aviation, so that discretionary action has come to be recognised throughout the whole institution. But the divisions of labour within the activity mean that this instinctual personal autonomy has now become re-structured and is managed through the use of regulatory rules and norms within the industry.

These instruments restrict discretionary intervention to those actions which can be later justified as critical for safety. This need for justification is described by the participants throughout the data, but it is the importance of the aircraft commander, who has full and final authority that is emphasised. This authority, which is embedded within the legal regulations, provides the necessary compromise to ensure that there is willing compliance by individuals with the prescribed operating procedures and other institutional actions, like flight data monitoring. This compliance is also ensured through behavioural norms, which are reproduced through operational instruments, and actions that are culturally mediated through the use of professional artefacts, like the procedures and checklists, the standard aircraft layouts and so on. There is thus this dialectic relationship between individual autonomy and institutional control that appears to have partially resolved into balance, and which only becomes apparent when we break down the safety concept through this analysis.

If this accounts for the duality of perspective that was outlined in the findings, where there were narratives describing the concept of safety *looking down* at the activity, as well as from *within* the activity, then Mead's theory of the '*self*' makes sense. Since humans can possess more than one '*generalised other*' (Lauer and Handel, 1977), then the various instruments that mediate action from a cultural historical Activity Theory (CHAT) point of view, lead to actions that are internalised through the performance of routine actions in recognised situations. This is also accompanied with institutional discourse that is communicated during recurrent training and through the various cultural artefacts within the airline. This is the self-as-object that views the self as a *collective agency* within the whole activity, as if viewed from above. But there is also the other 'Me' that acts from within the reality of the unfolding activity, pursuing situational goals, making necessary adjustments, and performing intuitive and flexible responses to uncertain occurrences.

But it is the institutional perspective that dominates the narratives, and it is this perspective that forms the idealised and systemic model, whose functional components have been used as the template for the systems model of safety that has been sought for transfer into the medical and healthcare setting. This is a model derived from a cultural history of technical innovation and development. It is essentially a causal and linear model that breaks safety down into individual component parts in order to identify, and then prevent the cause. These various assumptions and underlying principles have emerged from the actions of the individuals within this activity, but healthcare has a different cultural and historical past and the concept of safety as it is described by individuals working in this context is different.

7.6 Discussion about the medical differences

We saw in the findings that the concept of safety in this group is a less distinctive category, subsumed within a much broader, more general classification. This classification contains all actions and operations that are about either; reducing, avoiding, or reversing harm to patients. Its purpose is therefore focussed on producing the best diagnosis and treatment possible. The concept functions as a symbolic or linguistic artefact. It is an abstraction of experience that becomes an instrument of thought which mediates between the subject of the activity, i.e. the clinicians, and the object of their activity; that is the patient's health outcome. The success of this outcome is measured by delivering an overall improvement in the patient's health. Analysis of the findings within an Activity Theory framework (Engeström 1987; 1999) focusses on both mediated action and professional activity as the units of analyses. This offers a suitable framework for explaining these cultural differences. By considering how the findings relate to professional culture and the trajectory of its historical evolution, we come to see how the activity of medicine has developed in the way that it has along with its current professional and psychological tools. These cultural artefacts will be both an external outcome of this professional trajectory, as well an internal force that shapes the ongoing development of collective and individual actions. Conceptual organisation of knowledge will be one consequence of this process, but as we see from the findings the concept of safety is not one of the most distinctive symbolic tools for achieving the object of the medical activity.

But safety as a more general concept for avoiding harm is considered by the participants, and the research context inevitably invited comparisons of safety between the aviation and medical settings. This link with the research context must be borne in mind when evaluating the findings, and there will have been some awareness amongst participants of the aviation focus on accident causes. Indeed, this can be seen in some of the narratives that explicitly mention differences between aviation and medicine. It is possible that many of the participants will probably have imagined these aviation safety systems and used this as a starting point for their reflections on what safety means to them in their own professional settings.

While the participants spoke about reducing harm and improving clinical outcomes, they also described at length the practical difficulties involved in separating out events that might be classified as avoidable harm. This is not just a matter of being able to discriminate the causes of events that lead to a physical deterioration in the patients, but it is also about the degree to which there is control over these events in the first place. For people working in aviation, it is easy to identify when an accident occurs. It can be explicitly identified, and the level of control over operational proceedings is fairly high. But in the medical field there is a lot more ambiguity, greater variability between cases, and consequently less control when these circumstances conspire to produce a problematic level of uncertainty. So while safety is a clearly delineated category in aviation, it is less so in medicine. Although the category of iatrogenic harm was recognised, it was generally bundled into an overall class of problems that included the progression of harm resulting from the patient's illness, as well as any inefficiency with clinical interventions. Since the consultant's motivation, and the goal of their activity, is to improve the patient's condition, then the outcome of that objective will be established by the level of organic harm that remains after the patient has completed their treatment. The vicissitudes along the way have been expressed as a concern by the participants, but they are not the primary driving motivation, and are not a wholly determinate factor in the outcome. So there is this fuzzy correspondence between the primary motivation of treating the illness, and the meaning of safety as it was articulated by the participants. What is clear is that the concept of safety has much less utility as a category for organising experiences in this context, than it has for groups in other professional settings such as aviation. From the participants' narratives, the origins of this motive and the actions associated with it can be traced through the historically formed object of the relationship between doctor-patient. The ancient Hippocratic corpus of writing which date back to around 400 BC still influences this relationship, with quoted pieces from these writings appearing in the participants narratives as cultural '*rules'* commanding the clinicians to *'first do no harm'*. The long tradition of medicine has evolved very slowly over time to become the activity it is today through the interactions between doctors, and the objective responses to their actions which are continually mediated through the language and artefacts of the medical world. At the same time, those instruments are both formed and re-constructed through the collective actions of all those involved in the activity. These instruments include abstract conceptualisations, including moral values, norms, and the concepts through which current medical actions are fashioned and understood. Culturally, medicine is the most prominent of the traditional professions, and it centres on this moral commitment, or obligation to act in the best interests of the patient who is in a state of dependency within this relationship. But it is actually more than this mutual condition of dependency and fiduciary duty that exists between individuals; it has become a part of a much wider social relationship that is based on an implicit social contract between the medical profession and society (Cruess and Cruess 2008), something that forms the basis for the expectations and obligations of the community of actors within this activity. However, currently in the UK, medical care is a provision that is organised by the state through the structure of the National Health Service (NHS), so as part of this social contract doctors have to be careful in their practice, in order to efficiently manage the limited resources available. This is an obligation that appears as a constraint within the narratives, and over recent times it seems that the doctor-patient relationship has been transformed, so that the object of the activity is not just the individual patient and their final physical state, but it is the aggregate level of harm in all patients across the clinic, as well as the provision for future patients, and a drive for medical progress.

7.6.1 Contextual uncertainty, risk, and patterns of thought

One of the main differences between the two groups concerned the way that safety, and safety activities, hinged upon the apparent level of certainty within the activity. And as we mentioned earlier in the chapter, the higher levels of certainty in aviation have shaped their definition of safety so that it forms a much more distinct category.

This in turn has meant that the concept of risk is characterised as a pseudo-scientific phenomenon which is assumed to be both objective and measureable. At a local level the pilots described risk to them as a set of predetermined options to events in the form of statements of the type, '*if this, do that'.* They also described organisational risk processes in terms of calculated and '*data-driven approaches*'. It is the traditional 'risk as science' approach, where risk is quantified in terms of the probability of occurrence times the severity of a situation (Smith, 2004). This assumption is evident in narratives describing the use of tools such as risk matrices. As an activity that has its foundation in engineering, where mean-time-between-failures (MTBF) can be empirically tested in components, and where the failure rates of systems and sub-systems can be computed on the basis of those components and their combinations, it then makes sense to extend this philosophy out to other areas of apparent certainty. But the evolution of risk in the medical field is quite different since it is based on much greater levels of uncertainty. Many of these uncertainties mentioned by the participants were attributed to the unique condition of each patient, the inclinations or preferences of each individual clinician, as well as the continually evolving field of medicine. These aspects were all recounted along with other contextual ambiguities to blur the decision making process. So instead of focusing narrowly onto the detail surrounding the causes of an accident, the medical group were more concerned with the different patterns of risk probabilities for each patient, along with their various treatment choices and the estimated outcomes for those different possibilities.

So while the aviation group talked about operational elements and discrete events, as if they were separable parts that could be individually apprehended in order to produce an understanding of the whole process, the medical group instead described a system of ambiguous cues and knowledge-based probability estimates. Some of the narratives referred to the patient's journey or pathway, suggesting that safety is an active process of navigating risks and producing timely interventions. It is a characterisation linked to a different set of assumptions about causality and the evolution of events than those present in the aviation group. For this group, safety is not so much about eliminating trigger events, or reducing operational disturbances, it is more about disrupting the normal trajectory of events by picking up on indeterminate signs of physical illness, the subtle indications of deterioration, and introducing treatments or other interventions in order to reduce the overall harm experienced by the patients. In this respect, it is more of an active interventional process, requiring knowledge, intuitive recognition, professional insight, and local judgement. The point is that it requires specialist intervention in order to quickly diagnose and disrupt the process of disease and produce the best outcome possible for the patient. In many narratives, it is omissions, misjudgements, or delays that are expressed by the group as the problems which need to be addressed, rather than causal triggers. So this involves a different pattern of thinking to that of the aviation group, where linear spatial-temporal logic is used to identify causality. By way of contrast, the medical group use a type of heuristic reasoning based on specialist knowledge that is more akin to Bayesian probability, than to sequential logic. Unlike traditional probability, as used in aviation, where assessment of risk is based on frequency of occurrence, and a calculation of probability times severity, this relates instead to individual beliefs, or more accurately, the level of confidence about the risks of different treatment propositions. This approach makes sense if we consider the cultural context of each professional group; in aviation all aircraft of the same type are manufactured to the same specification, and accident rates and component failure data is more accurate. But in medicine all patients are unique. Consultants build up unique ideographic patterns of experience about the way different co-morbidities will have an effect in different treatment scenarios. These beliefs are always being individually adjusted as the various multiple patient factors get re-evaluated in light of the eventual patient outcome. This continual adjustment based on increasing clinical experience is qualitatively different from the broader and systemic institutional risk information that is fed back to the aviation group.

This difference in thinking styles can be seen from the consultants' narratives, where the participants talk about the evaluation of different risks, the balancing of risks, and the planned journey of the patient along their treatment path. Indeed, the centrality of risk as a topic, and the way that risk is formulated within the dialogue demonstrates how the concept of safety is a product of the cultural and historical activity within which the participants are situated.

7.6.2 Conceptual contradictions and conventionalisation

But even though patient harm is categorised in terms of patient outcomes and clinical success, and while safety as a concept is pragmatically merged with other concepts such as quality and best practice, that doesn't mean to say that the participants do not also hold in mind alternative conceptions of safety. The consultants' narratives certainly include references to aviation safety methods, and it could reasonably be said that these form a broader conception of safety encompassing contextual dependencies. So when aviation methods are described, there is typically the suggestion that these practices would be unsuitable in certain medical contexts. But more usually, safety narratives describe instead the complexities of risk evaluations, treatment options and the importance of clinical outcomes, indicating that 'safety' in the aviation sense of the word is just not a very useful way for organising experiences for this group. In other words, safety as a symbolic tool for communicating a collection of actions whose purpose is to avoid an accident, has not evolved to be a useful social resource in the activity of medicine. It seems that it doesn't hold the same practical value. However, there is this apparent conceptual dilemma, where grounded social experiences formed through socialisation within the context of this professional activity, and which is mediated through cultural instruments like; the hospital, the clinic, medical instruments, the specialisation of doctors' knowledge, the patient's medical notes, and the discharge process, are simultaneously held along with alternative yet contradictory conceptions presented to them through scientific discourse. So knowledge of safety in the aviation or technical sense is known as safety but not recognised as a useful conception of safety.

So these are seen and described as functional or scientific models, rather than concepts in the pragmatic sense. They are systemic and organised sets of activities that have been formed in other settings, and communicated through journals, academic discussion about patient safety, and also within the present research context. These apparently contradictory functional models are described in narratives almost as an antithesis to the participants' own concept of safety that they have formed through their own actions. This is seen from the way in which the medical participants' constructed counter-arguments that worked to oppose aspects of the aviation model of safety. Of course, the present research context is relevant because on being invited to take part in the research the participants are given some information that tells them that it involves safety in aviation and medical settings. They will have made inferences about the study, which will inevitably have had some effect on their responses. But their counter-arguments concerning aspects of the aviation safety model, shows that the safety concept is conceived as both an abstracted category of experience, as well as a functional model that is mediated through scientific discourse. In this regard it resembles Vygotsky's distinction between spontaneous concepts and scientific concepts. These two forms of knowledge are said to mutually work upon each other in ways that re-structure and transform the existing concept to create a higher form of conceptual knowledge (Vygotsky 1986). In this present study, the data is derived from verbal accounts, or narratives, that have been configured by the participants during their research interviews. Now, from an ontological perspective, these narrative configurations could be considered as a verbal process of external rationalisation; a working-through of these opposing ideas to produce an evolution of consciousness in a way that resembles Hegel's dialectic process (Marx 1975). These transformations occur when there is a synthesis of both the original proposition and the antithesis to produce a subjective re-structuring of experience. This course of development will be more radical during childhood, but a similar, more subtle process involving this conceptual re-structuring is likely to occur in adulthood. Indeed, activity theorists like Yrjö Engeström have argued that all conceptual learning depends precisely on the contradictions that present within the whole activity system for its evolution (Engeström, 1987). It is possible then that the inclusion of counter-arguments could indicate the embryonic formation of an approaching qualitative transformation in the medical conception of safety.

However, there is an alternative theory that offers a more convincing explanation as to why these counter-arguments have been constructed. When considered in light of the evidence of recent reports outlining a lack of success in transferring systemic, aviation type, safety methods into the healthcare settings (Benning *et al.,* 2011; Leape and Berwick 2005; HoC 2009; Wachter 2010), then it is a plausible account that is worthy of serious consideration. It is an explanation that derives from Bartlett's work on remembering (Bartlett 1936), where new material was seen to be assimilated or conventionalised on the basis of existing cultural knowledge.

We see from the narratives in this study, that the medical participants acknowledged the value of some aspects of the aviation safety model. For instance, they accepted the premise that monitoring ought to be a part of the safety concept, with some participants describing the problems of picking up on rogue clinicians. But at the same time they justified their existing safety concept by referring to the problems of clinical uncertainty and case variability, thereby exposing this apparent contradiction. But this reference to uncertainty as a logical barrier to change within their practice is in effect, one way of synthesising their emergent concept with the aviation model by limiting it to specific contexts where there is a much greater degree of operational certainty. In this way, they can assimilate the model, but in a way that has conventionalised it so that it remains in line with their existing cultural and historical pattern of activity. The participants' narratives in this regard, are a similar process of reconstruction to that observed by Bartlett in his memory studies, where new material was altered in line with existing conventions (Bartlett 1936). Extending the findings of Bartlett in this way makes sense, because although we normally consider cultural mediation as a qualitative transformation that empowers or enables higher forms of thought or activity, it can also act as a constraint that restricts ones view of the world in a manner that Kenneth Burke referred to as acting in the form of 'terministic screens' (Wertsch, 1998). His use of this particular term refers to the use of filters used in photography to colour the image, and which when used distinguished different features and textures within the world depending upon the particular screen being used. In this way, ones existing concept of safety will act to constrain new actions if are in consistent with current understanding.

Now from a pragmatist perspective, it is argued that actions and responses emerge out of the continuous internal dialogue between the two parts of the self-concept; the subjective 'I', and the self-as-other, the 'Me' (Mead 1934). So it could be argued that when responding to questions that demand conscious reflection on the experiences that underpin the concept of safety, then the participants are naturally orientated towards their actions and responses as a '*generalised other'*. It is an explanation that is not inconsistent with the way in which the participants' narratives in this study have been typically configured, as if they were an objective observer looking down on themselves and describing the meaning of safety through their activities. But also, this mechanism has been proposed as one possible explanation for the internal process behind Bartlett's schema reconstruction, which he elusively described as; *'turning around upon [ones] own schemata and constructing them afresh'* (Bartlett 1936 p. 206 in Wagoner 2013). If we follow that line of analysis, then it is assumed that relevant experiences, which have been organised into the safety concept through activity, will be drawn out of the stored schemata that are embedded into the self-concept. This would certainly create a more rational model of safety based on their individual actions, and would resemble a general abstraction of those actions that is in line with the typicality or prototype effects found in cognitive experiments into concepts (Armstrong *et al.,* 1983; Rosch and Mervis 1975). In any case, although these concepts are normally formed through action, the role of language in mediating that action is important in its ongoing process of reproduction. Because of this, the participants' narratives of safety within this research context have offered us some insight into those underlying logical structures and basic principles that form the concept of safety for that group. So the medical conception, which is based on a pattern of probabilistic reasoning, and a focus on outcomes, is quite different to the aviation conception built on a different pattern of reasoning involving linear causal progression, discrete components, and standardisation. That is not to say that patient safety is not able to evolve using methods from aviation, but rather that it needs to consider how these two conceptions can be integrated practically so that patient safety outcomes become an important factor in overall clinical outcomes.

7.7 Summary and conclusion

Detailed analysis of the participants' narratives reveals that safety is a concept that is formed from particular actions relating to the avoidance of harm. Those actions, and the meanings attached to them are an integral part of the setting within which the concept is used. The concept thus functions as a means of organising these experiences into a suitable shared category, and to generalise them for the purpose of communication, so they can be spoken of collectively and used as a symbolic artefact for planning and organising their utility and future development within the ongoing evolution of the whole activity. This function is most evident in the aviation group, where the concept of safety is a well formed and clearly defined representation of particular operations, actions, and abilities that are all performed for the purpose of preventing an accident. This can be contrasted with the medical group, who seem to merge the safety concept with quality and clinical efficacy to include all actions relating to the removal, alleviation or reduction of patient morbidity. It is one component category that sits widely within the whole boundary of clinical success.

At the very heart of the concept for both groups is a purpose or motivation that drives those actions. This is the object of the activity. It is the very essence of the profession, and is the reason it exists and is recognised as a distinct social grouping. All conceptual knowledge, including the concept of safety, is therefore inextricably linked to the social activities that are performed by the individuals within their particular social setting. For the concept of safety, these differences can be summarised as follows;

The aviation concept of safety is primarily organised as an institutionally wide systemic model that is about operational control. Its purpose is to avoid an accident, and it is formulated as a process of operational standardisation and reduction in performance variance, along with a continual search for potential accident causes. It also contains a dimension involving personal agency that is recognised through an institutional guarantee of exceptional discretionary control. This assurance connects the pilots' natural impulse to take personal control during events that are perceived as dangerous with their willingness to submit to institutional controls during routine operations.

The medical concept of safety is much less distinguished in terms of its utility. It is embedded within a much broader category involving quality and efficiency of practice. There is a primary concern with clinical success and overall patient outcomes that relate to individual judgements. The operational variability in this context produces a personal evaluative focus and a corresponding Bayesian approach to risk. This contradicts the technical preference for standardisation, invariance, and prescribed data measures found in aviation safety.

These differences between the two groups also reveal that there are separate sets of underlying assumptions about the way distinct operational components are seen to fit together to form composite actions and events within the whole activity;

In aviation, the safety concept is based on an understanding of the whole in terms of its individual parts and a temporal separation of events. There is a focus on causality, which is attributed to the presence of some disruption occurring somewhere along a linear progression of events. Safety actions are effectively null operations that prevent something unwanted from happening, so that events can progress normally along their expected pathway.

In medicine, the type of reasoning behind the safety concept is more holistic, involving a field of probabilistic risk evaluations that are weighed against each other in order to navigate through the various options. The concept of safety involves finding the optimum treatment pathway towards the best outcome to alleviate or reduce, rather than specifically avoid, harm. In this case safety actions are active and timely interventions that alter the normal progression of events so that net patient harm is much lower at the outcome.

Through the careful decomposition of the concept using grounded theory, we have laid bare the various sub-categories to reveal the differences between these two groups. These differences have made the connection between the concept and the groups cultural and historical setting more explicit.

Aviation is a relatively recent activity that originates from technological and engineering accomplishments. The artefacts within this professional context are primarily designed and engineered for stability and reliability. These artefacts convey meanings in the form of affordances, limitations and other cultural characteristics relating to their use, thus transferring historically and culturally developed information about human behaviour and human interaction, as the individual purposefully acts to achieve their goals (Wertsch, 1998). In this way, knowledge about the physical world is mediated through the use of these artefacts (Vygotsky, 1978). An example of one of the most salient artefacts within the aviation group is the aircraft. This must be flown precisely and consistently, ideally maintaining the middle of the flight envelope. The narratives also include insight into some of the other artefacts such as checklists, manuals and procedures.

On the other hand, medicine is an ancient profession that is based on the doctor-patient relationship involving a mutual state of dependency and obligation. Some of the artefacts described within this context are much more symbolic, involving models of disease processes and human anatomy, or patterns of communication with patients to elicit clinical information. While physical tools include diagnostic measures that generally require interpretation. For example, MRI scans or blood tests.

From the narratives it is clear that the principle source of these differences is the degree of certainty within each setting. In aviation, the amount of knowledge, information and invariance across the many flight operations is high, which means that there is a much greater level of certainty and a more detailed predictability about possible events. This is the foundation for the sequential causal logic that holds the concept together. While in the medical field there is much more ambiguity, which has led to the more knowledge-based Bayesian reasoning that structures the concept.

