Risk mitigation and culture: an examination of the utility of cultural cognition theory in determining operational security cultures in a healthcare environment

Melvyn Griffiths
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Risk Mitigation and Culture:
An examination of the utility of Cultural Cognition Theory in determining operational security cultures in a healthcare environment

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ABSTRACT

People tend to see danger and risk in different ways depending on their experiences, attitudes and beliefs (Douglas, 1992; Kahan, 2008; Slovic, 1992). In order to develop effective risk mitigation strategies, an approach that can successfully manage competing worldviews is needed. Hospitals provide a challenging setting for security due to the contrast between the open nature of the environment and the need for appropriate entry and access control measures. This study assessed the utility of the Cultural Cognition methodology in a security risk context by measuring competing worldviews and risk perceptions between various cohorts in a healthcare environment. Cultural Cognition provides a methodology for finding out how people perceive risks, and offers an explanatory framework that may increase the effectiveness of risk communication and security risk management (Kahan, 2008).

This study measured the cultural worldviews and security risk perceptions of three cohorts, being Doctors, Nurses and Patient Care Assistants (PCA’s) from three hospital Wards with different access control requirements. The collected data were analysed for statistically significant differences and measured onto spatial maps using the Cultural Cognition grid/group typology. The results demonstrated that, for all cohorts, there was a significant correlation between cultural worldviews and perceptions of entry and access control risk, and that the cohorts had selected their risk perceptions according to their cultural adherence. Organisational and social stratifications were demonstrated to have an impact on both cultural worldviews and security risk perceptions. The different cohorts were also found to have formed dominant worldviews within their self defined reference groups.

This study demonstrated that cultural risk worldviews correlate with security risk perceptions. Therefore, an integration of Cultural Cognition into the risk management process would improve risk communication and employee participation in the security effort, and reduce security decay. Successful application of the Cultural Cognition methodology within a security risk management context would allow for a cross-cultural risk consensus to be achieved among disparate cultural groups, providing risk mitigation strategies with more widespread support from the participants in the security effort.
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Signed.

... 6/9/2010
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CHAPTER 1
INTRODUCTION

"Most of the mistakes in thinking are inadequacies of perception rather than mistakes of logic."

- EDWARD DE BONO

1.1 Introduction

People tend to see danger and risk in different ways depending on their experiences, attitudes, and beliefs (Douglas, 1992; Kahan, 2008; Slovic, 1992). Risk mitigation strategies are often rendered less effective as a result of disagreement between cultural groups as to what constitutes a risk and whether there is any value in the mitigation strategies employed. In order to develop effective risk mitigation strategies, an approach that can successfully manage competing worldviews is needed. Security risk is an area where these varied perceptions of threat and risk can dramatically influence the effectiveness and outcome of risk mitigation strategies. A poor understanding of the risk biases within organisational cultures in the initial stages of risk management may lead to poor participation in the security effort, and inevitably to decay in the effectiveness of security practices. This first chapter offers some contextual background to the study, as well as detailing its significance and purpose. The significance of the concepts of security and risk are discussed, especially in regard to security in the hospital setting and to various theories of risk perception. The study’s research question and outcomes are also discussed, and an overview of the method of the study is presented.

1.2 Background to the Study

This study was concerned with security and risk in a public setting. In this context, security may be defined as a predictable environment that is “without disruption or harm and without fear of disturbance or injury” (Fischer & Green, 2004, p. 21). According to Aldridge (2005, p. 1), hospitals are reluctant participants in security due to the necessarily ‘open’ nature of these albeit restricted public spaces. The dichotomous open/restricted nature of public hospitals makes these facilities particularly susceptible to a variety of vulnerabilities. Risk perception cultures which may be reluctant to participate fully in the security effort (Mars & Frosdick, 1997, p. 118) create security problems, and the “protection level of a medical care facility is directly related to the extent to which employees participate in the security effort” (Colling, 2001, p. 347).
Strategies for mitigating these risks include the control of the entry and access of staff and visitors to different areas of the hospital environment. Such strategies are reliant on three elements – technology, procedure and culture. Entry control refers to the technological element, or the “physical equipment used to control the movement of people or material” (Garcia, 2008, p. 187), such as identification badges, biometric systems, and locks (Garcia, 2008, pp. 188-214). Access control refers to the procedural element and the use of databases or records to determine who may have access to which areas at what times (Garcia, 2008, p. 187).

One of the more difficult aspects of implementing risk mitigation strategies in any environment is gaining an understanding of the organisational cultures as part of the establishment of