These two different sets of operations, actions, activities, and their underlying principles have been developed historically within their particular settings. They have evolved through an evolutionary process as mediated human action. Part of that development includes language, speech, and scientific discourse, as functional models feed into, and develop from, both policy, and changes to practice. In the aviation field the influence of engineering, reliability, and ergonomic based analyses of accidents is apparent, with the participants describing safety in terms of sequences of causality, technical failures, and with references to human factors. In many narratives the participants describe safety using the technical language of scientists. For example, the term 'Swiss-cheese'[9] is used to describe a co-existing combination of failures. But its common usage in this setting illustrates how these sorts of functional explanations have been appropriated by aviation professionals. This is not surprising though, because it is a model that has been developed from research and analyses of past accidents in technological environments, and then fed back into those settings. In the medical field, there were less obvious references to academic or functional safety models. But there were descriptions involving notions of rescue, intervention, and human flexibility, and these and many other accounts describing decentralised action were loosely in line with the principles of mindfulness, and sensitivity to operations that are a feature of the resilience model of safety found in the HRO (High Reliability Organisations) literature (Weick *et al.,* 1999). It is an approach to safety that originates from research into the way that near disasters or close calls were handled so that it prevented them from manifesting into accidents. The analyses of these active and dynamic resolutions of these types of critical operational displacements within high risk environments have identified how local sensitivity to the operation can produce timely and flexible responses to avert danger. These two very different scientific models of safety are the product of alternative objects of analyses; looking at what goes wrong, and looking at what goes right. It is a distinction that resonates with the findings of this research, where safety as a concept relates to the purpose of the activity being undertaken. The traditional organizational accident model is more culturally appropriate to technical settings like aviation where there is more emphasis

[9] This refers to James Reason's popular model of organisational accidents (Reason 1997, 2000).

on controlling the process and avoiding an accident. However in the medical setting, where there is more uncertainty, the focus is on outcomes. In this type of environment, safety as an active and flexible response to critical changes along the course of the activity is more likely to be recognized within the existing concept. The HRO model would therefore seem to be a better conceptual match with existing practices in the medical context.

It is worth noting that these two practical approaches to safety have been combined into a dyadic model of safety by Hollnagel. This is outlined in his book *Safety-I and Safety-II* (Hollnagel, 2014) and offers a much broader range of options when considering policy or interventional changes within critical environments. Any changes to practice that are being implemented using safety as a justification needs to be fully merged with existing practice. As this study has demonstrated, in order to achieve this existing conceptual knowledge, including the principles that hold the concept together, must be in accordance with those proposed practices. If there are conceptual discontinuities, then the intended changes are likely to be conventionalised with existing practice so that essential features of the new model will be lost. An approach that draws on the most culturally appropriate methods will thus be more likely to succeed.

7.8 Practical relevance of the current research to the field

The aviation model is frequently used as a prototype system when planning safety improvements in the medical field. But this thesis has demonstrated that there are significant differences in the way the concept of safety is understood by professionals in these two domains. This needs to be taken into account when designing and implementing safety interventions. Sociocultural theories that relate conceptual knowledge to situated practice suggests that both the proposed practices, and existing conceptual knowledge, must be transformed if they to be successfully implemented in the new setting. However, because of this gap in conceptual understanding, alternative models of safety should also be considered. Safety models that are more attuned to the medical activity, perhaps focusing less on accident prevention and more on high reliability, resilience, and flexible interventional responses, might be better matched to this environment. For instance, the model that Erik Hollnagel describes as Safety II provides one example of this alternative approach (Hollnagel, 2014), and some authors have presented similar methods of safety that are specifically aimed at healthcare settings (Hollnagel, Braithwaite & Wears, 2013).

On a much broader level, when planning changes using safety as a justification, those changes must be incorporated in way that more closely orientates practice with existing knowledge. This will necessarily involve a process of learning by agents on both sides of the conceptual divide. In the first instance, the managers or clinical leaders introducing such changes will need to undertake some form of qualitative inquiry to find out about existing practices and their relation to the conceptual understanding of professionals working within the target area. In terms of satisfying this requirement, this thesis fulfils this objective by providing in-depth material data from two acute NHS trusts regarding the consultants' conceptions of safety. For particular interventions, more accurate data would relate to the particular trusts and specific clinical specialities where the proposed safety changes are to be implemented. Nevertheless, there is an abundance of data within this thesis to help practitioners and managers work to identify safety methods that would fit within the medical conception. Furthermore, the theoretical content in this thesis also offers a sound basis for making recommendations about the process through which safety methods should be implemented.

Since knowledge is formed through social action using mediational means, then simply attempting to transfer safety practices from one professional setting into another is going to be problematic unless there are significant similarities between the two settings. We have already seen how existing knowledge can constrain or limit the way that novel practices are understood because of the way in which this knowledge is shaped by current practice (Wertsch, 1998 p28-42). Therefore it is likely that the introduction of new safety methods and other artefacts taken from other cultural settings will be given new meanings by the professionals in this new setting. These meanings will be formed through a process of reflection involving the existing safety concept and its relation to these new artefacts and proposed practice changes. But this existing safety concept and its cultural content is specifically linked to the purpose of the current activity and all the mediational means within its '*activity system*' as outlined in Engeström's theory (1999). This involves everything that mediates between the subject and the object of the activity, which we have seen in the analyses of participants' narratives. For example there are tensions between the medical professionals and hospital managers, which results from the divisions of labour within the hospital setting. These tensions can lead to a questioning of the legitimacy of any proposed changes (Wertsch, 1998 p.40). As Leontyev suggested, such divisions of labour are often associated with different goals within the same activity, but there should be a common motive (Leontyev, 1978). However, because of these differences the intended safety practices will inevitably become the focus of reflexive contemplation about their usefulness within the medical activity and the motives driving these proposals. This can create an attitude of active resistance to such changes, particularly if they are not in accordance with current patterns of understanding. Even if the proposed safety practices are acknowledged, the process of appropriation is likely to conventionalise the practices so they are better aligned with the existing safety concept when they are externalised into action. This would be in line with Bartlett's work, which showed that new material is often adjusted to fit existing cultural patterns when recalled (Bartlett, 1936), and is consistent with Burke's account of 'terministic screens' describing the constraints imposed by existing knowledge (Wertsch, 1998).

A number of recommendations are put forward to address these problems. In the most general terms, it is suggested that there must be a coherent link between the intended changes and the conceptual justification, along with a logical pathway describing the course between existing practice and the proposed changes. But this is not all; there must also be a theoretical explanation that outlines how these changes relate to the main goals within the primary activity. They should be seen as transformational changes that will enhance practice. It may seem self-evident, yet in many instances safety methods that have been successful in the aviation setting have simply been presented as taken for granted solutions to be rolled out across the health service and throughout the hospital.

Presenting a logical bridge between current conceptual thinking and the modified or developed concept will set up suitable pre-conditions for internalising the proposed practices. This relates in a way to Vygotsky's '*Zone of proximal development',* where the practical gap between development and learning in children was observed;

> *"it is the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers"* (Vygotsky, 1978 p.86)

Vygotsky realised the importance of scientific and theoretical explanations in conceptual development, noting that the merging of both scientific and spontaneous concepts transforms existing patterns of thought (Vygotsky, 1986 p.194). He described how the '*conscious and deliberate character'* of the former acts upon, and under the influence of, the latter with its '*situational, empirical, and practical'* features, to form a higher conceptual categories. It is within the zone of proximal development where this transformation occurs. But the principle of carefully plotting a course and socially guiding or arranging for conceptual understanding has also been observed in other culturally organised activities (Cole, 1985). Although much of this evidence relates to the development of concepts in children, the social foundations upon which the theory was built suggest that it is plausible to expect that a similar process of learning continues throughout adulthood. This opens up an area of further research that would build on this theory, with the potential of providing significant benefits to managers and professional leaders involved in developing and implementing changes to practice.

I have argued that without the logical scientific reasoning to connect new concepts and proposed practices with existing knowledge then progress will be stifled. In such cases there will be no '*conscious and deliberate'* pathway along which existing '*situational, empirical, and practical'* knowledge can be persuasively progressed. Therefore it is likely that there will either be some form of conventionalisation of the proposed changes, or they will be resisted. It is clear then that the recommended ground work that is needed for identifying current conceptions of safety, and in specifying existing practices is vitally important when formulating patient safety improvements. This will provide the benchmark from which suitable experts embedded within the practice can work towards the production of a new conceptual account that supports the development of practice in the required manner. Once the proposed changes have been appropriately selected and rationalised so that they logically connect with existing conceptual thought, and the resultant justification has been communicated, there should then be selected reviews to establish the degree of internalisation of those practice changes to ensure that thought and action are both connected towards the main aims of the proposed changes.

There has been a great deal of research into the implementation of practice changes in healthcare, but it is worth drawing attention to one notable and widely cited paper that has conducted a review of the published literature in this area. In their conclusions they highlight several domains that are important for successfully implemented changes in healthcare. One of these domains relates to the character of the intervention. This includes the evidence, and the strength and quality of the innovation, with the authors cautioning that "*without adaption, interventions usually come to a setting as a poor fit, resisted by individuals who will be affected by the intervention*" (Damschroder *et al.*, 2009). Other literature also notes that successful implementation will depend on the quality of rationale used in claiming that the changes will produce the desired outcomes (Rycroft-Malone *et al.*, 2002; Stetler, 2001). This thesis offers an explanation that helps to explain why this feature of implementation is necessary, and thus provides additional details that are useful in preparing the justifications for change.

Successful intervention therefore involves the creation of a careful fit between current conceptions and proposed practice. Those safety interventions that have succeeded to some degree have done so through a process that has involved the staff during the development of the changes (Provonost, et al. 2004). One method of implementing changes to practice which draws directly on sociocultural theory, and so recognises the link between conceptual understanding and the cultural and historical heritages through which existing practices have developed, is 'The Change Laboratory' (Engeström *et al*., 1996 ; Virkkunen and Newnharn, 2013). This is based on notions of re-mediational design (Vygotsky, 1978), and expansive learning (Engeström, 1987) and would be a well suited method for creating safety changes that can close the large dialectical gap between knowledge and practice that this study has identified.

But the main significance lies within the rich textural narratives of the participants in this study, where the connection between mind and action is explicitly laid out in relation to their primary professional goals as they recall schematic knowledge that has become categorised within their conception of safety. This not only provides a concrete example of the processes described by social psychologists, activity theorists, and sociocultural theorists, it offers real insights into the way safety is understood by professionals working within these two concepts. Like all research there are limitations that relate to both the practical constraints of the research process and the limits of the chosen methodology, but this opens up a whole range of further questions, adding to the ones already posed by the research findings and the subsequent discussion. This offers the opportunity to further explore the relationship between conceptual knowledge and practice, particularly in relation to implementation processes. There are also specific questions that relate to contemporary definitions of safety within the field of safety science. Some of these questions about what safety means in different settings are starting to be a focus of attention for safety scientists like Hollnagel (2014) as the topic moves beyond the traditional technological settings into different social settings characterised by greater levels of uncertainty. There is certainly much more research to be carried out within this area, and the way forward must certainly include a consideration of how the concept has evolved naturally within these settings.

Appendix A

Selected Pilot Narratives – Extracts taken from 21 interviews used to illustrate the findings discussed in Chapter 5

A-A Institutional control

A-A1

"Safety (.) as I see it in the- (.) in my position (.) is an effective SMS which (.) is the abbreviation for Safety Management System (1) which is a structure in place approved by the authority (1) where they agree that it conforms to the (.)European (1) Safety Agency's requirements for a safety management system (0.5) so long as there is a safety management system in place that everybody is aware of (.) and the principles are followed (.) that to me is (.) is safety at work (.) safety in place." **Steve A003, Captain Boeing 757**

A-A2

"a safety management system is a structure which is set up within an airline (1) which (.) is a system whereby (1) the oversight of safety in the airline is the responsibility of the airline rather than the Civil Aviation Authority (.) it has nominated post holders (.) nominated procedures (.) nominated departments" **Steve A003, Captain Boeing 757**

A-A3

"the=the post holders (.) the nominated post holders <u>are</u> (.) legally responsible for ensuring that the (.) the SMS does work <u>and</u> (.) if it doesn't (.) they're the ones that (.) stand up before the judge and have to explain why (0.5) they are (.) legally required to (.) to ensure that (.) it operates as (.) as it's supposed to work" **Steve A003, Captain Boeing 757**

A-A4

“It really doesn’t matter what the individuals do (.) I could be the safest and best operator pilot there is (.) if I don’t have (.) you know- behind me (.) leadership (.) or safety management in the airline to back that up and support me (.) so the others are like me (.) you know (.) if it’s just myself (.) what am I going to do (.) just one drop in the rain (.) I’m nobody” **Pascal A013, Captain Boeing 737**

A-A5

“the regulator obviously plays a significant role in that you must have a safety management system in place if you’re going to be an airline of a certain size (.) but how that’s implemented is a very (.) I guess (.) variable- (.) I’ve only worked for two airlines so- (.) both of them had similar cultures in a sense that it was a- (.) they treated it as very much a learning thing” **Ron A019, Captain Boeing 737**

A-A6

“the flight safety system has been in existence (.) you know (.) for the last thirty-forty years (.) and the way the flight safety system has developed is now influencing the SMS (.) so they’re trying to put it into the rest of the company (.) the way of working the- the open reporting (.) the just culture (0.5) all that sort of stuff that goes with the flight safety reporting system (.) they’re trying to embed that into the rest of the company and- you know(.) looking at the risk (0.5) it’s a kind of- (.) the SMS is- I think it’s an ICAO recommendation or even IOSA” **Phil A004, Captain Boeing 757**

A-A7

“ICAO is obviously the- you know (.) the top international body for aviation that puts out statements of recommended practices (.) I think it’s SARP’s they call them (.) and basically (.) then it cascades down to national authorities (.) but there’s also something called IOSA (0.5) which is an international- if you like (.) safety certification (.) and every company- if you are IOSA certified- that means that every couple of years the independent inspectors come in and assess your working policies with the- against the ICAO recommended practices and things like that (.) and I’m pretty sure that the requirement for an SMS comes from ICAO and probably now also from EASA (0.5) so

most- all airlines in the UK should have a safety management system (.) which should be getting- you know more(.) more prominent" **Phil A004, Captain Boeing 757**

A-A8

"I don't see effectively the regulator playing any part in my normal life (.) they obviously do at a higher level because they issue instructions and guidelines to the airline (.) but the airline then interprets those things for me (.) and then issues instructions from themselves on whatever- (.) I guess the guidance that I've received from the Civil Aviation Authority(.) from JAR or from EU-Ops (.) so it's the regulators (.) as far as I can see have become a bureaucratic organisation (.) working in the background and interacting primarily with higher levels of airline management"
Russell A016, Captain Boeing 737

A-A9

"competence wise (.) obviously there's an industry minimum (.) or a regulatory minimum of your license basically (.) and that's- (.) for a basic- (.) as an airline pilot or a captain- just speaking as a captain because the licenses could be slightly different between a commercial license and a captains license as it were (.) but I think the vast majority of guys at my company (.) maybe two or three percent have the lower license but there's a minimum hours requirement to get that license (.) so its 1500 flying hours (.) so many night hours (.) so many cross country hours (.) so many hours flying (.) you know in cloud etcetera blah blah blah" **Charlie A015, Senior First Officer Boeing 737**

A-A10

"there is a minimum standard set by the regulator in terms of- I mean for example the (0.5) government- not the government the- (.) what's the word (.) the regulatory authority (.) the CAA says you will pass all written exams at 75% or greater (.) that comes from them (.) some companies may say (.) <u>well</u> to be with us you need to pass them at 80, 90 or higher (.) and certain exams within my company (.) are basically 80, 90 percent or even 100 percent pass mark (.) and so some companies do set higher ones (.) some might let the 75% be enough!" **Charlie A015, Senior First Officer Boeing 737**

A-A11

"the company will tell you=they tell us (.) that there are several levels of of standard required (.) both from a technical (.) and and skill level er (1) to to to all manner of er (.) of things and there is a minimum standard which is required by the civil aviation authority (0.5) the company's standard of=that they require is above that (.) and most individuals <u>own</u> standards are above that" **Steve A003, Captain Boeing 757**

A-A12

"each individual nation (.) and then below that (.) each individual company (.) then sets its own standards that its happy with (.) and that may be close to those minimum standards or it might be much higher than those minimum standards" **Russell A016, Captain Boeing 737**

A-A13

"in order to get your AOC certificate- (.) in order to fly passengers (.) you have to do X Y and Z (0.5) if you do X Y and Z you get the certificate (0.5) but on top of that you could do a lot of other things as well (.) but that's down to the individual (.) but yes (.) a very good way of saying it is (.) they are there to enforce the minimum standards" **Nathan A010**, **Senior First Officer Boeing 737**

A-A14

"I mean our company are held to the same standards as any other UK air operator certificate holder (.) but I think <u>our</u> safety procedures (.) and culture (.) and standards are so <u>way and above</u> the minimum required (.) that the CAA don't really have a huge impact on our operation (.) because I think our- sort of- our philosophy, our standards are so way and above the minimum anyway (.) but I know they're there (.) I know what the minimum required is (.) it's just I think we're so far past them" **Charlie A015, Senior First Officer Boeing 737**

A-A15

"there's a very interesting debate as to whether you aim to just be compliant or whether you aim to be- (.) have an <u>added level</u> of safety (0.5) <u>now</u> (.) that's very much

a matter of the culture of the airline and as the commercial pressures get higher (.) the pressure to purely be compliant get higher" **Simon A009, Captain Boeing 787**

A-A16

"the rules are one thing (0.5) you can write a million rules (.) but if there's nobody to oversee effectively that those rules are being ((laughs)) followed then they might as well take themselves down to (.) whichever Michelin starred restaurant happens to be nearby and spend their lunchtimes getting pissed (.) because it doesn't matter(.) rules are just words on bits of paper (.) it's actually enforcing them and making sure that they're complied with fully that's- (.) you know- (.) you can make rules up the Ying Yang it doesn't make any difference does it" **Dave A012, Captain Boeing 737**

A-A17 *"you do need a regulation in place (.) but more importantly that regulation needs monitoring to make sure that people are achieving those standards (.) because it's all very well putting the rules in place (.) but you've got to make sure people are adhering to the rules"* **Mike A005, Captain Boeing 757**

A-A18

"We have a lot of rules of course (0.5) a lot of rules (0.5) <u>everything</u> is governed by rules (.) from the smallest to the biggest (.) and within those rules I have the dispensation (.) if you want (.) to work around them to come to a safe outcome (0.5) so in other words I know I can do something that breaks the rules if I think that this is the safest course of action (0.5) <u>so-</u> (1) and then I can sit down face to face with my manager or my boss (.) and all the authorities (.) and explain myself=why did I do it (0.5) and its huge (.) it's really=really big to know that my judgement is trusted beforehand (.) and I've been told that all the time (.) continuously I've been told that my judgement is trusted (.) that I do what I think is the safest thing to do (.) even though that might momentarily=or you know (.) once every now and then (.) that breaks some rules (.) if it was the safest thing to do" **Pascal A013, Captain Boeing 737**

A-A19

"The procedures are very important (.) the way we operate together has to be prescribed (.) and obviously approved by the- (.) I don't know whether our operations are approved by the CAA anymore or not to be honest (.) but they have to pass (.) I guess our own quality audit as fit for purpose (0.5) without adequate prescribed procedures (.) then (.) you couldn't operate an airline safely" **Chris A021, Captain Boeing 757/767**

A-A20

"most airlines want you to do certain things at certain times with certain procedures (0.5) so it's all very procedural (.) we're not encouraged to explore the- (.) the limits of what the aircraft can do" **Russell A016, Captain Boeing 737**

A-A21

"because of the regulatory frameworks now (.) and because of a huge emphasis on today's world where we have a very litigious society (.) is that (.) there's a real dumbing down to the lowest common denominator (0.5) so you have the set of rules that cater for the most- (.) if you like (.) benign situation (.) and you therefore remove that sense or perception of being able to make that judgement call (.) even though it is quite clearly stated in our operations manual (.) the commander can do whatever he wants if it's in the interests of safety" **Aiden A014, Captain Boeing 737**

A-A22

"on a day to day basis (.) I mean=you know (.) we know what we're supposed to do (.) we know what we're supposed to say- (.) I'm not sure how much knowledge of aircraft operation you have (.) but we have a book that is our bible (.) we say exactly what it says=or we should say exactly what it tells us to say (.) and we should do exactly what it tells us to do (.) each minor point (.) and it's to the point of=you know (.) perfection would be saying <u>flaps</u> instead of <u>flap (.)</u> you know (.) that's what guys are aiming for now" **Charlie A015, Senior First Officer Boeing 737**

A-A23

"the checklists are written out (.) and you read them out from the checklist (.) and if you don't get the exact words back you're expecting (.) then you look at the guy and say (.) you know (.) and get him to say the word back (.) so the interactions on the flight deck (.) on the specified parts of the checklist (.) and specified parts of the approach are very formal in terms of the words you have to use are specified" **Phil A004, Captain Boeing 757**

A-A24

"it's a bit like a play (0.5) it's exactly like a stage play (0.5) I say one thing (.) he does another (.)he=he does something else (.) he he he say's something and I do something (.) its er its=it's this repetition um (.) that of=-that we alluded to earlier (.) that makes sure that <u>nothing</u> gets er (.) gets overlooked (.) nothing gets er (.) gets screwed up=you know (.) action (.) cross-checking um everything that he does and says I watch and listen to (.) and likewise everything I do and say he (.) watches and listens (.) um (.) you know=I mean sometimes (.) you know (.) mistakes are made (.) you know=you know=you know (.) humans do make mistakes (0.5) but the way which we've got this er (.) um (.) standard operating procedure of checking and cross-checking (.) means that er (.) that this is er=you know when these=these mistakes do happen it gets picked up" **Steve A003, Captain Boeing 757**

A-A25

"when I first joined the aviation industry (.) in small company's there was hardly any standardisation at all (0.5) one of the things I found (.) when I was a young co-pilot that used to drive me barmy (.) was everybody used to do something different=used to use different procedures (.) different calls (.) different=everything was different (0.5) and so monitoring of the other guy's performance was difficult (.) knowing what was coming next was a real pain (.) if you didn't know what this particular individual was likely to do (.) and that meant (.) without that monitoring it was very difficult to actually enhance the safety of the situation (.) because it was always a bit of an adventure to see what would happen (0.5) a little bit later on (.) I got to a more senior position in the same company (.) and the first thing I did (.) was introduce standard

calls and procedures based upon the best practice that I was aware of (.) for that very reason (.) that it allowed the inexperienced co-pilot some chance of knowing what was going on (.) and if something bad was developing (.) of being able to spot it (.) and hopefully do something about it (.) later on (.) things have got much more standardised than they ever were in the early days (.) and I think as a result safety has increased" **Russell A016, Captain Boeing 737**

A-A26

"I think ninety-nine point nine percent of the time (.) the standard operating procedures (.) and the processes that are put in place by the CAA (.) by the company (.) by the manufacturer (.) fit the operation of the aeroplane (.) it's only when it's all gone wrong that you have to start to improvise" **Henri A007, Captain Boeing 737**

A-A27

"It's very rare that you would find the scenario where you would choose not to follow the standard operating procedure (.) and as a result there are safeguards in the company (.) that if you then don't do an SOP=for whatever reason (.) they'll investigate it (.) and they'll give you a good chewing out if you've not got a good reason for ((laughs)) doing it" **Henri A007, Captain Boeing 737**

A-A28

"the operations manual (.) it has to be a Bible (.) that's what the- (.) when incidents or accidents happen one of the things that the investigators do (.) they look at the operations manual (.) firstly to see if the crew complied with it (.) and then to see if by complying with it (.) did they actually make it more dangerous" **Simon A009, Captain Boeing 787**

A-A29

"the impression I get (.) and again I don't know this (.) is that Mr Boeing is having a big influence on our procedures (.) and I think the perception is (.) that if we don't operate by Boeing's prescribed procedures (.) that if we do something wrong down the line (.) and that we have an accident (.) then it's entirely our own fault (.) but (.) if we're

operating a jet according to Mr Boeing's procedures (.) and something happens (.) we say (.) well this is Mr Boeing's prescribed procedures (.) sue <u>him</u>" **Chris A021, Captain Boeing 757/767**

A-A30

"the SOP's are written by the manufacturer of the aircraft (.) they're written by the company as well so they- (.) the company (.) take the manufacturers guidance as to how to operate the aeroplane (.) and then the company add their bits to make it safer usually (0.5) because you can't go lower than what the manufacturer recommends (.) you can only go safer" **Henri A007, Captain Boeing 737**

A-A31

"you've got the two pilots checking each other immediately (.) and then the flight data monitoring system will be checking for something that might have just deviated out of the norm" **Iain A020, Captain Boeing 737**

A-A32

"Everything that we do (.) one person will be flying the aeroplane (.) and the other person will be monitoring (.) and we swap around from flight to flight and sector to sector (.) and the person monitoring is a constant cross-check on the person who is flying (0.5) for example (.) if we're cleared to- (.) if air traffic control clear us to another altitude or flight level (.) the person flying will set the autopilot altitude selector to the level that he's been cleared to (.) and will say it (.) that flight level is set (.) and the other person will look at it and then say- (.) repeat exactly the same flight level to say that flight level is checked (.) from what he's just said to air traffic control on the radio (.) so that there's a cross-check there (.) that the correct thing is set" **Iain A020, Captain Boeing 737**

A-A33

"well there's a lot of checking and monitoring (.) the- (.) you know (.) our duties are spilt (.) apart from being captain and first officer=which are more sort of titles I suppose (0.5) rather than- (.) although the captain obviously has the ultimate legal

responsibility for what happens to the aircraft (.) but functionally you're split into pilot flying (.) and pilot monitoring (.) and in the standard operating procedures there's a set of duties for the pilot flying (.) and the pilot monitoring (.) and there's a set of standard- (.) let me see (.) words for the pilot monitoring to use (.) if the pilot flying goes outside specified boundaries in terms of height (.) speed (.) angle of bank (.) things like that (0.5) so the pilot monitoring is continually checking what the pilot flying is doing (.) and vice versa (.) so it's more of a team game than anything else" **Phil A004, Captain Boeing 757**

A-A34

"Well safety, as an old saying says is (.) safety is no accident (.) and it means operating the aeroplane as safely- (.) in other words as far away from danger as possible (0.5) we have a saying in aviation (0.5) middle of the envelope (.) which you may or may not understand (.) but you don't get near any limits (.) I have another thing always tell my co-pilots (.) how my philosophy for operating an aeroplane is (.) I try and avoid hard limits (.) therefore (.) if I can avoid operating with minimum fuel (.) I will (.) I won't operate with minimum fuel unless its commercially necessary to achieve the task=obviously (.) if to do the task I have to fly with the minimum legal fuel and I consider it (.) in my judgement (.)to be safe to do so (.) I will do so (.) but as a routine part of my operation I never- (.) I always try and avoid working against hard limits=not least because it makes it hard work to operate (.) because you always then have to watch that parameter (.) so if you try and operate in the middle of the envelope (.) that being the flight envelope (.) but it actually applies to many other parameters" **Peter A011, Captain Boeing 757**

A-A35

"if you visualise the picture of the flight envelope of an aeroplane (.) you know (.) there could be the low speed at one end and the high speed at the other end of the high altitude (.) and all the rest of it (.) and a fighter pilot (.) by the nature of his job is going to keep- (.) he wants his plane to be right at the edge of that envelope (.) so that he gets an advantage over his adversary (0.5) my passengers (.) I feel (.) pay me to keep it right in the middle of that envelope (.) if things start going a bit wrong I'm still

in a very strong position (.) I've still got the ability to get a bit out of line but the aeroplanes still going to look after me (.) it's that sort of (.) rather conservative look at it (.) which is at the heart of what makes civil aviation as safe as it is" **Simon A009, Captain Boeing 787**

A-A36

"They can make these rules and they can make these limits (.) giving due consideration to all the research (.) all the knowledge=everything (.) and they can make rules (.) which hopefully=I believe they are so far (.) giving adequate safety margins in everything that they do" **Dave A012, Captain Boeing 737**

A-A37

"the FDM is literally looking at criteria (.) firm criteria that they can say (.) did you breach it or did you not breach it" **Henri A007, Captain Boeing 737**

A-A38

"That's through the entire flight from starting engines (.) basically from the door closing to the door opening (.) all parameters are recorded (.) it's something like a thousand parameters that the- (.) and it records it once every half second or something like that" **Henri A007, Captain Boeing 737**

A-A39

"all flights are monitored (.) there's a data dump on landing=through using a mobile phone network (.) and the flights are analysed by a special analyst (.) and a computer (0.5) and all they're looking for is (0.5) fly within a safe envelope (.) if something goes outside that (.) then there's a democratic process (.) of actually calling the crew in=and again it's done with non-jeopardy (.) unless it was obviously a gross negligence" **Nigel A001, Captain Boeing 757**

A-A40

"everything you do with the aircraft is exceedingly visible because they have (1) well (.) there's flight data monitoring (.) are you aware of this (0.5) basically (.) every=all the parameters throughout the flight are recorded on a memory disk (.) or a memory card

(0.5) end of every day (.) it's downloaded onto a computer and run through an analysis system (.) and the analysis system pops out (.) you know (.) flags (.) red flags (.) amber flags=if you were (.) you know (.) too fast here (.) you did this (.) did that (.) did the other (0.5) and then if you've operated the aircraft in a bad way (.) or like in a non-standard way (.) or in a way that shows decreased safety=if you like (.) then you'll get=there's a certain- (.) there's a certain protocol to follow (.) where the flight data analyst will talk to the union representative (.) who deals with that (.) and the union rep will then phone the pilot in question and say (.) hey <u>what happened here</u> (.) and generally treat it as a learning exercise (.) make sure that an air safety report is submitted if- (.) you know (.) that would shed more light on the situation (0.5) and in the initial stages (.) if the pilot involved submits the air safety report then (.) you know (.) nothing else is done=no further action is taken (0.5) however (.) there is a sort of (.) a short circuit to that procedure if the flight data analyst then decides that (.) you know (.) the seriousness of the flight data monitoring incident was so great that (.) you know(.) you can then go straight to the chief pilot with the pilots name (.) and they can then=not take disciplinary action (.) but take quick management action to solve the problem (.) but as far as I'm aware in the last (.) you know (.) ten years that's never happened" **Phil A004, Captain Boeing 757**

A-A41

"the protocol is that the union will give them a phone call (.) it's all anonymous (.) but the union will give them a phone call and suggest that they contact the company (.) and if they put their hands up to it all well and good (0.5) if they don't put their hands up (.) the union will then liaise with company and it might get taken further" **Rob A002, Captain Airbus A330**

A-A42

"I know that (.) capturing that data is about looking at the whole picture rather than just my own performance=so=so=so (.) for example (.) it's used to monitor trends rather than an individual's own operation" **Neil A006, Captain Boeing 757**

A-A43

"I'm relaxed in the way that it's used (.) in that I know that it is used to monitor a trend" **Neil A006, Captain Boeing 757**

A-A44

"I genuinely believe (.) in our company we use the flight data monitoring for exactly what its meant to (.) its overseen by BALPA very closely as well (.) but I believe it's used exactly for what it's meant to (.) which is detecting safety trends" **Dave A012, Captain Boeing 737**

A-A45

"you can see <u>exactly</u> (.) what's er the conduct of the whole flight from start to finish (0.5) um (0.5) and (0.5) it is actually (.) used (0.5) predominately (.) to monitor trends=you know (.) um (.)if=if there are bad habits er (.) creeping in=you know people (.) starting to do their own thing a bit (0.5) um (.) you know (.) the=er=the=the company can then say (.) right (.) listen you guys (0.5) er (.) we've noticed a (.) a trend for rushed approaches let's say=now people leaving it till (.) a bit too late if=you know you've got to get the gear down before=you know (.) before you're (.) lower than seventeen hundred feet above=above (.) above er runway elevation (.) um (.) that's seventeen hundred feet=not fifteen hundred feet not a thousand feet that some of you cowboys are doing=and they can identify=you know that was just an example you know (.) there=there's a they can (.) they can identify trends and s- stamp on them before (.) before they become habits possibly (.) and that's what it's used for" **Steve A003, Captain Boeing 757**

A-A46

"that's quite important (.) for first of all first of all spotting anything that's a blatant error (.) that shouldn't have happened (0.5) but also trends (.) if you find that too many crews are doing the same sort of thing wrong (.) you might need to alter your training (.) to iron that little bump out of the system (0.5) so- (0.5) yes that's- (.) you've got the two pilots checking each other immediately (.) and then the flight data monitoring system will be checking for something that might have just deviated out of the norm (.)

but you need to train the crews into watching that more closely (.) so that doesn't happen (.) <u>yes</u> (.) that's like a third monitor effectively (.) but it's a more long term thing than the immediate thing of the two crew" **Iain A020, Captain Boeing 737**

AA47

"You know we've got a set of rules to fly by (.) if you stick to those rules (.) with a buffer either side (.) with a good margin either side for error or environmental factors (.) you're not going to exceed any of the limits that are set on these computers"
Charlie A015, Senior First Officer Boeing 737

A-A48

"certainly in criteria like stabilisation, you are looking at where would the average Joe be able to put the aeroplane sensibly- where would the mere mortal human being be able to operate the aircraft, you're not looking at the steely eyed Sky God's who really are really are steely eyed Sky God's, but equally you're not looking at the complete inept, you know, person who's there by the grace of God. You're looking at the guy who's the average pilot. Can the average pilot get in" **Henri A007, Captain Boeing 737**

A-A49

"you know (.) you we're talking about very different experience levels (.) and we're talking about some people (.) who this is their first aeroplane (.) and they're just out of training (.) versus myself for instance (.) coming up to ten thousand hours on 737's (.) and eighteen thousand hours total time (.) over a period of thirty years (0.5) so the sort of back ground experience is quite variable (.) and I appreciate the need=because we've got a lot of inexperienced people (.) to sort of=dumb down isn't the right word (0.5) but sort of tune the thing to the lowest common denominator (.) so I appreciate now (.) I see all kinds of things where I would do it slightly differently based upon my experiences (.) but the person that I'm flying with for instance (.) is flying it much more cautiously (.) because they have less experience and (.) less knowledge of the aeroplane" **Russell A016, Captain Boeing 737**

A-A50

"as you get more experienced you can be a little bit frustrated sometimes by the sheer regiment of your operating regime (.) but it is necessary with inexperienced pilots (.) that you work within the company and manufacturers parameters (0.5) it's a little bit like painting by numbers (.) but it undoubtedly does work with crews who don't have any other building blocks to build on (0.5) obviously as you gain more experience (.) you can devise a more comfortable and non-conformal style" **Peter A011, Captain Boeing 757**

A-B. Individual autonomy and intervention

A-B1

"Because I've got a larger amount of experience to bring to bear on any given situation (.) I can see a lot more ways out of it (.) than perhaps the standard route (0.5) now that may lead me (.) for instance to be more risky (.) because I know that I can get out of it (.) but that doesn't stop me from- (.) if I don't appreciate where my own limits are (.) of allowing that risk to develop (.) and therefore suddenly finding that I am out of my depth and we do have a problem" **Russell A016, Captain Boeing 737**

A-B2

"a good pilot is not somebody who can fly an aeroplane well (1) a good pilot is somebody that delivers safety (.) and the two things are not actually the same because (.) there are pilots who can fly the aeroplane (.) make it dance and sing (.) and make it do most anything (.) as the song goes (.) <u>but</u> their attitude stinks (.) and they lean heavily on their abilities (.) which (.) actually I don't like (0.5) I like people who go (.) you know what (.) I'm going to keep this as near the middle as I possibly can (.) I know that sometimes I'm going to get near the edges of the envelope as a matter of course (.) through events that I can't control (0.5) however (.) as much as I can control it (.) I'm always consistently going to be with the maximum margins that I can possibly produce" **Dave A012, Captain Boeing 737**

A-B3

"there are people who are highly experienced (.) who've still managed to make the most amazing cock-up's that you could believe (.) and there are some young pilots around (.) who fly the aircraft safely and competently within their own limits (0.5) in fact there's a famous test pilot called Bob Hoover (.) who once said the most important things for him (.) are to know your aeroplane (.) know its limits (.) but mostly (.) know your own limits (0.5) and that philosophy (.) I think is something that you don't necessarily have to have a lot of experience (.) because if you know that you don't have a lot of experience (.) then you know that your limits are small (.) if I could put it that way (.) then you'll fly the aircraft safely" **Russell A016, Captain Boeing 737**

A-B4

"You know there's something wrong (.) but you don't know what it is (.) and it's almost like the hairs on the back of the neck start standing up=it's that sort of thing (0.5) that comes with experience- (.) I'm not happy (.) and years and years and years ago (.) when crew resource management first came in they went in this- (.) I'm not happy=are you happy (.) I'm not happy either (.) why aren't either of us happy" **Rob A002, Captain Airbus A330**

A-B5

"You get to a- (0.5) it's not a (.) cocky stage (.) but you get to a stage in your career where (.) you know (.) sometimes things stick out for no particular reason (.) and whether its experience (.) or you've seen it before (.) or you've heard about it (.) then sometimes you know (.) these red flags sort of start appearing (.) and then you have to probe a little deeper to find out if there really is a problem (.) or if it's just you're (.) you know (.) being over sensitive to something (.) so I think there is an element of experience in there as well (.) and based on (.) you know (.) past=past experience (.) past outcomes (1) that sort of thing" **Phil A004, Captain Boeing 757**

A-B6

"I think that pilots are paid to have an acute- (.) an accurate perception of risk (.) it's always going to be personal (.) but that is what your experience is based on (0.5) it's

how serious is that risk (.) and the consequence of it" **Simon A009, Captain Boeing 787**

A-B7

"Safety is not just an abstract concept for me (.) because <u>I'm</u> actually on the aircraft (.) and you know (.) if the aircraft is safe (.) then <u>I'm safe</u> (.) and by extension then (.) you know (.) if the aircraft is safe (.) I'm safe (.) then the passengers are safe as well (0.5) so that's kind of the way I like to think about safety (.) is that (0.5) you know (.) <u>yes</u> I should be thinking about all the passengers down the back (.) but actually I'm thinking about my own little pink body and I want to try and keep that safe (.) and therefore as a result of that I try to keep everybody else safe" **Phil A004, Captain Boeing 757**

A-B8

"You can't help but want to look after yourself (0.5) I think instinctively (.) biologically (.) if you look at- (.) you know (.) I always say=well I'll look after me and my mate sat next to me (.) everyone else is going to be fine as a consequence (.) that's our throw-away line (.) I think you cannot help but always want to look after yourself anyway (.) and if you're not then there's something wrong with you (.) I think you can't help but always want to look after yourself (.) you know if I'm nervous about something (.) then I'm going to do something about it (.) I'm not- (.) you know=you don't have that perception if you're sat in a nice air conditioned office flying your drone from A to B" **Charlie A015, Senior First Officer Boeing 737**

A-B9

"It's a feeling informed by intelligence and experience (.) so it's- (.) you can't say it's just- (.) it's not just a feeling (.) but there's a number of things that come together that make you start to think- (0.5) so I might use the word's (.) I feel uncomfortable (.) but what I'm doing is thinking about the various factors and scenarios (.) I've seen what the options are and saying (.) oh I think we're beginning to turn into a cul-de-sac (.) I don't like this (0.5) so you can't separate out the feelings from the state of mind" **Sam A017, Senior First Officer Boeing 757**

A-B10

"the other ingredient you've got (.) if you've got say an emergency=you're both actually (0.5) you're experiencing fear (.) real fright if you like (.) it might be an environmental threat (.) it might be thunderstorms (.) or a really bad problem with the aeroplane technical system (.) and- (.) one of my colleagues calls it monkey brain=because you literally- (0.5) what you were thinking clearly five minutes previously (.) all of a sudden (.) your capacity is absolutely- (0.5) you know (.) your capacity bucket is absolutely full" **Nigel A001, Captain Boeing 757**

A-B11

"the fear is there and you- (.) but in order to be able to suppress the fear (.) and literally not freeze up (.) you have to have a crutch (.) you know a stick to lean on (.) and that stick is all your training around the human factors side (0.5) a situation you've never experienced before (.) ask for help from your other fellow" **Nigel A001, Captain Boeing 757**

A-B12

"We looked at it (.) and the heart goes into the mouth (.) you think <u>oh shit</u> (0.5) what the hell (.) and it literally was- (.) it was things like (.) cabin altitude (.) cargo fire (.) wheel well fire (.) all of the big ones in <u>bright red</u> on the screen (.) and you go <u>bloody hell</u> (.) but then we watched for a couple of seconds (.) we sat on our hands=which is what we're trained to do (0.5) assess the situation (.) we have these coping mechanisms like (.) I don't know if you've heard of it (0.5) things like DODAR (.) and SADIE" **Henri A007, Captain Boeing 737**

A-B13

"For the most part you're talking about what you're doing (.) it's almost like providing a running commentary (.) you do obviously- (1) I get more (.) I don't want to use the word anxious (.) but alert and ready for things when it's windy or if the weather's bad (.) but (.) going into an airfield where there's a thunderstorm (.) or where there's very

strong wind's or something it will all have been put out on the plate" **Ron A019, Captain Boeing 737**

A-B14

"I'm the goalkeeper (1) I'm the guy who in the end=and that was beautifully put to me by a superb guy (.) who trained me when I was doing my command course for captain (0.5) he said (.) ultimately you're the goalkeeper (.) and you catch that ball that's coming into the net (.) and that's what- (.) and as you pointed out (.) the industry is a system (.) so everyone's doing their job (.) the load sheets' being prepared (.) the engineers are signing the aeroplane off (.) and my job is to spot that fast ball coming in at the last minute (.) and catch it (0.5) and hopefully (.) catch it in good time (.) so the earlier I catch it (.) the less dramatic the catch will be hopefully" **Peter A011, Captain Boeing 757/767**

A-B15

"all the time in my back pocket (.) I have this get out of jail card (.) <u>which is</u> (0.5) I know the book says so and so (.) but <u>I'm</u> going to do something else (.) because I think that's safer- (.) and then I'm going to have to live and deal with the consequences (0.5) so the authorities in general doesn't care about that (.)that's <u>my problem</u> (.) but again (.) judgement comes in (.) and still that's what they trust me for (.) my judgement primarily (.) then comes character and everything else (.) but judgement is the tool of that they're really looking for (0.5) if you take (.) from the youngest pilot that joins an airline at the age of twenty-two (.) today (0.5) when they interview you (.) they don't interview him for his aptitude (.) and technical knowledge (.) or anything (0.5) yes (.) of course these are elements (.) but primarily (.) they want to see if this guy has the judgement skills (.) or if he has a foundation for them (.) and how they can be developed over the course of the years" **Pascal A013, Captain Boeing 737**

A-B16

"Within the framework that we have we're given a healthy amount of discretion to act on our own initiative (.) because it's realised (.) or certainly in the aviation industry its

realised (.) that the rules don't always cater for everything" **Rob A002, Captain Airbus A330**

A-B17

"As a captain you have the authority to depart from the standard operating procedures (0.5) but there had better be a good reason (.) you know (.) you can do it (.) but you need a <u>damn good reason</u> (.) and it's got to be understood between both captain and co-pilot what you're doing and why you're doing it" **Steve A003, Captain Boeing 757**

A-B18

"there's a caveat in the books which say (.) basically (.) the commander of the aeroplane has the authority (.) to depart from standard operating procedures where safety is concerned (0.5) where there is an issue with safety (.) and it would be (.) by his judgement (.) would be safer to do something else (.) than do that (.) that's the point where the commander earns his money (0.5) that's why you get paid the money that you get paid (.) because you're making a professional decision based on previous experience (.) that- (.) doing that at this moment would be inappropriate (.) for whatever reason" **Henri A013, Captain Boeing 737**

A-B19

"how would I draw the line unsafe (.) I think it begins to become unsafe where (.) without positive intervention there's going to be some sort of incident (1) I think under normal operating conditions (.) we have several layers of protection (0.5) and when we're operating aircraft (.) there's each of us (.) you know (.) there's the two of us (.) and there's the aircraft itself (.) and its systems (0.5) but when you get to a point where if you don't- (.) <u>positively</u> intervene (0.5) if things continue in the direction they're going (.) then it's- (.) then there's going to be an incident (0.5) then I think you draw the line there don't you (0.5) in other words (.) all the preventative measures that are set in place (.) whether they be SOP's (.) or your training (.) or your experience (0.5) you've got to the point where they've all failed (.) and I think that's the point where

you step from safe operation to unsafe operation" **Henri A021 Chris, Captain Boeing 757**

A-C. Information and predictability

A-C1

"it's what we call the proactive safety and the reactive safety (.) because there are two types really (0.5) the proactive (.) which is the one we really want (.) proactive safety is the one that can foresee possible or potential issues (.) and set up the rules and the procedures to avoid them" **Pascal A013, Captain Boeing 737**

A-C2

"Accidents never ever happen because of one thing (.) one causal factor (.) it's a combination of factors (.) and you can liken it to five or six slices of Swiss cheese (.) all with the holes in (.) and when the holes line up (.) that's when an accident will happen (.) you know (.) there's always something there to catch you- (.) to prevent the accident from happening (.) but occasionally all the holes in the Swiss cheese will line up (.) and that's what happened in (.) with the Air France aircraft in the South Atlantic" **Steve A003, Captain Boeing 757**

A-C3

"*You may be familiar with a study about the series of effects in aircraft accidents (.) and it's a well-known picture (.) where the guy sliced one of those Gruyere types Swiss cheeses (.) and in order to- (0.5) we've got lots of protections all the way throughout the thing so- (.) some error can happen (.) it will go through one of the holes in the cheese but them comes to another layer of protection (.) another layer of the cheese=where the holes haven't lined up (.) and every accident that you look at (.) once they've eventually analysed it=it's not normally one prime cause (.) any number of effects that have built up (.) it's gone through all the holes in the Swiss cheese and they've all lined up (.) and so the protections that you've got in the system have suddenly not been there (.) and that's when it's gone wrong (.) so that's what- (.) a lot of the pilots find that a very good visualisation (.) it's that=trying to make sure that- (.)*

what you're trying to do is catch your errors before they become- (.) so that they- (.) you can't necessarily- (.) you can try and reduce the probability (.) but what you can definitely do is try and reduce the severity of it once it's happened (.) and that's quite a crucial thing" **Simon A009, Captain Boeing 787**

A-C4

"So these holes in the Swiss cheese do occur (.) now hopefully they don't all line up on an individual day (.) and thankfully on the vast majority of flights across the world (.) that obviously doesn't happen (.) but there still is things that get through some of the layers of cheese (.) and if they're not being picked up and fed back to the company (.) then obviously they know no different" **Matt A010, Senior First Officer Boeing 737**

A-C5

"going back to the Swiss cheese analogy (.) what you're trying to do is ensure there's always some layer of defence (.) you've made this mistake (.) you get through one hole of the slices of cheese (.) but there's another layer of defence behind you which picks it up=whether it be something that's built into the aeroplane (.) which it often is (.) or procedural call (.) or something you've done that will actually make sure that you've averted disaster" **Simon A009, Captain Boeing 787**

A-C6

"The thing is though (.) <u>everybody makes mistakes</u> (.) the trick is to catch the mistakes (.) before the individual mistakes made in different parts of the organisation=or different parts of the system (.) all line up (.) and create the conditions for having an accident (.) you know (.) there's always- (0.5) if you read an accident report (.) there's always a chain of errors and contributory factors and things like that (.) and if one of them wasn't there (.) then the accident would have been averted (.) you know there's- (.) you probably know all this (.) the Swiss cheese model (.) and things like that (.) so you know (0.5) there's lots of- (.) sort of=methods of considering the factors that cause an accident" **Phil A004, Captain Boeing 757**

A-C7

“as the science of aviation has progressed (.) technically the aircraft are 99.9% reliable now (.) they very (.) very rarely fail catastrophically (.) <u>yes for sure</u> you’ll get systems=a generator or hydraulic system or- (.) might go (.) but very rarely will you get a really nasty failure (0.5) so the accident rate has started going down (.), and then it levelled off (.) just by evolution (.) it was recognised that the technical failures are now <u>minute</u> (.) it’s now the personal and human failures that are causing this still high accident rate” **Rob A002, Captain Airbus A330**

A-C8

“In the old days (.) back in the 60’s and 70’s (.) they were having engines falling out of the sky every day (.) now that doesn’t happen anymore (.) so the industry has done everything they could (.) and they’re doing it all the time (.) to improve machines (.) the human however (.) that’s the difficult part” **Pascal A013, Captain Boeing 737**

A-C9

“So these holes in the Swiss cheese do occur (.) now hopefully they don’t all line up on an individual day (.) and thankfully on the vast majority of flights across the world that obviously doesn’t happen (.) but there still is things that get through some of the layers of cheese (.) and if they’re not being picked up and fed back to the company then obviously they know no different” **Matt A010, Senior First Officer Boeing 737**

A-C10

“The risk is of an accident (.) that’s what we’re talking about (.) so what you’re working to do is to avoid things that might lead or move you towards an accident” **Sam A017, Senior First Officer Boeing 757**

A-C11

“We have a risk register with the safety review board (.) they look at all the things that are occurring (.) and they look at the most common things that are occurring and try to then drive down into (.) why (.) how (.) and then how to fix” **Aiden A014, Captain Boeing 737**

A-C12

"There is a formalised risk assessment matrix where it's the likelihood times the severity (.) and its assigned as (.) you know (.) a score (.) and then if the product of that is- (.) reaches a certain value (.) then they have to take action to mitigate it within sixty days (.) or within (.) you know (.) thirty days (.) or immediately (.) you know that sort of thing (.) so that's the sort of formalised procedure for that (.) but the trick really is to get people to report the problems in safety terms (.) if you like (.) on the non-operational side of the airline" **Phil A004, Captain Boeing 757**

A-C13

"There's two aspects to it (.) one is likelihood and the other is severity (0.5) so that it might be that something's not terribly dangerous (.) but is much more likely to happen (.) and there other things which might be catastrophically dangerous (.) although they're less likely to happen (.) and how (.) you judge the seriousness-" **Sam A017, Senior First Officer Boeing 757**

A-C14 *"There is a formalised risk assessment matrix where it's the likelihood times the severity (.) and its assigned as (.) you know (.) a score (.) and then if the product of that is- (.) reaches a certain value (.) then they have to take action to mitigate it within sixty days (.) or within (.) you know (.) thirty days (.) or immediately (.) you know that sort of thing (.) so that's the sort of formalised procedure for that (.) but the trick really is to get people to report the problems in safety terms (.) if you like (.) on the non-operational side of the airline"* **Phil A004, Captain Boeing 757**

A-C15

"it could actually be something that causes harm over a long period (0.5) something that maybe is a stress (.) that would potentially put that person (.) or that thing at risk further on down the line (.) and so if you're continually working earlies (.) that might put you at risk of being fatigued to then end up- (.) you know- (.) and if you don't sort of say (.) <u>hang on</u> a minute guys (.) there's something wrong here (.) then potentially

further on down the line (.) all the Swiss cheese holes could line up (.) and we end up with a real problem" **Henri A007, Captain Boeing 737**

A-C16

"They look at the risks from a different side of things (.) and th<u>ere</u> (0.5) <u>risk</u> is likelihood of the event (.) you know(.) not many aeroplanes crash (.) in the <u>grand scheme</u> of things (.) but the potential reward to them is more important (.) and that's the financial reward (1) to some of these airlines (0.5) so no doubt that=that=that <u>balance</u> (.) between safety and commercial (.) could quite easily go towards the commercial aspect without regulation in place" **Mike A005, Captain Boeing 757**

A-C17

"The perception of safety for the man on the Clapham omnibus (.) and corporate concept (.) <u>as in</u> (.) airline management perception of safety (.) they're going to be quite (.) quite different (0.5) the airline management is probably going to be looking much more at things statistically (.) they're probably going to have=just like the military does- (.) though we probably don't broadcast it (.) an acceptable level of risk for a number of things" **Russel A016, Captain Boeing 737**

A-C17

"So it is trying to minimise the risk for the appropriate level of expenditure I suppose (0.5) so to me (.) in an ideal world (.) money would be no object to meet <u>training</u> requirements (.) <u>design</u> requirements (.) those two requirements to protect life (.) <u>however</u> (.) the reality of the world is (.) it's what people are prepared to pay for (.) or give up (.) or risk (.) to achieve what they want to achieve" **Jamie A018, Captain Boeing 737**

A-D. Efficiency and productivity issues

A-D1

"the pressure to achieve an on-time departure (.) the pressure to get back within your flight-time duty limitations (.) the pressure to get an aircraft away (.) the pressure to carry an unserviceable item (0.5) so there could be a commercial pressure (.) an operating pressure (.) the pressure to continue in weather that might not be suitable for example" **Rob A002, Captain Airbus A330**

A-D2

"Now there is a commercial imperative to any airlines operation (.) and there will be a compromise at some point during- (.) in the flight safety process there will be a compromise (.) where we'll want a piece of kit (.) or we'll want to embark on a training programme (.) and it'll just be too expensive" **Rob A002, Captain Airbus A330**

A-D3

"it's a balance of commercial responsibility I suppose (.) against the risk (.) so if it's very minor and it's acceptably within the boundaries I don't see there's an issue (.) but if there is clearly a risk issue (.) then I would challenge it (.) so if it were something that the company felt was ok to accept and go with (.) and I didn't feel happy (.) then I would say so" **Jamie A018, Captain Boeing 737**

A-D4

"you're always having to balance what is a (.) commercial pressure with (0.5) and commercial pressure is <u>real</u> (.) you're balancing that against the probability of a situation arising (.) so (.) on a really nice day when the forecast is done (0.5) and we knew what we'd planned to bring back to destination would be the flight planned fuel (.) but on a day when it's likely to be fog (.) or there's likely to be thunderstorms (.) and we think it's likely that we're going to have to hold for a little bit (.) and that everybody's going to get held up (0.5) then we would take extra fuel (.) and we make that decision (.) there and then on the ground" **Sam A017, Senior First Officer Boeing 737**

A-D5

"There is always an element of commercial pressure (.) I think (.) perhaps (.) depending on one's own view (.) one's own confidence (.) maybe one's own experience (.) in a role that assumes a smaller or larger part of what you think (.) I personally don't feel under any commercial pressure (.) I personally feel that I have the experience to be able to say (.) I don't think we'll do this (.) not always (.) and I'd like to think that's where my colleague comes in (.) but I don't personally feel that I'm under pressure to take risks"
Neil A006, Captain Boeing 757

A-D6

"You have to remember that balanced against that (.) is always the finance and the economy (.) and (.) you know (.) you could always say that we'd be much safer off if we took an awful lot more fuel (0.5) but that costs a lot of money (.) so we're always under pressure to take no more than we have to" **Simon A009, Captain Boeing 787**

A-D7

"the same with flying about with not enough reserve fuel (.) because when you put fuel on a plane it costs you fuel to carry it because it has a weight (.) so they encourage us to take-off with absolute minimum amount of fuel to get to where we're going" **Chris A021, Captain Boeing 757**

A-D8

"I mean fuel is the big one (.) the fuel is the biggest cost (.) there's always that- (.) there's always the=it's not even a desire (.) there's always a desire to take as little fuel as possible (.) because it costs fuel to take fuel and the more you burn the more it does" **Charlie A015, Senior First Officer Boeing 737**

A-D9

"the company would like us to take less fuel all the time (.) they always want us to take less fuel (.) that's what companies do (.) all commercial aviation companies are like that these days" **Sam A017, Senior First Officer Boeing 757**

A-D10

"well commercial pressures are always there (0.5) we've just had a new change to our procedures that I'm reading up on now (.) as to how much fuel we can take (.) they've cut back <u>fur</u>ther on the fuel that we're allowed to take (.) over and above what's required to actually physically move the aeroplane from A to B (0.5) the law requires that we take fuel from A (.) to B (.) plus a contingency margin for stronger than forecast headwinds (.) or not as strong as forecast tailwinds (.) of (.) five percent (.) the company have got the civil aviation authority to <u>agree</u> that we can cut that back to <u>three</u> percent" **Steve A003, Captain Boeing 757**

A-D11

"I think having a regulator (.) an <u>external independent</u> regulator(.) I think is a good thing for safety (.) because the airline's all driven about money (.) obviously it's a very costly business (.) airlines (.) and I think sometimes the regulator would- (.) can push them into doing things which are good for safety but which aren't necessarily good for the economics of the airline (.) so I think having a regulator is a must" **Phil A004, Captain Boeing 757**

A-D12

"experience tells you that often (.) that's <u>not</u> a safe amount of fuel (.) but they seem to have this spreadsheet again (.) it's a spreadsheet mentality which say's (.) if we reduce the amount of fuel (.) on every flight (.) to this amount of reserves=they put it in the spreadsheet (.) and they show that they can save (.) I don't know (.) a hundred kilo's or two hundred kilo's every flight (.) and they do the same mathematics (.) and <u>bingo</u> (.) they save (.) you know (.) two million litres of fuel and a million pounds worth or whatever (.) and I get the distinct impression that this counts towards ((laughs)) their bonuses (0.5) I don't know that's correct (.) but this is how it's perceived from where I'm sat" **Chris A021, Captain Boeing 757**

A-D13

"It probably depends on the way that the company message of trying to be as efficient and as frugal as you possibly can (.) if you go around beating people with a stick or if you produce (.) for instance there's a <u>league table</u> type of thing (.) of who takes the most fuel and who doesn't take the most fuel (.) who's the best at saving fuel and money and (.) that can backfire because you sort of get into a sort of competition mind-set" **Ron A019, Captain Boeing 737**

A-D14

"It's very subtle=it's very subtle and it's very interesting (.) I mean for example on the fuel policy- (.) so the company- (.) what the company will say is it's monitoring some-thing (.) so the company will say (.) you know (.) we want everybody to take flight planned fuel unless they've got a good reason for taking more (.) and we want you to account for every bit that you take over and above (.) so that's kind of good (.) and people will say- (.) you know (.) people- (.) if you ask (.) nobody will say that they've been rung up and challenged about the amount of fuel they take for places (.) <u>but</u> there is a sense of being watched that has changed over the time that I've been with the company (.) because fuel has gone up and is massively more expensive (.) and all airlines are far more conscious about the cost of fuel than they used to be" **Sam A017, Senior First Officer Boeing 757**

A-D15

"when we pitch up for work it's a fuel that is planned to be loaded on the aircraft is always (.) or almost always (.) the <u>absolute minimum</u> that they legally can carry and they- (.) and whilst they encourage us not to carry more fuel (.) they encourage us to make our own decisions based on the day (0.5) but there's a constant drip drip drip from our management=although it's dried up a little bit lately (.) so maybe that's good (.) they're almost like nagging us okay (.) and eventually you start reducing the amount of fuel you're putting on because of the nagging (.) you know ((laughs))" **Chris A021, Captain Boeing 757**

A-D16

"in ((name of airline redacted)) they're not actually <u>*employed*</u> *by ((name of airline redacted)) (0.5) they're on zero hours contracts most of them (.) and if they go contrary to the company (.) it would seem in almost any respect (.) the first thing that happens is they have a month's roster with nothing at all on it (.) therefore they earn nothing (.) and so the dangers of that level of pressure being brought to bear are I think as plain as the nose on your face really"* **John A008, Captain Boeing A320**

A-D17

"it's quite resourceful for management to encourage everybody to take minimum fuel (.) but it's quite wrong for them to say <u>*you must*</u> *(.) and that's a very fine line that has to be drawn (.) and when airlines get a bit more- (.) get to the stage where they are mandating things like that (.) which may well encourage people not to do things which they shouldn't do (.) then (.) if people don't extra fuel when the weather is particularly bad (.) and there are extra risks (.) and they're doing that because they're afraid of a letter they're going to get from their fleet manager (.) that isn't very safe"* **Simon A009, Captain Boeing 787**

A-D18

"the only thing that stops that becoming a real hazard to our flight safety is the fact that the Captain's look at the fuel and think- (.) <u>*no*</u> *(.) I'm not going flying with that thank you very much (.) we'll put* <u>*more*</u> *on (.) but they (.) as a business (.) they don't seem to really acknowledge that that's really what's happening (0.5) okay (.) and they seem to be counting the savings as being saved=which obviously they're not (.) but without understanding that actually we're not in a complete state of chaos (.) the reason we're not in a complete state of chaos where every other flight diverts (.) and some flights are declaring a mayday for fuel (.) is only because- (.) it's not because 3% is enough=they think 3% is enough ((laughs)) actually the reason that we're not doing those things (.) diverting and declaring maydays is because Captains are putting more fuel on"* **Chris A021, Captain Boeing 757**

A-D19

"what they're trying to do now is maximise utilisation of crews and aeroplanes (.) so even now we're getting considerable problems with the company (.) with rosters that are given to people (.) and when we argue that it is fatiguing=or it's not safe=or its unfair (.) the answer that we get nearly=invariably is (.) <u>but it's legal</u> (1), so it doesn't actually matter whether it's safe or not (.) it's <u>legal</u> (.) and I think there will be a growing tendency for that kind of thing to happen" **Russell A016, Captain Boeing 737**

A-D20

"FTL (.) flight time limitations are changing under EASA ((European Aviation Safety Agency)) (.) if you go back to the CAA ((Civil Aviation Authority)) ones (.) the CAP 371 ((CAA document)) (.) <u>that</u> was designed as sort of like a <u>book</u> (.) and it was never designed to go to all the limits (0.5) and I think over the years (.) with computerised rostering (.) computers have obviously worked out ways and patterns to push things more to all the limits (.) so now you're bouncing off all the limits (.) so what will happen is you'll get something- (.) or you'll get a run of flights (.) and you'll look at it and go (.) oh (.)I know that's going to be fatiguing (.) or knackering (.) but actually within the bounds of the rule book (0.5) it's within the <u>rules</u> (.) within say five minutes"
Jamie A018, Captain Boeing 737

A-D21

"Well where there are rules are set out (.) the company would put extreme pressure on people to fly till they dropped and you know (.) you'd be worried that health and safety- (.) that you're sick record (.) or fatigue records would come into account (.) but I mean one of the things that mitigates against too much bullying by the company management (.) is the fact that we have a strong union and (.) the union is over ninety percent union in ((airline name redacted)) (.) so there is an opposition to company commercial pressure (.) and we'd be in a much worse position without that (.) I think having a strong union is a really huge asset to safety" **Sam A017, Senior First Officer Boeing 757**

A-D22

"My personal feeling is that the authorities work hand in hand with aircraft manufacturer's (.) and the airlines (.) and I don't think they have the right balance between safety and efficiency (.) I think they're looking at efficiency a little bit too much (.) and they're definitely more reactive than proactive (.) so they will push it as far as they can (.) they will try to cut out as much fat as they can (.) until something happens that reveals that this was the wrong thing to do (.) and then they back-off (.) and we've seen that in the United States" **Pascal A013, Captain Boeing 737**

A-D23

"From an airline's point of view however (.) there's nothing quite so crippling financially (.) to an airline as a crash (.) crippling financially (.) you know (.) it's- (.) serious accidents finish airlines off (.)Pan American (.) you know (.) if even it wasn't their fault when the Lockerbie bomb- (.) they went bust straight after that (0.5) Valujet (.) in the States (0.5) when another one went down (.) in the everglades (.) they went bust after that (.) because as soon as the flying public gets the idea that that airline is not safe (.) for whatever reason (.) they don't fly with you (.) so all of a sudden you've got these very expensive assets (.) and no one's using them" **Simon A009, Captain Boeing 787**

A-D24

"if people don't think you're safe (.) then (.) you know (.) you'll lose your market and you'll be out of business (.) so the airline management has to make that decision (.) whether it does things on safety (.) or commercial grounds" **Phil A004, Captain Boeing 757**

A-D25

*"*I think you're starting to see the idea (.) that (.) *well (.) we're a very safe industry (.) why do we need all of this training (.) why do we need to spend so much money on eight hours of simulator per person every six months (.) can't we do it in six (.) that'll save us eight hundred quid (.) happy days (.) for every pilot that we have it'll save us eight hundred quid (.) great (.) that'll work (.) that'll increase my chances of getting my bonus this year" "* **Henri A007, Captain Boeing 737**

A-D26

"flying has undoubtedly become much safer (1) to a certain extent I'm very surprised (.) the amount of flying going on (.) and sometimes you see the way less scrupulous operators cut into the bone and treat their staff (.) I think it's a tribute actually to the- (.) I think mainly the manufacturers (.) that the aeroplanes are so safe" **Peter A011, Captain Boeing 757**

A-E. Collaborative and functional activities

A-E1

"you need to have been taught (.) you know (.) from basic training through- (.) and then refreshed every year so that you can handle an emergency (.) and do all the various things that you require (.) like communicating (.) handling the emergency (.) handling the aeroplane (.) handling the people around you" **Nigel A001, Captain Boeing 757**

A-E2

"when we bring new people into aviation (.) through part of their training (.) they are trained through human factors=crew resource management (0.5) so right from the word go (.) you're training and influencing their opinion of how the flight deck should be run (0.5) so it's done right at the grass roots (.) and it's also making people realise (.) that they haven't got all the answers (.) and human error is inevitable (.) it's going to happen (0.5) you know (.) the day where I go to work and don't make a mistake (.) is the day that I've missed the mistake that I've made (.) so there's always going to be little mistakes in there (0.5) so it's making people aware of that" **Mike A005, Captain Boeing 757**

A-E3

"We're all supposed to do it (.) and I guarantee if you get into a light aircraft with one or two pilots (.) a company that's got four or five aircraft only (.) you will find a

completely- (.) you'll find CRM there (.) you'll find human factors training (.) you've got to (.) because the same regulator insists on it" **Nigel A001, Captain Boeing 757**

A-E4

"it's crew resource management (.) and part of the regulation is that pilots and cabin crew do have a half a day (.) in the afternoon or whatever else (.) to train together about human factors and CRM (0.5) so they're now brought together as a group and they're given tasks to do=we talk (.) about CRM (.) and because of that (.) they <u>do</u> now see that they are part of that larger team" **Mike A005, Captain Boeing 757**

A-E5

"one of the things that's thrown into one of the annual refreshers is a full day in the classroom just going through the CRM thing (.) the crew resource management (.) to ensure that everybody is always working together properly to ensure the safe outcome of things" **Iain A020, Captain Boeing 737**

A-E6 *"the training in this crew resource management is really to treat everybody as a resource (.) the first officer (.) the cabin crew (.) air traffic control (0.5) the engineers on the end of the phone back at base (.) you know (.) in operations (.) as a resource to- (0.5) if there is a problem (.) to use those resources to solve the problem and come up with an appropriate response (.) appropriate actions"* **Phil A004, Captain Boeing 757**

A-E7

"you know it's a team game (.) although I'm a captain (.) you know (.) its- (.) there's not a- (.) there shouldn't be a really big gradient= authority gradient (.) between myself and the guys sat on the right and seat" **Phil A004, Captain Boeing 757**

A-E8

"I think the CRM aspect is now embedded so heavily into the airline that (.) you know (.) we get six monthly simulators (.) and we get annual=perhaps more often (.) line checks (.) where you- (.) you know (.) line checks is where do a normal flight with passengers (.) and you have an instructor watching your every move (.) checking your

compliance with SOP's (.) and how you interact with the crew (.) and everything else like that (.) so you know- (.) the actual scoring system for the line checks (.) and also for the simulators (.) has CRM included in those (.) so you know (.) if you're not coming up to scratch on the CRM (.) then you know they're going to do something about it (0.5) re-training (.) or counselling (.) and things like that (.) so although there are guys that like the prestige of being a captain and feel they deserve respect (.) they don't necessarily bring that to their (.) sort of work persona if you like (.) once they're on the aircraft. **Phil A004, Captain Boeing 757**

A-E9

"*I actually had a non-normal event a couple of months (.) a couple- oh about six weeks ago now (.) which the company's standard operating procedures for dealing with non-normal events (.) just went straight out the window and were completely ineffective (0.5) and this has been taken up by the company (.) and its now being included in our- (.) in the cabin crew and the flight deck's annual classroom recurrent training* **Steve A003, Captain Boeing 757**

A-E10

"we've probably got getting on for fifty or sixty aircraft all over (.) plus (.) you know (.) the wider group airlines as well (.) where you can't make all the mistakes yourself (.) but if you learn from everybody else's (.) then you're not going to make them (.) but you've got to promote it (.) and the company have to- (.) it has to come from the company first" **Charlie A015, Senior First Officer Boeing 737**

A-E11

"those sort of incidents are fed back into the training system (.) so that we can then look at training (.) with the individuals (.) or across the whole country (.) having had a couple of people have such an experience (.) we say (0.5) <u>okay</u> (.) well that's probably something worth looking at from a training point of view (.) we haven't done that for a long time (.) so let's look at that" **Aiden A014, Captain Boeing 737**

A-E12

"we had an example of an aircraft at Dalaman airfield (.) which had to fly a missed approach because it got a warning that it was close to terrain (.) so that was an individual incident that <u>then</u> (.) although the crew were doing everything correctly (.) we were then able to feed back into a training module that we've done recently" **Neil A006, Captain Boeing 757**

Appendix B

Selected Hospital Consultant Narratives - Extracts taken from 20 interviews used to illustrate the findings discussed in Chapter 6

B-A. First, Do No Harm

B-A1

"reducing harm is probably the most important subset of achieving any outcome (.) because morally that's the most important thing (0.5) somebody comes to me broken (.) the bare minimum I can do for them (.) is not do any further damage (0.5) so actually (.) therefore that is the definition of safety" **Ramesh H017, Consultant Emergency Medicine**

B-A2

"well, patient safety involves prevention of harm I suppose (1) we do potentially dangerous things to sick people all the time (.) and clearly there's lots of opportunity (.) both in terms of acts of commission (0.5) things you do wrong (.) and also (.) things you fail to do that you should do (.) to cause serious harm or even threaten people's lives (0.5) and so patient safety is about trying to avoid that" **Andrew H002, Consultant Vascular Surgeon**

B-A3

"If someone has got a knife stuck in his chest (.) and the knife has gone through his heart (.) or partly their lung (0.5) then I can do the basic management of keeping him alive (.) like look at his airway (.) breathing and circulation (0.5) but I wouldn't be able to rip his chest open and take the knife out (.) and do everything (0.5) because that is not something I'm trained to do (.) I might cause more harm to the patient (1) so I should not (.) because I'm a surgeon (.) get me a knife=I'll open him up and see how it goes (.) <u>no</u> (0.5) I wouldn't do that (0.5) I'd get somebody who knows that (0.5) I will do the basic life support (.) which I know=which every doctor should know (.) but

beyond that I wouldn't go- (0.5) because (.) <u>do no harm</u> (.) that's the basic Hippocratic oath (0.5) first thing (.) do no harm (0.5) and if you feel you're not sure if you're doing harm or not (.) it's better not to do it" **Kumar H018, Consultant Orthopaedic Surgeon**

B-A4

"doing no harm (.) that's what it ((safety)) means (1) how you achieve that I suppose is a bigger question (.) but it terms of what it means (0.5) it's ensuring that at all times (.) that in terms of patient safety (0.5) that <u>their</u> safety (.) is not compromised in any way"
Charles H019, Consultant Orthopaedic Surgeon

B-A5

"I only work within a hospital environment (.) but we recognise that (.) that environment carries numerous risks for patients (0.5) and understanding those risks (.) and trying to control them (.) and minimise them as much as possible (0.5) contributes to patient safety (.) or lack of it (.) so it- (.) I suppose it's really understanding the risks that the patient is exposed to at each step of their journey=their sort of pathway"
Miles, Consultant General Surgeon

B-A6

"patient safety (.) essentially- (.) I mean- (.) means (.) when they come=when they use our services (.) they- (.) their- (.) whatever interventions or treatment they require (.) results in an improvement in their condition (.) and no adverse consequences of our intervention (.) so that we provide an environment (.) in which they can achieve the maximum potential health (.) with no adverse consequences from being in that environment" **Gerry H010, Consultant Paediatric Intensivist**

B-A7

"we need to try to avoid any errors in all the processes (.) from the first time the patient engages in their journey through the hospital (.) the diagnostic process (.) the treatment process (.) you name it (.) any processes to do with us (1) so for me safety is to make sure (.) that what needs to be done is done in the appropriate manner (.) okay

(0.5) this describes it in one sentence” **George H014, Consultant Cardiothoracic Surgeon**

B-A8

“its errors of commission (.) errors- (.) and errors of omission as well (0.5) I mean you can- (.) you can commit an error (0.5) but if you don't do something (.) it has the same impact on- (.) in terms of safety- (1) if the patient is referred=goes to the GP with a condition (.) which- (.) where malignancy is expected- (.) is one of the potential diagnosis (.) or even presumed by the GP (.) and the letter comes to the hospital and it gets looked at by- (.) I don't know (.) it sits in an office and doesn't get handled quickly enough (.) it gets reviewed by a junior member of the team because the consultant's away (.) and is not given appropriate emphasis (.) and then the person who sees the patient in out-patients=maybe even does the correct things (.) but interprets them incorrectly (.) nothing has- (.) nothing- (0.5) there's been no committed act which is unsafe (.) but lots of omitted acts (.) which are unsafe” **Richard H009, Consultant Urologist**

B-A9

“I think it’s making sure that patients=my patients (.) people who are ill=requiring healthcare (.) receive timely and appropriate investigations and treatment (.) with the minimum of undue (.) adverse events or risks...safety is a part of quality (0.5) safety is more at the risk end (.) you can have something that’s=I guess safe (.) but sub-optimal (.) because I guess (.) first do no harm (0.5) but on the other hand what you’re- (.) certainly what my speciality is=you’re always trying to do is- (.) there’s a balance between what’s safe for now (.) and what’s best for the long term (0.5) and you’re always therefore balancing (.) potentially (.) an increased risk at one stage for jam tomorrow (0.5) and trying to balance those things” **Olivia H015, Consultant Cardiologist**

B-B. Professional autonomy

B-B1

"if you're talking about vascular surgical patients (.) it's quite useful to have a bit of knowledge about vascular surgery (1) for example (.) the sorts of things we do to them and the sorts of things that can go wrong (0.5) I think you need- (.) I mean some of it is just a very (.) basic level of experience=just recognising=you know=actually (.) this isn't right (.) this persons ill (0.5) he shouldn't be like this=you know (.) this is=you know- (0.5) I mean obviously when somebody's nearly dead it's pretty easy for anyone to recognise they're very ill (0.5) but the trick is to be sufficiently experienced to realise when they're beginning that- (.) starting that process (.) and pick it up quickly (0.5) so I think (.) you know (.) you need to make sure (.) that you have people available who have the knowledge and skills to- (.) they don't necessarily need to sort the problem out (.) they just need to be able to recognise that there's a problem (0.5) and I mean you often find (.) you know (.) I can be on call and available (.) and somebody just needs to phone me up (.) but they don't phone me up (.) and the next morning I think=why the hell didn't you tell me (.) you know if you told me about this (.) I would have come in and seen this person (.) and I'd have taken them to theatre=you know (.) and now there's this disaster (.) you know (0.5) so you need people with sufficient knowledge (.) and experience (.) and confidence I think (.) you know (.) to recognise when there's a problem and seek help" **Andrew H002, Consultant Vascular Surgeon**

B-B2

"it depends on the person=the patient you're treating and- (.) one (0.5) their general health (.) and (.) two (0.5) what their particular condition is=and what the risks of treating it are (0.5) and what the risks of not treating it are (0.5) and what's you're likelihood of success=treating it successfully is (0.5) and all those things- (.) and they all vary with each individual person you're faced with (.) and often you make a best guess (.) but actually (.) often you don't know the answer for sure (.) you just have to try and do it as best you can (.) in the circumstances you're faced with (.) often at very short notice (.) often in a state where you don't have much time (.) say you have to do it as an emergency case" **Andrew H002, Consultant Vascular Surgeon**

B-B3

"I wouldn't necessarily (.) say it's a (0.5) problem (.) but evidence based practice in paediatric intensive care=and paediatrics more generally (.) still (.) unfortunately (.) forms a relatively small part of what we do (.) and (0.5) clinician preference (0.5) and sort of (.) anecdotal experience forms a (.) significant part of (.) what drives practice (.) now obviously we try and accumulate evidence (.) and we try and be as evidence based as we possibly can (.) but (.) certainly when it comes to drugs for instance- (0.5) there's a good example in children's practice- (0.5) the evidence for use of a lot of the medicines we use in children (.) *is just not there (0.5) and in terms of large multi-centre trials (.) proving the benefit of this particular drug in a given condition for a child (.) its- (.) that's a big challenge for paediatricians the world over (.) and it's just not unique to the NHS and our particular (.) sub-speciality (.) so (0.5) so the rigidity=where- (.) where I'm coming from (.) from that- (0.5) the (.) proscriptive nature of guidelines is necessarily somewhat (0.5) limited (.) because the evidence for it in many cases is not there"* **Gerry H010, Consultant Paediatric Intensivist**

B-B4

"We often operate in the absence of evidence (.) or- (.) what level of evidence- (.) and your level of evidence can go from- (.) there are people who work in areas where your evidence is rock solid (.) multi-centre trials and stuff like that (.) and that's great (.) and it's great for overall strategy and decision-making=for individual patients it doesn't always add up (.) but it tends to be helpful (.) I think for a lot of our patients (.) there's zero evidence (.) or there's the evidence of prolonged experiences (.) about as good as it gets=or there's pooled evidence (.) anecdote essentially (.) we use that (0.5) we phone a friend and say (.) have you ever seen this=because a lot of what we see is one-off's (.) and I think not being afraid to acknowledge an absence of evidence (.) is quite important really (.) I think (.) if you're upfront with that (.) and say (.) there is no evidence to support this (.) but (.) on balance (.) based on experience in other situations of this (.) then this is a reasonable approach (0.5) and then you're always looking at the balance of risk-benefit" **Olivia H015, Consultant Cardiologist**

B-B5

"it's so complex (1) the level of the complexities <u>are</u> (1) <u>patient</u> (.) they're complex=every human being is a complex system(0.5) that interaction is complex (.) the decision making pathway is complex (.) the systems we're working (.) the regulation policy framework is complex (.) it's a bloody complex system (0.5) <u>but</u> (.) unless we appreciate that (.) we won't be able to take it forward (1) one of the problems we have=which is again (.) totally against the concept of being a high reliability organisation (0.5) is simplifying (.) we've got this habit of saying (.) oh (.) if it just wasn't for that thing (.) it wouldn't have happened (0.5) or (.) If only we could do that thing (.) it will solve the problem=and it's total ignorance of the fact (0.5) a simple solution (.) <u>does</u> <u>not</u> (.) exist to a complex system (.) you need two-hundred simple solutions for a complex system (.) and we (.) <u>should</u> <u>not</u> (.) be trying to simplify it (.) because we cannot (.) it's complex" **Ramesh H017, Consultant Emergency Medicine**

B-B6

"I think bottom line (0.5) if you're not competent (.) then the danger will be that you (0.5) get yourself into trouble (0.5) and you don't necessarily=and the problem there is (.) whether you've got insight or not (.) so (0.5) being competent to do something is one thing (.) but it's also about having insight as well (0.5) so there are people (.) who may be incompetent (.) but they have insight into that incompetence (.) and so they know=it comes back to what I said about knowing their limitations (.) and they can actually then develop (.) and train (.) and gain that competence (.) as opposed to those people who might <u>think</u> they're competent (.) but <u>aren't</u> competent (.) but don't have the insight (.) and so insight is a big factor in what we do as individuals"
Christopher H011, Consultant Paediatrician

B-B7

"the vast majority of consultants I think (.) are very conscientious (0.5) if there's been an intra-operative (.) perioperative death (.) major complication (.) most people will analyse=go through (.) look at the case in detail (.) is there anything I could have done differently=should have been done to- (.) different (.) we do- (.) some of those are formally discussed in governance meetings (.) but not a lot of them (.) but that whole

self-reflection thing (.) I think a lot of consultants do it (.) and go through it (.) the ones that are very-=but the small percentage of people that there will be a problem with (.) aren't going to be the self-reflectors (0.5) that's the problem you've got (0.5) I think a lot of people do reflect (0.5) but the people who we would be concerned about (.) might not necessarily be the people who would self-reflect in that way" **Graham H008, Consultant General Surgeon**

B-B8

"people who have capacity and want to go home (2) and appear in front of two (.) different physicians or ward teams (1) they may end up making different decisions (.) dependent upon the prejudices and (.) perceptions of risk (.) of the clinical team (.) you know (.) I know that I have physician colleagues (.) who when they're on call at the front door send thirty percent of the people they see home the same day (0.5) and there are other colleagues (.) when presented with the same group of patients would send ten percent home" **Dimitris H001, Consultant Physician**

B-B9

"surgery is still an art (.) or a craft (.) and at the end of the day (0.5) if you were to try and cut something right (1) you could use a knife to cut it (.) You could use energy to cut it (.) you could use energy as in electro-surgery (.) you could use harmonic to cut it=I do keyhole surgery where (.) when you have electricity going through someone the potential risks (.) though low (.) are there (0.5) but you sit down and choose what's the most cost effective way depending on your philosophy (0.5) if you've had a complication from something (.) you might turn around and say I'm not using this (.) I might do it this way (.) or that way (.) or this way (0.5) so- (0.5) because there are different ways of trying to do something (.) I think that side of things is difficult to get people to change" **Sunil H016, Consultant General Surgeon**

B-B10

"it's partly because of the way doctors are trained (1) so the traditional medical model is as an apprenticeship model (.) our people have a degree (.) they come and work as a team (.) they become an apprentice(.) and they learn from the master=and the

consultant is always right (.) and you just get indoctrinated into this school (.) and then you have this- (.) and then you set up these lofty standards for yourself that (.) I will never fail (.) I will be one hundred percent right (.) I will always do the right thing (.) and actually (.) as time has gone by we've realised (.) actually you'll never be one hundred percent right because (.) <u>what is right</u> (1) unless you're measuring what you're doing every time (.) against the outcome (.) you cannot track whether you're right or wrong (.) so it's a mistaken notion (0.5) secondly (0.5) I will never come to an error=well <u>actually</u> (.) your errors are as good as your recording of what errors they are (.) in a follow-up of what you are doing (.) and what are your indicators for deciding what is an error (1) there is no standardisation on that (.) so actually (.) the fact that I can never commit an error is false (.) and the fact that I will always be doing exactly the same thing- (.) you cannot (.) you're a human being=you're not a machine (0.5) I cannot depend on you to be exactly the same (.) at your best every day (.) it just doesn't work" **Ramesh H017, Consultant Emergency Medicine**

B-B11

"so the whole concept (.) that I train from a person (.) and I keep on practicing the same thing (.) also means that I do not evolve (.) I do not have new learning (.) because I'm doing what I was taught (1) and when I started medicine- (.) I constantly hear phrases like (.) this is what I was taught (.) and I was like (.) you were taught that twenty years ago (.) life has moved on (.) why haven't you (.) medicine is science (.) it's moving (.) and I am scarily behind where I should be (0.5) and every day goes by (.) and I realise I'm even more behind than where I should be (.) because the pace of change of knowledge (.) is so fast that I cannot keep up with it (.) I just cannot (.) and I've given up (0.5) and instead (.) I've decided (.) <u>actually</u> (.) instead of trying to keep up with the pace of change (.) and knowledge (.) I'll get a better understanding of how to look for signposts to knowledge (.) and I will seek knowledge at the moment that I need it from others (.) that will improve my safety" **Ramesh H017, Consultant Emergency Medicine**

B-B12

“the problem with evidence in medicine (.) is (.) that evidence (.) is good only if you are performing medicine at an average level and below (1) if you go above that (.) the evidence has not been created yet (.) if you do unique procedures (.) and if you do procedures which are still parts of trials or anything (.) and if you have that sort of patient (0.5) the evidence has not been created yet” **George H014, Consultant Cardiothoracic Surgeon**

B-B13

“If you take laparoscopic surgery as an example (0.5) when laparoscopic surgery came in (.) twenty years ago (.) a few general surgeons went from here to the States (.) to watch somebody who’d done (0.5) maybe (.) ten (.) or twenty (0.5) and came back (.) and started doing them=and our bile duct injury rate went up (0.5) but everybody took it on (.) because the perceived benefits to the patient looked good (.) but were largely (.) if you like (.) cosmetic really (0.5) if you tried to introduce that now (.) you’d have to have (.) a hugely detailed process of mentoring and so on (0.5) which would almost sink the thing before it’s started (0.5) so I think there are worries (.) in the surgical fraternity (.) about our ability to introduce new technologies (.) and new techniques in an era when (0.5) if anything goes wrong (.) the new technique is looked at (.) and your use of it (1) inevitably (.) when you start using such a technique (.) your experience is going to be limited (.) or minimal” **Tim H013, Consultant General Surgeon**

B-B14

“I guess it’s this balance of risk and (.) sort of acceptable risk (0.5) and acceptable benefit (.) that- (.) you know (.) for Christian Barnard doing his first ever heart transplant he- (.) you know (.) you couldn’t <u>do that now</u> (.) I mean you just couldn’t (.) without=well you just couldn’t (.) you know (.) the- (.) just to sort of do it in <u>that way</u> (.) would now deemed to be (.) probably morally and ethically questionable” **Dimitris H001, Consultant Physician**

B-B15

"basically (.) if you have a new thing (.) a new procedure=and it happens with medication also=and it happened with voltorol (0.5) okay (0.5) I'll give you an example (0.5) <u>diplofenac</u> (0.5) one of the most potent painkillers (.) and anti-inflammatory drugs (0.5) has been used for (0.5) it must be pushing (.) forty-years now (0.5) we now don't prescribe it at all (.) because we found (.) after <u>forty-years</u> (.) we found it was associated with an increased risk of cardiovascular events (1) so you're more likely to have a heart attack if you take voltorol (0.5) <u>forty-years</u> (1) okay (0.5) thailidamide=it was on T.V. the other day (.) it was the morning sickness tablet (.) because at the time they thought that morning sickness was because of anxiety (.) so thalidomide was a mild anxiolytic (0.5) they gave the mother's thalidomide (0.5) <u>thalidomide babies</u> (0.5) it took them even with <u>that</u> (0.5) with the <u>obvious</u> disfigurement (.) the obvious problems (.) and you know (.) the red flags coming out (0.5) I think them (.) I think (0.5) three years to identify (.) that was the drug that was causing the mutation" **George H014, Consultant Cardiothoracic Surgeon**

B-B16

"managing the risk of the training aspect=because we're training new doctors and surgeons all the time (.) and that's done- (.) that's still done really in surgery by a type of apprenticeship system (.) so if I've got a trainee attached to me (.) I would operate with them a lot of the time (.) until I had a clear idea of what they were able to do (.) and what they were capable of (.) they would have to keep a log book of everything they did (.) which is actually submitted to the Royal College (.) and a regional body (.) so it's pretty carefully analysed (.) each year they're interviewed by a committee (.) to check that they're making the right progress in terms of their training (.) but also to make sure that the training they're receiving is quality training=and that it's being done properly and safely (0.5) so a trainee surgeon would not be able to do a procedure on their own unsupervised (.) unless they had been assessed in that (.) and were felt capable of doing it" **Miles H020, Consultant General Surgeon**

B-B17

"you don't get a brand new medical student to perform complex cardiac surgery (.) and say (.) <u>oh look</u> (.) just get on with it (.) and I'll hold your hand and well (.) do your best (.) there's=you know (.) there's something about (.) people working within an environment in which they feel safe (.) in which they feel able to ask for help (.) in which the risk is managed (0.5) and also being clear to the person who is on the receiving end of whatever's happening (.) that this is the environment in which they place themselves (.) and I think to be honest (.) what a lot of patients understand is (.) that there is a sort of (.) what many people=patients (.) understand (.) is that there's a sort of (.) a requirement (.) to invest in the next generation of doctors and nurses and all the rest of it (.) and that comes with (.) what may be a modest increase in the risk of the care that they're receiving now (.) but there's a sort of deferred benefit if you like (.) in that in twenty years-time (.) when they're asking for help (.) there's actually going to be some help there" **Dimitris H001, Consultant Physician**

B-B18

"we constantly go on courses (.) conferences (.) I can ask my colleague (.) I haven't done this operation for ages (.) is there anything new happening (.) he'll say (.) don't worry (.) you do the operation (.)I'll come and help you (.) we'll do it together (0.5) it's a lifelong learning process (0.5) to the day you die you're still learning (.) it changes=the operations I did twenty years ago (.) they are obsolete today (.) if I did them people would laugh (.) twenty years ago (.) if you had a pain in your knee (.) we'd give you some tablets and wash it out (.) now we do a joint replacement=take the whole joint out (.) put a new knee joint in (.) when I was at medical school we didn't even know that we could do that…you go on conferences everywhere (.) some people have exchange of ideas=that is extremely important (0.5) and now (.) it has become a bit of mandatory thing (.) again they have made rules that you have to do this (.) and you think (.) we <u>always</u> did this (.) why did you have to make a rule (.) do you think I=as a surgeon (.) will suddenly say (.) no (.) I'm not going to learn anymore" **Kumar H018, Consultant Orthopaedic Surgeon**

B-B19

"I think in the speciality I work in (.) it wouldn't be uncommon for very few people in the theatre to know exactly what I was up to (.) and I think that's a nature of the speciality=and the sorts of things that we do…there's very little chance of the nurse (.) or assistant that I'm working with (.) or a radiographer (.) detecting that I've made an error" **Greg H005, Consultant Interventional Radiologist**

B-B20

"Clearly, from the healthcare end (.) in terms of=or me (.) delivering safe care to my patients means (.) making the right decisions at the right time (.) making sure they get the right follow-up intervals=and that they understand what's happening (.) and that they understand the risks and benefits (.) and they have some participation in that choice process (.) that's all about safety (.) that's safety for the patient in terms of their life and wellbeing" **Olivia H015, Consultant Cardiologist**

B-C. Social and cultural issues

B-C1

"nowadays (.) one of the main feed-in processes to the decision-making (.) that ten years ago we'd largely have done (.) as an individual surgeon in outpatients (.) with an individual patient (0.5) is now the meeting that I've just come from (.) that's gone on for three hours (0.5) looking at every HPB[10] patients' scans (.) with a group of five other HPB surgeons (.) and two or three radiologists (.) and a heptologist (.) and junior staff (0.5) and you look at all the scans (.) and you say (.) what do we all think (0.5) it's <u>not</u> (.) necessarily one surgeon's decision (.) because you can have one surgeon (.) who'll be very aggressive (.) and one surgeon who'll be more timid (.) and you'd hope that the MDT[11] (.) would bring a consensus judgement to what's sensible (.) and what isn't sensible (.) to tackle surgically (1) I suppose that (.) as an individual surgeon (.) you're still the end-point (.) of making the decision (.) so you're basically the one who

[10] HPB – Hepatobiliary
[11] MDT – Multidisciplinary Team

sees the patient in outpatients (.) knows how fit they are (.) talk to the relatives (.) and have all the background information which feeds in to what the MDT will decide to do (0.5) but you still have a moderating influence (.) of your colleagues saying (.) well actually that's just not sensible" **Tim H013, Consultant General Surgeon**

B-C2

"You feel that (.) actually (.) you shouldn't be deciding on your own to do stuff anymore (.) because that almost exposes you to a personal risk (.) of patients (.) or relatives (.) coming back and saying (0.5) you made that decision (0.5) If you can offset that to a group of ten consultants (.) who've sat there and made what you would <u>hope</u> (.) is a rational decision (0.5) then <u>actually</u> (.) you've sort of offset your risk really"

Tim H013, Consultant General Surgeon

B-C3

"I have this thing where (.) we have a joint ward round (0.5) so the other consultant paediatric neurologist and I (.) do joint ward rounds (0.5) once or twice a week we go round together (.) so (.) most of those (.) we're together watching each other (.) talk to the family (.) and examine or discuss the case (.) or discuss the plan (0.5) so I would say (.) you know (.) sort of say (.) oh (.) you could do that (.) or (.) you know (.) it might not be that (.) maybe think of that (.) or I should- (.) I would probably- (.) I'd do the ammonia or- (.) and then she'll say to me (.) have you sent the- (.) have you sent this test off (.) and have you done that test (.) and I said (.) no but- (.) I mean (.) you know (.) if someone is suggesting it (.) you might as well do it (.) so=so (.) that's quite a good thing (.) rather than working completely in isolation" **Martin H007, Consultant Neurologist**

B-C4

"a lot of the big decisions we make (.) are made in a formal Multi-Disciplinary meeting (.) where a fair amount of critical appraisal goes on (.) shall we say (0.5) and you could call it (.) brain-storming (.) or floating ideas=and when the team is functioning well (.) that is a really powerful tool (.) and when the team is functioning badly (.) you end up with a camel=an animal devised by committee (0.5) in general (.) it's a good thing (.)

occasionally it's mind-blowingly inefficient (.) so there's a balance (.) if you need to make a fast decision immediately (.) then you're going to have to do that on a one-to-one (.) whereas if there's the time to look at the whole picture (.) then you may make a better decision with a group think (1) I think that most (.) not all but (.) most (.) of our decision-making (.) is at least shared in terms of discussion about it (0.5) in the end (.) somebody has to make a decision (.) sometimes we go for a majority decision (.) sometimes we go for a minority decision (.) if somebody feels strongly enough about it" **Olivia H015, Consultant Cardiologist**

B-C5

"it's (0.5) not an aspect of (.) patient care that's very well (.) covered in your medical education (.) so (.) nothing in my- (.) certainly (.) medical student education=in the eighties (.) or my radiology training (.) basically prepared me for high risk procedures with associated outcomes (.) and the personal responsibility that you take on for this role (0.5) so I wasn't trained from that point of view (1) in terms of your personal response to error (.) or bad outcome (.) whether it was error related or not (0.5) that's very (.) personal (.) we're all different (0.5) I think it's very important (.) to be aware of the impact it has on you (.) and to be open (.) and to be able to discuss it (.) so we have opportunities to discuss it (.) because as (.) operators (.) in a team we (.) talk to each other…to debrief sequentially after a bad event is really important (0.5) so you have- (.) you pick up the (.) the emotional impact of it immediately (.) together (.) and you (.) share the shock (.) and the horror (.) together (.) in a setting (.) and so (.) the power of that is not to be underestimated (.) actually (.) we're seeing the benefits of it (.) more and more for preventing things like post-traumatic stress (.) amongst junior staff in particular" **Gerry H010, Consultant Paediatric Intensivist**

B-C6

"if you think that you've made an error of judgement (0.5) and that's caused (.) harm (.) there's no way of getting rid of the anxiety (0.5) guilt (.) embarrassment (.) all or those things that (.) come with making a choice that wasn't- (.) that proved not to be the right choice (0.5) however (.) if the situation you're faced with is (.) one that you couldn't cope with and (.) no one else could cope with (.) then there's a certain amount

of rationalising that you can go through to- (.) sort of offset (.) those (0.5) natural feelings (.) of regret that you have if a procedure didn't go to plan (0.5) sometimes there is a mismatch (.) between anyone's abilities (.) and a clinical scenario (0.5) so your personal response depends on the situation you find yourself in as an individual (0.5) certainly if you feel you've made a bad choice (.) and its harmed a patient (.) that's a really unpleasant scenario (0.5) all you can do is try and learn from it" **Greg H005, Consultant Interventional Radiologist**

B-C7

"there is a temptation (.) which has to be resisted (.) I think (.) to wallow in guilt and self-pity after something's gone wrong (.) and you have to be as professional as you can (0.5) and calm and collected (.) and logical (.) and break it down into (.) how much of this can I actually beat myself up about (.) or should I actually be beating myself up about (0.5) and- and yes (.) you know (.) I think the branches (0.5) of the profession (.) which have to do these (.) very high risk provision of care (.) do have quite a high burnout rate (0.5) if you look at (.) anaesthetists for example (0.5) it's the highest suicide rate (0.5) in the medical profession=apart from psychiatrists (0.5) is- (.) is anaesthetists (.) and- (.) and- (.) that I think is because (.) you come in (.) for a procedure (.) for example (.) a relatively well child having elective surgery (.) and then something goes wrong (0.5) you know (.) the potential there for guilt (.) and (.) you know (.) extreme adverse self-criticism is quite high" **Gerry H010, Consultant Paediatric Intensivist**

B-C8

"there's a good example in this institution (.) of somebody (.) who everybody would regard as a <u>phenomenally good</u> surgeon (.) has a bad run (.) of two or three complications (.) and a couple of complaints (.) and then somebody (.) a patient (.) writes to the GMC (0.5) and somebody who's done twenty years of service=who everyone recognises is phenomenally good (.) suddenly ends up (.) off with depression for a year (.) and what- (.) again (.) I think in terms of the people doing (.) high risk procedures (.) in NHS hospitals (0.5) I think there is no support mechanism in place (.)

you have to be fairly internally robust to yourself (.) hope you have some quite supportive colleagues" **Graham H008, Consultant General Surgeon**

B-C9

"I suppose the other important thing is (.) the sharing problems with each other (.) so (.) having regular meetings (0.5) when one might discuss unusual complications that have arisen (.) and feedback on them…its more (.) clinical meetings (.) where we might review challenging cases (.) either for a point of view (.) to tapping into colleagues expertise for this particular case (.) what approach would you use (0.5) and learn from that (0.5) or (.) if there have been misadventures (0.5) to feed them back (.) and share with each other (.) so that is relatively informal though" **Douglas H004, Consultant Orthopaedic Surgeon**

B-C10

"our main quality assurance processes are (.) mortality and morbidity meetings (.) where all of these (.) <u>incidences</u> (.) have been analysed (.) by all of the major clinicians involved in the care of patients (0.5) and that we identify (.) not just (.) some that deviate from what is the accepted protocol (.) but (.) we identify if the accepted protocol did not really take into account the scenario (.) and if we need to change it" **George H014, Consultant Cardiothoracic Surgeon**

B-C11

"I think we tend to=consultants tend to (.) defend their juniors (0.5) people tend to defend their colleagues (0.5) I think nursing (.) in nursing (.) certainly the investigation can seem like very punitive to nurses (.) and I think (.) nurses are much less likely to stick up for their colleagues than doctors are (.) I mean (.) I think you know people (.) you can say there's a tendency to (.) <u>blame</u> people (.) when things go wrong in healthcare (.) but equally historically (.) doctors have tended to cover up for poorly performing colleagues (.) and things like that (0.5) so and I'm hoping that doesn't go on (.) I mean (.) certainly I think you've got to be (.) very=very aware (.) when you're looking at practice that is- (0.5) that is deviant to the point of being unsafe (0.5) and I think people (.) do have to be honest (.) and run the risk of making themselves

unpopular with colleagues if they- (0.5) I mean you can do these (.) you can do things (.) you can identify issues (.) and sort them out with charm and discretion=which is great (.) but if it doesn't get sorted out (.) you've got to sometimes take the gloves off I think" **David H012, Consultant Physician**

B-C12

"when I was training (.) most of the training was (.) on the job really (.) so when I was training (.) there wasn't a lot of structure to any training <u>at all</u> (.) you sort of (.) learnt as you went along (.) and unfortunately (.) sometimes (.) you learnt by your mistakes (.) and the consultants (.) would <u>be</u> there (.) and they'd point you in the right direction (0.5) you know (.) every now and again they'd sort of say (.) <u>no</u> (.) <u>this is</u> the right way to do it (0.5) you learnt- (.) the senior registrars (.) were the people who were on the shop floor (.) who were actually- (.) usually trained most of the junior doctors (.) but that really- (.) whilst you got a huge amount of experience (.) because you worked (.) sort of very long hours (.) you learnt fairly quickly in terms of experience (.) you didn't necessarily always work=<u>learn</u> (.) in a very structured way (.) and simply having experience (.) doesn't necessarily make you competent either" **Christopher H011, Consultant Paediatrician**

B-C13

"you can't learn swimming by reading a book (0.5) I can give you a big thick book on how to swim (0.5) you can read it ten times (.) you're not going to swim (.) the only way you <u>will</u> swim (.) is to jump in the water and swim (0.5) if I give you a book (.) you read everything=you master everything (.) and I put you in water (.) I bet you=you will drown (0.5) so there are certain things (.) you've got to get in there and get your hands dirty (.) <u>yes</u> (.) you can make rules (.) and you can make mistakes (0.5) but some things you <u>do</u> (0.5) and experience (0.5) each surgeon <u>has</u> to make <u>some</u> mistakes (.) he will make- (.) but you can cut down the number of mistakes (.) you can cut down the way things are done (.) and that is all part of education and experience (0.5) that is absolutely important (0.5) we don't let some guy come in with a knife and start cutting (.) he has to go to medical school (.) get training (0.5) the first operation he does (.) there is one person standing there telling him what to do (.) those are the things you

can't write (.) they are taught on the job" **Kumar H018, Consultant Orthopaedic Surgeon**

B-C14

"managing risk (.) of the training aspect (.) because we're training new doctors and surgeons all the time (.) and that's done- (.) that's still done really in surgery (.) by a type of apprenticeship system (0.5) so if I've got a trainee attached to me (.) I would operate with them a lot of the time (.) until I had a clear idea of what they were able to do (.) and what they were capable of (.) it's pretty specified (.) but I mean (.) it's not specified to the extent of saying (.) right (.) that registrar's got to do (.) <u>fifteen</u> hernia repairs (.) before they can do one on their own (.) but (.) the more senior surgeons are relied on (.) to supervise the trainees as closely as we feel is appropriate (.) and I suppose (.) we've developed=with experience (.) over the years (.) an understanding of when that point is reached (.) the trainee's do have to <u>acquire</u> (.) a certain numbers of procedures before they can get their certificate to say they are trained (0.5) they have to have done (.) a certain number of various procedures (.) so I suppose in some ways that's fairly rigorous (0.5) the trainee's=like all of us (.) you know (.) we all vary in our ability (.) and one trainee might need to do (.) a hundred colonoscopy's before you reckon they're safe enough (.) to do it all on their own=whereas another might only have to do twenty (0.5) and you rely on the supervisor (.) the master (.) to look at the- (.) the master-apprentice thing (.) to help guide that process (.) so there are elements of it that are rigorous (.) there are elements of it that are rather loose" **Miles H020, Consultant General Surgeon**

B-C15

"if you're looking at (.) a personal error (.) that I've made=and detected (.) I'll present that at our morbidity and mortality meeting (.) or (0.5) it gets presented at a discrepancy meeting if it's an interpretive error (0.5) if it's an error that I think would benefit from being broadcast beyond the trust (.) I will take it to our UK neuro-interventional group meetings (.) which happen twice a year (.) and I've done several presentations of personal errors and mistakes (.) that I've made during procedures (.) at our national meeting=but I felt they're very easy to make and quite hard to stop

yourself making at times (.) so I've presented that type of error at national meetings" **Greg H005, Consultant Interventional Radiologist**

B-C16

"*on a sort of (.) less informatics based way of looking at outcomes (.) we have regular team discussions about- (.) around adverse events (.) and we have (.) monthly meetings looking at outcomes=not just adverse outcomes (.) but good outcomes (.) audit (.) mortality and morbidity meetings are monthly in this setting at ((name of hospital)) (.) and bi- monthly in the paediatric unit at the ((name of hospital)) so- (0.5) but whilst it has traditionally been the domain of a few people in a given team (.) I'm firmly of the opinion that (.) the more people that buy into the whole thing the better the team works together"* **Gerry H010, Consultant Paediatric Intensivist**

B-C17

"we've got (.) monthly mortality and morbidity meetings (.) where we present cases of serious untoward incidents (.)maybe some responses to complaints (.) and action plans from complaints (.) and also (.) review of mortality of patients (.) who are considered to have had avoidable outcomes=or worse than expected outcomes (.) the surgeons are much better at doing this (.) we've only just started these (.) and I have to say (.) the meeting is running particularly well at the moment (.) but I think (.) that is something that could develop further (.) and it's also the junior doctors attend (.) ward managers attend=so its multi-disciplinary as well" **David H012, Consultant Physician**

B-C18

"I know two paediatricians (.) who diagnosed epilepsy when it wasn't (0.5) and both those children (.) died (.) from Cardiac arrhythmia (.) so it was a misdiagnosis and the kids died (0.5) so that would be terrible=and yes I would feel bad about that (0.5) but (.) I suppose we'd have the consolation (.) if we'd gone through the process conscientiously (.) so you've done a proper history and (.) examined- (0.5) I think with one of those (.) the consultant had never actually seen the child=you know (.) it was a junior (0.5) and then they got discharged home and it was never=nobody ever (.) nobody (0.5) he never got a grip on it (.) so then you still feel bad about that (.) and it's

hard to explain (0.5) and then you have the extra responsibility of (.) you know=explaining to the parents" **Martin H007, Consultant Neurologist**

B-D. Risk

B-D1

"in terms of risks then (.) there are different risks that we're talking about (0.5) the two main themes I would say=there's the risk related to the disease process (.) and the decision to operate (0.5) and there's the risk related to an anaesthetic (.) and co-morbidities (.) that the patient may have independent of the disease I'm focussing on (0.5) and the operative risks I'm quoting for that disease (1) so there are two main themes" **Greg H005, Consultant Interventional Radiologist**

B-D2

"everything we do to people has a risk to it (.) <u>even</u> if we do it well (.) and to a high level of competence (0.5) and there's also a risk of not doing it (0.5) so a lot of the time- (.) for example (.) I will (.) I don't know (0.5) operate (.) on a patient's carotid artery (.) to try and prevent them from having a stroke (.) there's a risk of giving them a stroke by doing it (.) I don't <u>know</u> for sure (.) that if I hadn't done it (.) they would have a had a stroke (.) overall it's better to do the operations (.) but you always have this dilemma when you're weighing up with an individual patient (0.5) well ok I can do this to you (.) how likely is that you'll have a stroke=how likely is it you'll not have a stroke (0.5) it's very easy to be risk averse and say (.) well <u>actually</u> (.) you're a bit high risk (.) I'm not going to operate on you (.) but then actually (.) you're doing them harm (.) because you're denying them the treatment that would have reduced their risk as best as possible (0.5) so this argument about not doing harm immediately becomes much more complicated (.) because it's not just about (.) what your operative mortality rate is (.) it's also about (.) <u>who</u> did you <u>select</u> (.) and <u>who</u> did you <u>not</u> offer surgery (.) and what happened to them (0.5) and that becomes very difficult to quantify (.) difficult to pin down=if you see what I mean" **Andrew H002, Consultant Vascular Surgeon**

B-D3

"the fact that he is there (.) and you're going to do an operation on him (.) that's because somebody's got a cancer (0.5) or somebody's got a broken bone (0.5) or somebody's got a broken nerve (0.5) or somebody's been shot (.) or been knifed (0.5) so they're already in a hazardous situation (.) and if you don't do anything (.) they're not going to go away (.) sometimes it's not that hazardous (.) but yes (.) there is no other way to rectify that (.) than to put them into this situation" **Kumar H018, Consultant Orthopaedic Surgeon**

B-D4

"I don't think you can equate harm as a single isolated event (.) harm is part of a much bigger picture (.) you know (.) the fact that he's got appendicitis- (.) actually (.) because we do not know (.) how to manage appendicitis in any other way (.) is the reason (.) why we're subjecting him (.) to a procedure (.) which has got a risk of actually causing more harm (0.5) but we're balancing that (.) with more risk of harm (.) if we don't do anything (0.5) and that's why we're going down the pathway of actually (.) causing harm (.) to prevent further greater harm (0.5) but we are causing harm (1) like catheterise a person (.) we are causing harm to avoid further greater harm (0.5) but it's a much more delicate balance (.) because you can get away without catheterisation a lot of the time (0.5) you cannot get away without doing the surgical appendectomy (.) most of the time" **Ramesh H017, Consultant Emergency Medicine**

B-D5

"I will only ever see a patient who's got a problem of some sort (.) and that problem itself (.) will represent a risk to them (0.5) but quite often (.) that risk is extremely small (.) so a patient might come in with (.) a spot (.) on the back of their hand (.) or something (0.5) and in fact (.) the risk to them (.) of having that spot (.) on the back of the hand (.) is minute(0.5) whereas the risk of me doing something to remove that spot under an anaesthetic (.) in an operating theatre (.) would be a much greater risk (0.5) so yes (.) sometimes (.) patient's actually come in with a very low risk problem that they're wanting advice about (0.5) other patient's- (.) I mean I'm on emergency duty at the moment (.) and we know (.) over these next few days (.) we'll get some very

ill patients in (.) who are at high risk of not surviving their illness (.) and therefore the fact that we're suggesting a high risk intervention to them is (.) a sort of fair exchange (0.5) because the risk of our intervention is justified by the risk of their problem"
Miles H020, Consultant General Surgeon

B-D6

"the alternative treatment options for high risk cases (.) involve even higher risk (0.5) so (.) some of the treatment options(.) with minimally invasive techniques (.) and treatment through the blood vessels (.) although they involve significant risk of death (.) or disability (.) to some patients (.) carry a lower risk than neurosurgery as an alternative (.) and a higher probability of recovery and independent lifestyle (.) than doing nothing (0.5) so although the risks are high (.) as an individual I can rationalise they're justified" **Greg H005, Consultant Interventional Radiologist**

B-D7

"a lot of our patients have complex problems (.) some of them (.) you could do a lower risk procedure now (.) but that will make a subsequent procedure harder (.) and you have to try and balance those decisions (1) you're also trying to make decisions about safety (.) or the timeliness of a procedure for one patient against another (0.5) and those are quite often qualitative (.) as you don't have (.) endless resources (.) and you don't have (.) endless money (.) endless facilities (.) endless space (.) and endless time (.) you're always in a situation where you have competing resources (.) and you have very little control over what comes through the door (0.5) so there's an element (.) of prioritisation in there (.) and the safety=the risk element (.) comes into that (0.5) so there's risk management (.) in that (.) to say which patient (.) has the (.) <u>greatest</u> need for something (.) but if the patient that has the greatest need for something (.) actually then (.) is in a situation where there isn't the resource to pick up any complications afterwards (.) then (.) they're going to have to wait until they're in place (0.5) there's an ongoing series of risk management decisions that people are making all the time (0.5) some of those (.) are very small (.) some of them (.) are very big (.) how you capture those is really difficult (0.5) but underlying that (.) you have to have a culture

(.) that maintains that awareness to the bigger picture (.) as well as t(.) the small details" **Olivia H015, Consultant Cardiologist**

B-D8

"it's very difficult to put a hundred percent target in for stuff (0.5) for VTE (.) Venus-Thromboembolism prophylaxis (0.5) the target <u>is not</u> (.) a hundred percent (.) because there's an acknowledgement (.) that clinical systems either <u>can't</u> (.) or <u>shouldn't</u> (.) perform at a hundred percent (0.5) because the effort expended on the one case (.) that gets you from 99.9 (.) to a hundred percent (.) will be disproportionate (0.5) because (.) that effort (.) <u>could</u> (.) and <u>should</u> (.) arguably (.) be spent on another riskier area to help you balance your resources appropriately (1) if you're on the steep part of the curve (.) you're probably getting- (.) well you're going to be getting (.) the most benefit from effort expended (.) and I guess you've just got to work out where the curve becomes flat" **Dimitris H001, Consultant Physician**

B-D9

"well (0.5) it depends where=how you look at it (.) you know (.) you might look at- (.) oh I don't know (0.5) a surgical admissions area (.) which is overwhelmed once a fortnight (.) and the people working on the surgical admissions area say (.) <u>look</u> (.) this is overwhelmed once a fortnight (.) and there are other people in the organisation (.) who've got twenty-six different areas (.) that are overwhelmed intermittently (0.5) and <u>actually</u> (0.5) being overwhelmed once a fortnight (.) is the least of the problems (0.5) so the resources get put where the risk is greater (.) and (.) you know (.) you're in your overwhelmed surgical admissions area (.) trying to say (.) well actually (.) let's get the sick ones through as quickly as we can and- (.) ok look (.) you've broken your toe (.) I'm sorry go and see your GP (0.5) to try and get <u>the risk</u> (.) as <u>good</u> (.) or as <u>low</u> as possible (.) and somebody else further up the organisation () is saying(0.5) well (0.5) whatever's going on there (0.5) that's <u>nothing</u> compared to over here (.) where its overwhelmed continuously (0.5) and you know (.) they're laying out five people a day who've- (.) you know needlessly died (1) you know (.) so (0.5) somebody has to work at every level"
Dimitris H001, Consultant Physician

B-D10

"within the hospital setting (.) I suppose (.) if the risk of something happening (.) was like (.) one in a hundred (.) then it would cause a lot of worry (.) because (.) you know (.) we see hundreds and hundreds of patients (0.5) but if the risk of something happening is very much rarer (.) maybe one in a hundred thousand (.) or one in ten thousand (0.5) then it doesn't raise a lot of worry locally (.) because that's- (.) you know (.) going to happen every ten years or something (0.5) but of course (.) in the UK (.) it's going to happen every year (.) so (.) for the department of health it's become an issue (.) so it's- (.) for things to get- (.) you know (.) change from my personal practice for instance (.) I wouldn't want a risk of something happening one per cent of the time (.) but I- (.) you know (.) I do use medicines and things that- (.) where I know the risk is going to be one in ten thousand (0.5) so I think (.) oh that's- (.) I'm not so worried about that (.) and we don't feel obliged to go into huge detail about those sort of risks with families (.) because I put it in a perspective that (.) what's (.) you know (.) the risk of them (.) have something happening in the car trip here (.) and going back (0.5) especially if the roads are terrible ((laughs)) (1) so it just- (.) trying to get it into some perspective (0.5) but for the hospital (.) they're more fussy (.) so (1) they're more fussy than I am because then=of course they've got (.) how many consultants have they got here (.) there must be hundreds (.) there must five or four hundred or something (.) so that- (.) so they're going to get these things crop up every year (0.5) and then for the department of health (0.5) they should be even more fussy" **Martin H007, Consultant Neurologist**

B-D11

"Most clinicians are=and nurses (.) are just seeing the patients around them (0.5) and they don't see the patients in the rest of the hospital (.) let alone (.) you know (.) across the- (.) across the country" **Adrian H006, Consultant Anaesthetist / Medical Director**

B-D12

"again (0.5) as I said (0.5) data is data (0.5) evidence is what you make of it (.) there isn't a study worth its salt which proves either way (.) in fact (.) when you go to some

places like in Germany (.) if you go=and you're not wearing your full-sleeved white coat (.) you would be reprimanded (0.5) whereas if you wear a white coat in this country (.) you are a safety <u>*risk*</u> *(.) how is that possible (1) Germany is no third world country (.) in fact they have a very good medical system (.) they are quite scientific too (1) this is a* <u>*prime example*</u> *(.) of safety issues gone mad=I can't wear a tie (.) I can't wear a full-sleeved shirt (.) I can't wear my watch (0.5) I can't wear anything around my wrist (0.5) but I can wear a dirty wedding ring with no problems"* **Kumar H018, Consultant Orthopaedic Surgeon**

B-D13

"let's say I'm in re-sus (.) and I'm also running the department (0.5) and I happen to be in one (.) tiny area of the department (.) dealing with one sick person (.) you know (.) I- (.) for that moment (.) while I'm there (.) I've just lost situational awareness (0.5) I have no idea what's happening elsewhere (0.5) and actually I've just exposed a pile of people to a higher risk (0.5) but before I went in to do that (.) what I would hopefully be doing (.) is having (.) say every hour=or every two hours (.) having a debrief (.) with my team (.) so I <u>*know*</u> *(.)* what is *the degree of risk (.) already in the department (.) so that when I go in and I (.)* <u>*lose*</u> *(.) the department for fifteen minutes (.) well=being very well I cannot be there for more than ten to fifteen minutes (.)if I do (.) I cause (.)* <u>*more*</u> *risk to them (.) and then I come out (.) and I regain situational awareness by doing another round than actually doing another debrief (.) so that is kind of balancing individual risk against system risk (0.5) I think that is something we constantly do in the Emergency Department" "* **Ramesh H017, Consultant Emergency Medicine**

B-D14

"at the end of the day (.) if you look at (.) when you're treating someone (.) quality of life will become a major issue today (0.5) previously (.) people would turn around and say (.) you had cancer (.) I've cured you (.) right (.) today (.) for men (.) or people who have rectal cancer (.) we're talking not only about curing them (.) we're talking about what's their sexual function like (.) you know (.) what kind of quality of life (.) are they happy (.) are their bowels working well (0.5) and people are starting to analyse and look at that (0.5) now traditionally (.) a lot of the doctors=the surgeons (.) do you know

(.) we don't like failure (0.5) and if someone tells you (.) or you've cured someone (.) but (0.5) you=you- (.) you've done (.) <u>harm</u>- (.) and I'll give you an example of mine (0.5) I had a lady who was in her eighties (.) frail (.) had a cancer of her colon (.) and I said to her (.) do you know what this means (.) that every once in a while (.) you need some blood (0.5) you're too unfit for an operation (.) I think it would be best (.) we leave it as it is (.) and we see how you get on (1) and every three or four months she would get nervous (.) she would come to me (.) and probably (.) about seven or eight months (.) or a year down the line (.) she presented while (.) I was away (.) one of my colleagues saw her (.) said (.) do you know what (.) you could have an operation (.) you know (.) this is (.) slowly getting bigger (.) we might as well do an operation (0.5) now (.) <u>she</u> was (.) someone who was independent (.) lived in a house (0.5) she had an operation (.) we cured her from her cancer (0.5) but she never went back home again (0.5) she went to a nursing home (1) <u>and</u> (.) she had to be cared for by people around her (0.5) plus she had a permanent bag" **Sunil H016, Consultant General Surgeon**

B-D15

"it always is a concern that (.) you don't do the surgery before its ready to be done (0.5) so for instance (.) the two extremes I mentioned (0.5) if you had the chap who could still enjoy his hiking (.) getting a bit of a pain (.) if he had a hip which got infected (.) it would be to him a <u>total disaster</u> (.) whereas (.) the person who is in agony (.) and they had a hip which got infected (.) you still have help with some pain relief (.) and one of the salvage options for infected hip (.) is to take it out and leave you with a floppy hip (.) which commits you to walking with a frame and son on (0.5) they still have less pain than they started with (.) with the bone-on-bone arthritis (.) so again (.) the concept of infections and complications (.) does make you (.) not rush to offer surgery too soon (.) you know (.) in that it becomes more of a relative disaster (.) if you've got a high level of function (.) less so if you're in agony=obviously it's a disaster (.) in a way to have an infection (.) but you could end up still being better off (.) than if you'd never started the whole process" **Douglas H004, Consultant Orthopaedic Surgeon**

B-D16

"I'll give an example (.) you have gallstones (.) you're someone who is seventy-five (.) that is purely a risk base (0.5) you tell someone (.) you know what (.) you're not the fittest of people (.) you've got gallstones (.) you've had two attacks this year (0.5) numerically (.) I can predict that over the next year (.) there's a fifteen percent chance (.) year on year (.) that you'll have another attack (.) you could have an operation (.) which carries a risk of (0.5) say two percent to your life (.) which of these risks=what do you think about it (0.5) and some patients will be (.) you know what (0.5) I can't cope with the pain (.) and the attack that I had was so bad (.) I want an operation (1) some patients will turn around and say (.) you know what (.) I'm scared (.) I'm happy (.) I'll cope as it is (.) and- (.) <u>however</u> (.) if you have a cancer (.) you tell someone (.) <u>listen</u> (.) your risk of doing nothing (.) the cancer is going to get you (.) when (.) I don't know (.) now at eighty-five you can argue and say (.) there's a twenty-percent chance (.) that year on year (.) you might just drop dead (.) right (0.5) on the other hand (.) do we do something (.) don't we do something (0.5) surgery in you (.) is probably ten-percent risk (.) <u>so</u> (.) what should we do (1) and then you give them some potential outcomes (.) so yes (.) we are assessing the risk of the intervention (.) vis-a-vis the risks of doing nothing (.) the so called background risk that you're referring to" **Sunil H016, Consultant General Surgeon**

B-D17

"to the best of our ability we will have information (.) that's based on trial data and personal performance (.) that we will present (.) to the patient (.) to try and give them the best information available (.) to help them with their decision (0.5) and then we have to try and (.) factor in (.) the patient's response to that information=to try and make a good decision on a case by case basis (0.5) sometimes (.) the risk-benefit balance is so clearly in favour of offering a treatment (.) that we very strongly recommend a treatment (0.5) and where I feel the risk-benefit balance is fine (.) I openly state that to the patient (.) and say (.) <u>their response</u> (.) to that information (.) is going to be a key determinant of what happens (1) so you try and help people make good decisions (.) even when you're giving them very small (.) marginal differences (.)

between doing something and doing nothing- (.) not doing anything for the time being" **Greg H005, Consultant Interventional Radiologist**

B-D18

"I suppose (.) checkpoint (.) is the wisdom of the anaesthetist for individual cases (0.5) if he feels- (.) look (.) this patient just is too frail to survive this surgery (.) they will flag it up (0.5) so there is a limit (0.5) you know (.) we don't do every bone-on-bone patient (.) but just those who are expected to survive (.) and gain a benefit from it" **Douglas H004, Consultant Orthopaedic Surgeon**

B-D19

"In terms of <u>assessing</u> those risks (.) patients with neuro-vascular diseases are discussed at our multidisciplinary meeting (.) with several of my interventional neuroradiology colleagues (.) a neurosurgeon as well (.) and certainly the elective cases that we do (.) are always discussed at the multidisciplinary meeting (0.5) so there's an estimate of risk (.) of the natural history of the disease (.) and estimate of risk of the operation (.) and a probability of success of the operation (.) an estimate of any residual risk from an incomplete operation (.) and all of those factors come into consideration of (.) whether the risk-benefit balance (.) is in favour of offering the patient a procedure (.) or alternatively (.) offering them a period of follow-up and modifying their (.) not- more risk (.) their sort of (.) cardiovascular risk factors (.) and keeping an eye on them" **Greg H005, Consultant Interventional Radiologist**

B-D20

"I've done some anaesthesia myself as part of my training (.) and it's quite sort of (.) it's quite- (0.5) when you're – (.) what's effectively taking the place of a lot of the reflexes=protective reflexes (.) of the patients (.) it's a big responsibility and so- (.) so it's kind of thrilling (.) and also demanding" **Gerry H010, Consultant Paediatric Intensivist**

B-D21

"some of the risks are shared and (.) that you have to say to the patient (.) this is a needle (.) I'm going to stick this needle into=you know (.) into your lung (.) and these are the things that can go wrong (.) and there is a risk that this could=you know (.) you <u>could</u> die from having this done (.) but the reason we're doing it that=are you comfortable with that (0.5) so (.) that's the form of consent=which is sharing the risk (.) so that (.) we'll only do a procedure (.) if we think that there's significant benefit to the patient from undergoing it" **Sarah H003, Consultant Radiologist**

B-D22

"we've become much better at informed choices since we had (.) what we call (.) specialist nurses (.) in clinics with us (.) and they're much better at going through options (.) and treatment choices with the patients than doctors are (.) and often (.) after a consultation with a doctor=and I include myself in that (.) the specialist nurse (.) will go through and just (.) re-iterate (.) and go through the various things with them" **Graham H008, Consultant General Surgeon**

B-D23

"*We have discussions where we say (.) right (.) there's a number of options (.) and all with the patient (.) or the family=there's a number of options (.) this is a preferred option (.) this is potentially a higher risk option (.) this is a null option=or whatever (.) and we would involve the patient=or parents (.) in that decision trio (0.5) I don't think you can just offer them the evidence and say (.) <u>you</u> choose (.) but your role is to (.) inform and advise (0.5) but it's certainly safer=from a medical perspective (.) at some stage (.) to involve other people in that decision-making process (.) because it reduces the fallout later on"* **Olivia H015, Consultant Cardiologist**

B-E. Avoidable problems

B-E1

"the problem of infection is the real albatross in hip surgery (.) because (.) usually it entails a lot of further treatment (.) even the gentlest treatment (.) usually entails going back and washing it out (.) it's another procedure (.) with all the recovery from that (1) worse than that (0.5) are the more seriously entrenched infections (.) where (0.5) you then often have to go back and re-do the whole thing (.) often in two stages (.) and even there (.) there's not a hundred percent success (0.5) so I think it really is a major (.) major (.) set-back (0.5) that you try and minimise the risk (.) but some people (.) sadly (.) are just that little bit more pre-disposed (.) so for instance (.) frail rheumatoid patients are known to have a high risk of infection (.) and sometimes (.) there's no special rhyme or reason" **Douglas H004, Consultant Orthopaedic Surgeon**

B-E2

"the other aspect of safety I suppose (.) are the environment (.) and hospital acquired infection- (.) and (.) again we've- (.) if you look at the recent data on MRSA (.) we've taken huge strides to eliminate a lot of (.) the key (.) hospital acquired infection- (.) and I think we're continuing to make progress on that front (0.5) the next thing is (.) having an operation that goes wrong (.) or a procedure (.) or an intervention that goes wrong=and whilst you can't completely ever eliminate that (.) because things do happen (.) what you can do is minimise it" **Graham H008, Consultant General Surgeon**

B-E3

"the problem with all of these things (.) is that when you get totally insight-less people(.) that's the problem (.) people who think they know everything (.) people who will blame everybody else (.) people who don't have the insight to realise the problem might be with them (.) they are very difficult (.) I'm not sure we have systems in place (.) in surgical training to wheedle these people out (.) and you know (.) you have a not

<u>insignificant</u> (.) level of consultants around the country (.) who are totally insight-less into their own performance and their own shortcomings (0.5) I think most surgeons are slightly reflective (.) and very self-critical (.) and I don't think you have a problem with those people (.) it's the people who aren't that you have a problem with…I think (.) a lot of the other aspects of patient safety and poor performance have been dealt with (.) but what we've not really ever properly tackled is (.) individual consultant (.) surgeon (.) interventional radiologist (.) performance (.) and what cases they do (.) and what their outcomes are (.) I don't think that's ever been addressed" **Graham H008, Consultant General Surgeon**

B-E4

"It's very difficult to actually say that one particular doctor is under-performing (.) because of the way that errors are identified (.) they're quite sporadic (0.5) so that (.) we might <u>not</u> (.) be able to say that one particular doctor is poor (0.5) they've all gone through a training package (.) and we know from national data (.) that it's very difficult to point a finger at one person and say (.) you're not very good (.) we don't want to employ you anymore (0.5) because (.) you can't use statistics to show (.) that because everybody makes mistakes (.) your error rate (.) may not be outside the normal ranges" **Sarah H003, Consultant Radiologist**

B-E5

"the case experience you need (.) to demonstrate (.) with any power (.) the difference between one operator or another=when they're doing forty procedures a year (.) makes it very (.) very difficult (.) for any centre to say (.) my operator is better than your operator (.) because the case load isn't big enough" **Greg H005, Consultant Interventional Radiologist**

B-E6

"the difficulty with outcome measures (.) certainly=I mean if you've got a relatively homogenous population (.) without a lot of confounding things (.) then=then they're very effective (0.5) the problem with any kind of outcome data (.) is that people always argue that their population is a special case (.) I have a lot sympathies with that (.)

because I'm a geriatrician (.) and all of our patients have multiple conditions and multiple co morbidities (.) and I think that case mix adjustment (.) is quite a difficult thing in that situation" **David H012, Consultant Physician**

B-E7

"the whole process (.) about what you would do if you had a colleague (.) who was (.) very clearly (.) <u>woefully</u> under-performing (.) is difficult (0.5) the whole culture (.) unfortunately (.) has been that (.) if you stick your head above the parapet and raise an issue (.) it doesn't often- (.) it often backfires on you (.) and you don't get- (0.5) things don't get properly looked at (0.5) nobody wants to know there's a problem really (.) is the bottom line" **Graham H008, Consultant General Surgeon**

B-E8

"the majority of care=and in terms of surgery (.) is delivered during hours (.) in what we call an elective setting (.) and the number of times that things go wrong badly in that elective environment (.) is quite small actually=surprisingly small (.) whereas (.) the emergency situation (.) which is non-elective (.) in other words unpredictable (.) and precipitated by deterioration in the patient's condition (.) where you've had to set up an out of hours list (.) or an emergency intervention of some kind (0.5) that's much more prone to error (.) and there are things that drive that (.) there's the fact that (.) the patient's condition is unstable anyway=which is a higher risk situation (.)there's the- (.) the sort of need to do things quickly (.) which some people are good at (.) and some people are less good at (.) and the omission therefore (.) of critical steps in various tasks (0.5) and then there is the situation of timing (0.5) and when things occur in the middle of the night (.) it doesn't matter=you know (.) what industry you're talking about (.) there's more errors occur at four o'clock in the morning (.) than four o'clock in the afternoon" **Gerry H010, Consultant Paediatric Intensivist**

B-E9

"there will always be errors of professional judgement which (.) you know (.) sometimes are- (.) sometimes you make an error (.) and its actually quite a bad error

(.) it's you know it's a- (.) a negligent error (.) but it but it can be done in good faith"
David H012, Consultant Physician

B-E10

"I initially was thinking of (.) mistakes and preventable harm (.) but (.) you know (.) when you think about (.) the preventable harm by seeing an inexpert doctor who- (.) or doctor who's on a bad day=you know (.) a bit like a footballer on a bad day (.) it's actually those kind of skills we do (.) they're not all logical (.) they're not all consciously logical skills (0.5) some of them are to do with clinical acumen (.) and were you observant enough for noticing this and that (.) and you notice some things=as an experienced doctor (.) sub-consciously (.) so are you- (.) are you hung-over (.) or are you (.) you know (.) are you up to speed (.) are you exhausted (.) or are you fresh and- (.) are you enjoying the clinic (.) or is it getting you down because you've got too many people waiting (.) so- (0.5) and you know (.) sometimes you can have a bad day (.) whatever job you're in (.) but- (0.5) and that can then have a consequence on the quality of care" **Martin H007, Consultant Neurologist**

B-E11

"somebody needs to do something about it (.) because if you just get a whole lot of crude data (.) and just publicise it (.) it can be <u>extremely misleading</u> (.) and also (.) almost fear invoking within the population (.) so you have a population of people= who rely on your local unit to look after your- (.) =their children=or look after relatives (.) or whatever (0.5) and someone somewhere (.) is publishing something that you know is misrepresentative (.) but actually paints you in a bad light (.) just because it's not been properly reviewed (.) and sorted out (.) it's just sort of (.) there you go (.) that's the data (.) without any- (.) taking any account of the sort of service you run (.) the demographics of the population you serve (.) then that can lead to lack of confidence in your service (.) and that can quickly (.) sort of run away with itself (.) and <u>suddenly</u> (.) you can look as though you're a failing service (.) when actually it's not the case at all" **Christopher H011, Consultant Paediatrician**

B-E12

"I mean the problem with outcome data is (.) how complex the patient was in the first place (.) taking a- (.) for example=taking a kidney cancer out of a slim young patient (.) with a small lump and a normal anatomy (.) is one level of complexity (0.5) and taking a large lump out of a very fat patient (.) with abnormal anatomy before you start=who happens to have diabetes (.) and heart disease (.) is a completely different level of complexity (0.5) <u>now</u> (.) if you were going to say (.) simply compare the outcome (.) from one of those nephrectomies from the outcome of the other (.) <u>that's nonsense</u> (.) and it allows people to say (.) <u>well</u> (.) I'm not going to do those difficult cases (.) because it will make my outcome data look bad" **Richard H009, Consultant Urologist**

B-E13

"So the best outcome indicator is death=if somebody dies (.) it's a good outcome indicator (.) <u>unfortunately</u> (.) it's also a <u>dreadful</u> outcome indicator (.) because it's- (.) so many processes influence death (0.5) so if you were then to look at- (.) okay (.) fine=let's bring it down to something specific (.) and say (.) death from a heart attack (.) or say (.) death from sepsis (.) or (.) death in people above the age of eighty-five (.) who do not have a DNR CPR order (.) so (.) once you start making it much more specific (.) I think it makes more sense as an outcome indicator (.) in terms of an indicator that I can actually act on to improve (0.5) than (.) this is my mortality rate (.) <u>improve it</u> (0.5) <u>yeah</u> (.) I'll just stop people from coming into hospital (.) <u>or</u> (.) I'll move them out before they die (.) and <u>guess what</u> (0.5) my mortality rate ratio will improve=you know it's just a silly way of looking at it" **Ramesh H017, Consultant Emergency Medicine**

B-E14

"the challenge is competing priorities (.) how many projects can you do like this in a complex system such as ours (.) and still expect each one of them to be delivering the benefits (.) because there's no point in saying (.) I want to improve sepsis mortality by twenty percent in six months (.) because might that mean (.) my chest pain management worsens in six months (.) and it is that balance that (.) I think is the real

challenge (.) and that balance is a real challenge because my resources are finite"
Ramesh H017, Consultant Emergency Medicine

B-E15

"It's difficult (.) because we measure= certainly historically (.) the healthcare system (.) measures (.) the things that are <u>easy</u> to measure (.) not the things that <u>actually</u> matter (.) our specialities have been subject to being measured with all sorts of things (.) that are completely meaningless (0.5) it's quite easy to measure mortality in our speciality (.) because people die (.) more of our patients die perhaps (.) than a lot of specialities (.) because if your heart stops (.) you're a bit stuffed really (0.5) that's a very crude indicator (.) but it's very easy to measure=it's very black and white (.) dead (.) or not dead (.) and it's easy to capture nationally as well (.) so that's easy (0.5) a lot of other safety aspects are harder to capture (.) unless you have proper data systems (.) and that requires massive investment (0.5) we don't have a black box data recorder= or two (.) or three (.) or a voice recorder (.) <u>nothing</u> (0.5) to capture everything properly (0.5) you'd have to have this enormous audio-visual monitoring (.) I mean talk about Big Brother (.) and the data stream from that would just be vast" **Olivia H015, Consultant Cardiologist**

B-E16

"the problem that's always been felt (.) within the health service= which really does set it apart from a lot of other businesses (0.5) is the metrics (0.5) what do you measure (.) what do you measure to decide whether I've done a good job (.) or a not so good job (0.5) for an anaesthetist (.) it's pretty difficult=even if you were to do it for surgery (.) it's <u>really difficult</u> (.) you know=<u>really=really awkward</u> (.) something which actually will be objective (.) and everyone will say (.) yes (.) we can see there's a difference between doctor 'A' and doctor 'B' in that service (.) will be very difficult indeed (.) and for surgery (.) you might get there (.) but with all the case mix (.) and the other co-morbidities (.) and difference=you know (.) there will always be a significant proportion of staff who would doubt the information (.) or (.) particularly if it's <u>bad information</u>= we tend not to doubt information if it's good information (.) which is acceptable (.) and

in fact (…) as a hospital we do it all the time (.) I mean we try and stop it (.) whenever we get a bad report we explain it rather than- (.) as you say this is a bad result (.) let's <u>do</u> something (.) we always start off by <u>explaining</u> a bad result (.) and- (.) and actually applauding the good ones (.) we never try and explain the good ones and say (.) well this an error because=you know (.) we code differently from everyone else (0.5) but whenever it's a bad result we say (.) well this is an error because we code people in a certain way (0.5) the amount of times we use the coding argument is enormous=and I'm sure others would do the same (.) and that's the problem (.) because when are you going to get to the point (.) where you're really sure that you can say hospital 'A' (.) or doctor 'A' is better than hospital 'B' (.) or doctor B (0.5) it's difficult" **Adrian H006, Consultant Anaesthetist / Clinical Director**

B-E17

"*at the end of the day (.) a lot of us today with research would say (.) hang on (.) give us the data (.) why <u>should</u> I change (.) what are you trying to just say (.) and that becomes very difficult (0.5) I give a couple of lectures for (.) looking at the use of energy in surgery (.) now it's very difficult to sit down and find differences (.) where the times you caused injury are very=very small (.) but they do occur (0.5) now to sit and show the difference between intervention 'A' (.) 'B' (.) and 'C' (.) might be practically impossible"* **Sunil H016, Consultant General Surgeon**

B-E18

"I don't want to sound very extremist by saying that (.) surely you know there is (.) lies (.) damn lies (.) and statistics (.) of data (0.5) you put in rubbish (.) you get out rubbish (0.5) data can be manipulated the way you want it to look (.) so a lot of it is (.) I wouldn't say all of it is a bureaucratic exercise (.) some of the things are quite good actually (.) but some of it is definitely bureaucratic (.) some of it is basically justifying some people's roles (.) they've been employed to do something (.) so they need to produce something (.) they need to justify their existence many times (0.5) and that's why all that happens" **Kumar H018, Consultant Orthopaedic Surgeon**

B-E19

"then there is the kind of thing that happens through- (.) out of laziness=or you know (.) tiredness (.) or can't be bothered=ok (.) now that's also something (.) in which the aim isn't to do harm but the practice is so poor that it is actually (.) so people can't be bothered to look through their blood results (.) or consultants end up with a huge pile of un-reviewed notes from discharged patients (.) with outstanding laboratory tests (.) that haven't been reviewed (.) or if a junior doctor just can't be bothered to handover=yes (0.5) there may be (.) other factors that may be relevant (.) in terms of working conditions (.) workload (.) stress (.) training and things like that" **David H012, Consultant Physician**

B-F. Bureaucratic output

B-F1

"Most of the time the organisation put diktats on people without providing the resources (.) they say you've got to do (.) this (.) and <u>they know</u> (.) if their organisation says it=and they don't do it (.) their salary gets affected=their promotion gets affected (.) something will go wrong (0.5) so they take their eye off their main work (.) and do all the bureaucratic work more (0.5) that is happening in <u>our</u> hospital (.) as soon as I start the operation (.) the staff start filling out paperwork and I'm saying (.) <u>excuse me</u> (.) can someone check the patient (.) they're doing paperwork=I'm thinking (.) forget <u>that</u> (.) do <u>this</u> (.) but that is more important to them (.) because that is going to affect their promotion (.) or whatever. **Kumar H018, Consultant Orthopaedic Surgeon**

B-F2

"you can compare it with what happens in private healthcare (0.5) so in private healthcare=of course it's on a smaller scale (.) but I suspect that the number of patient safety issues that occur in private healthcare is much smaller (0.5) and there's a pretty obvious difference between private healthcare and NHS healthcare (.) which is that (.) it's genuinely run by (.) and delivered by (.) consultants (0.5) and the number of

administrative staff that are involved is (.) extremely small (.) because they're expensive and they don't contribute" **Richard H009, Consultant Urologist**

B-F3

"for example (.) one of the things which I find most frightening (.) about the way we practice (.) is that (.) there is no robust mechanism (.) to make sure that things get followed up properly (.) so if I don't pay my electricity bill after a week (.) I get a snotty letter (.) and then after another week (.) I get one in red saying (.) we're going to cut your electricity off (.) it's not that somebody will just (.) not notice (.) that I haven't paid it (0.5) whereas if I order a CT scan from somebody (.) and either the request goes astray (.) or the CT scan doesn't get done=or the result doesn't come back to me (.) there's nothing that say's=you know (.) <u>you said</u> you were going to do this CT scan on this bloke (.) well it hasn't been done (.) and its now two months down the line=or two weeks down the line (.) what are you going to do about it (0.5) you know chase it up (.) it's very (.) you know- (.) a lot of our systems involve- (.) so I rely on the fact (.) that the CT report will come across my desk (.) and I'll go <u>blimey</u> (.) I didn't know <u>that</u> (.) I better go and see him urgently (.) and you know (.) if it doesn't come because it was ordered some time ago (.) and because I've seen lots and lots of patients (.) I may remember it (.) but I may not=you know" **Andrew H002, Consultant Vascular Surgeon**

B-F4

"so (.) the WHO checklist for surgical safety was brought in (.) because this is what they do in aviation (.) and it seems to be a great thing=and it makes surgical procedure safer (.) and that may (.) or may not be true actually (.) because the medical research that it's based on (.) is extremely sketchy (.) but one of the things which is supposed to happen at the end of the checklist is (.) were there any problems (.) how do we respond to them (.) and how do we make sure it stops happening again (.) and I'm <u>absolutely certain</u> (.) that that's almost never completed (.) and almost never actioned (.) because if you try to action it=I suspect all people's experience will be (.) well nothing ever happens (.) so if you say (.) the instruments today=the scissors were blunt (.) and the correct (.) whatever (.) widget that that I normally use (.) wasn't there (.) so I had to use something else (.) and I think that's an issue (.) and the action will be (.) <u>well</u> (.) we

better get them (.) and if we haven't got them (.) how do we get them (.) and should we be doing another one of these procedures if we haven't got the correct kit (.) is it that important (.) and the individual might say (.) <u>yes</u> (.) it is that important (.) and I can tell you that (.) the next time one of those cases comes in (.) <u>that</u> will not have been corrected (.) and the same process will happen again and again" **Richard H009, Consultant Urologist**

B-F5

"there were areas of resistance (.) and with all sorts of reasons why it wouldn't work (.) and even suggestions that- (.) well we don't like this checklist (.) we'll use this one=you know (.) and the checklist- =I even had emails on there ((gestures to computer screen)) from very- (.) very senior consultants (.) saying this checklist makes surgery <u>more</u> dangerous (.) I didn't actually follow the explanation (.) but=you know (.) those are the sorts of difficulties we have- (.) but now (.) and we are now (.) are we two years into it now=I don't know (.) I lose track of time (.) but we're one or two years into it (.) and it is the way we do things now=and that's=that's- (.) that's the sort of process which has been quite difficult" **Adrian H006, Clinical Director**

B-F6

"if you were- (.) say you work in electrics and I was the boss (.) I would have a rough idea of basically what your job was (.) and you couldn't say (.) you don't know what you're talking about (0.5) but if I'm telling an orthopaedic surgeon that (.) I want to change the way they work (.) he can say (.) well what do you know about orthopaedic surgery (.) and I'll say (.) absolutely nothing...we haven't got the autocratic opportunity (.) to tell people what to do=because we're not sure always (.) that what we want to do (.) is necessarily the right thing (.) we <u>think</u> it is (.) but <u>actually</u> (.) we're telling people that may know more about the subject than we do (0.5) because of that extreme situation we're in (.) it's very difficult for the chief exec to go and tell a bunch of say (.) orthopaedic surgeons (.) this is what you're going to do (.) because the consequences (.) at the first complication we have=first patient event (.) first death or something (.) may well be associated with that decision (.) to reduce their autonomous opportunity for them to decide (.) what's best for the patient (.) that's as sure as eggs

are eggs (.) and that's why the chief executive will be quite reluctant in some ways (.) to do it without their agreement=with their agreement its fine (.) without their agreement (.) it's very difficult" **Adrian H006, Clinical Director**

B-F7

"there's also a resistance to leadership I think=you know (.) there is a natural resistance (.) which tends to come out to play quite often (.) but=but- (.) I mean- (.) I think we do probably better here than many hospitals in that respect (.) but it's still a challenge for us (.) and that's why (.) if we had a new build and recruited=you know (.) people with an idea of (.) this is what you'll do- (.) and making consultants employee's=which is not really their status at the moment=I don't think (.) I mean I could be wrong (.) but when I was a consultant (.) I never regarded myself as just an employee (.) it was a different status to that" **Adrian H006, Clinical Director**

B-F8

"we have senior managers (.) of which I am one of them=okay (.) and if I was a senior manager in John Lewis (.) and I wanted you to do something=you would do it=okay (.) you would have to have a <u>very good</u> reason (.) as someone who is perhaps less senior to me (.) to say (.) no I don't want to do it (.) I say (.) well tomorrow you're going to do it this way (.) because I think it's better (.) you'll say yes sir I'll go and do it that way (.) and we're unlikely to have a discussion…because what I want is profit (.) and the way to get profit is good customer satisfaction (0.5) and that's how John Lewis works (.) in the health service (.) you have a great idea (.) but I can't say (.) we're going to do it on Monday (.) because I have six hundred consultants=okay (.) and, a similar number of senior nurses (.) but it's the consultant body that is particularly, challenging…I wish I could run round to people and say (.) we're going to start this on Monday=because there's no doubt there are things that we want to do (.) and as in any business (.) there are areas of excellence here (.) and areas where old systems still pertain" **Adrian H006, Clinical Director**

B-F9

"*some bureaucracy is required (.) as long as it is tried and tested (.) and reviewed (.) and it's not a diktat which just- (.) I'm wearing a short-sleeved shirt (.) because <u>somebody</u> decided that (.) if you wear a full-sleeved shirt the infection rate goes up (.) whereas (.) if you go anywhere in the entire world (.) all doctors wear full-sleeved (.) white coats except England (.) where they think having a full-sleeved anything increases infection (.) you wear a tie (.) you increase infection (0.5) whereas in the entire world (.) that is <u>not</u> the case (.) we do it because (.) somebody decided that's how it's going to be (.) so we've given up our ties (.) given up our full-sleeved shirts=I've got hundreds of full-sleeved shirts in my house (.) I can't wear them to work (.) I have loads of ties (.) but then suddenly (.) three years ago (.) ties became infection"*

Kumar H018, Consultant Orthopaedic Surgeon

B-F10

"It's difficult (.) and I think that people (.) tend to blame management for pressures (0.5) and everyone looks back (.) to kind of golden age (.) when there were more nurses (.) and the doctors wore ties=and nurses had little hats and things like that (.) but- (.) so there's undoubtedly-(.) I mean I think- (.) you've got to manage things (.) and run things (.) and sometimes just leaving it to the professionals isn't good enough (.) because (.) there are certainly examples of cases (.) where actually leaving it to the professionals has ended up (.) sort of (.) establishing quite poor patterns of care (.) but I think if management is focused on the wrong outcomes (.) and the wrong targets that's- (.) that's dangerous **David H012, Consultant Physician**

B-F11

"I'm sure it's about commercial pressures (.) and (.) it's about whether or not the people who are responsible for the provision of the equipment=for example (.) are actually taking the views of the people using the equipment seriously (.) and act upon them (0.5) but in the end (.) I can tell you (.) that in all medical cultures (.) if you continue to complain and nothing gets done (.) you stop complaining (.) I'm sure you know that" **Richard H009, Consultant Urologist**

B-F12

"It's a balance isn't it (.) it's evidence and the bureaucracy (.) if you had such good strong evidence about (.) one particular action (0.5) was going to (.) improve safety in some way=but involved a level of bureaucracy that (.) in another situation (.) might not have been acceptable (.) you'd probably be obliged to actually do it (.) whereas (0.5) if there's something where the evidence is very weak (0.5) but there's hardly any bureaucracy involved (.) you might just take that on board anyway" **Charles H019, Consultant Orthopaedic Surgeon**

B-F13

"they're all fantastic people=or they're all very skilled people (.) and they've all got their patient's interest at heart (.) but they're six hundred autonomous=very senior people (.) who don't see me as someone who can tell them what to do (0.5) and quite clearly (.) I <u>can't</u> tell them what to do (.) because I can't do a hip (.) and I can't treat someone with Parkinson's (.) a stroke (.) or whatever (0.5) and even if they were in my specialty they'd feel they know more about it than I do (.) so it's not like a business (0.5) so you need to change the culture by other means because=and you'll always have people who will resist (.) whatever- (.) so the way we do it here is (.) to actually make sure (.) that we have clinical champions within the consultant body (.) those people who are a bit more progressive (.) that will be interested in change for the benefit of the patient (.) and- (.) and are not likely to say no (.) just because they can" **Adrian H006, Clinical Director**

B-F14

"I like to think of myself as someone who's prepared to discuss (.) and negotiate and (.) sort of- (.) I don't think compromise is the right word (.) but who is able to (.) sort of explain where we are (.) from a clinical point of view (0.5) and also prepared to understand where (.) from a managerial point of view=or a business point of view (.) we are where we sit (.) as well (0.5) and then (.) we have to try and work through (.) how we keep the show on the road=if you like (.) but my role (.) as a clinician (.) is to ensure that clinical quality (.) and safety (.) is maintained at all times (0.5) and the managers role (.) is to ensure that budgets are met (.) and targets are

maintained=and this sort of thing (.) and that's perfectly understandable (.) that's perfectly reasonable (.) as I say (.) sometimes it makes for some robust discussions (.) but I don't think any of us feel that (.) that's a problem (.) it's just the nature of the job (.) I mean the days of when clinicians could have whatever they wanted (.) have gone (.) and that's not a bad thing=it would be nice to have more resources (.) but we are where we are (.) we just have to make sure that we manage to keep the standards (.) and the safety and quality (.) as high as expectations want us to keep it" **Christopher H011, Consultant Paediatrician**

B-F15

"what used to happen (.) is people had <u>very good</u> secretaries (.) and they used to just do it all=and know everything=and run it <u>all</u> (.) and that's sort of been taken away now (0.5) and probably- (.) I mean the IT is pretty clunky=I mean it's there now (.) but it's=you know (.) it's still quite hard work to request an x-ray (.) or look up the result or=you know- (0.5) the systems are- (.) if you'd bought a program like that you'd send it back (.) you know what I mean (.) and say (.) <u>this is rubbish</u> (.) whereas you have to=you know- (.) I mean I think they are gradually coming along (.) and I'm sure in ten years-time they'll be a whole lot better (.) but you know (.) I think we're lagging behind on that side of things" **Andrew H002, Consultant Vascular Surgeon**

B-F16

"there are certain things that are introduced like (.) the WHO checklist (.) and so on=which come from on-high=and hit the whole of surgery (.) and are of varying use (.) and vary in utility really (0.5) if you work with the same theatre team (.) day in (.) day out (.) introducing yourselves at the beginning of an operating theatre list (.) is relatively pointless (.) you all know who you are=you've worked with them for five years (.) but then of course (.) if you dilute it down (.) and only do the relevant bits (.) you run the risk that you actually miss out the critical bit (.) so I think introducing a checklist=where certain things are checked (.) is entirely sensible (.) and things like that are usefully done from a Trust Board level really=you know (.) <u>you will</u> (.) do this (.) and <u>you will</u> check this every time a patient comes into theatre (.) and before your operating list (.) <u>you will</u> (.) have a team briefing (.) and will discuss the order of the

list=and who's not turned up today (.) and this sort of thing (0.5) so I think there's no doubt that=that has a lot of sense to it (.) and we've all gone along with it (.) and it seems entirely reasonable" **Tim H013, Consultant General Surgeon**

B-F17

"you've heard of the WHO Checklist have you (0.5) I'm not sure whether the WHO Checklist really works (.) and I'll tell you why in a minute=I don't think it's the WHO Checklist necessarily (.) but the fact that <u>you have</u> a WHO Checklist (.) it just focuses minds (.) and gets everyone thinking together momentarily (.) to make sure everything is right (.) so I think <u>that</u> (.) being introduced over the past few years (.) has helped remind us=from my environment which is a surgical environment in an operating theatre (.) to help remind us about safety" **Charles H019, Consultant Orthopaedic Surgeon**

B-F18

"I have to say that (.) I think a lot of hospitals (.) long before that had their own form of checklist (.) but it was clear that a number of hospitals weren't doing that type of check at all (.) so the WHO checklist has now become a universally applied thing"
Miles H020, Consultant General Surgeon

B-F19

"the previous chief executive=and his executive team (.) were very focused on (.) what was the plan to obtain (.) foundation status (.) which meant (.) balancing books (.) and on top of all the austerity that's coming down from the government (.) they wanted to be even more stringent (.) to make sure they got this foundation status (.) and whilst they created an environment (.) for the doctors (.) and the nurse managers (.) which was very finance focused (.) unfortunately=sort of shades a bit of (.) Mid-Staffs (.) only nothing like as bad (.) because we didn't have the problems with excess mortality (.) and that took us away=it actually distracted us a bit (.) from more important concerns about care quality" **Gerry H010, Consultant Paediatric Intensivist**

Appendix C

Rough Interview Guide

The following questions relate to your professional role. I'd like you to answer using lay terminology where possible.

Switch on recorder

Q) Can you describe what safety means, and what its main attributes are? – Follow up on attributes

Safety - general opening prompts

What are the main threats to safety?

What is the purpose of safety?

Who is responsible for safety?

Risk

Can you describe your own understanding or involvement with risk?

What is your understanding about the level of risk and the point at which something becomes a safety concern?

Agency

How much individual control or personal influence do you have over safety?

To what extent are you able to control the hazards and threats within your area?

Are you able to easily predict the presence of potential hazards or other threats?

Do you have any power or control over safety policy, safety procedures or working practices?

Error

Why do things sometimes go wrong?

To what extent does your interaction with other people or equipment create problems for safety?

How do errors occur?

How do you prevent errors?

Accountability and performance

What is the relationship between performance, accountability and safety?

> **(Pilots)** How are you personally accountable for safety?
>
> **(Medics)** How accountable are you personally for the safety of your patients, and how is that accountability measured?
>
> > **(Medics)** What are the consequences for clinicians when a patient is harmed as a result of their hospital stay?

Systemic issues

Can you say something about the sorts of systems within your organisation that relate to safety?

> **(Medics)** Why do patients get harmed in hospital?
>
> **(Pilots)** Why do air accidents occur?

What environmental factors influence safety?

Are there any other factors that could weaken safety?

Production pressures

How are operational objectives or production goals kept in balance with safety?

What is the relationship between safety and workload, either individual workload or the workload across the whole organisation?

What is the managers' relationship to safety?

Surveillance

How do you know if things are going wrong?

Is checking or monitoring an essential aspect of safety?

Reliability

Can you talk about any methods or processes that you follow that have been produced to enhance safety?

Final Prompts

Is there anything else you want to tell me that we haven't talked about might be relevant?

When the Interview has concluded

Express thanks

Switch off recorder

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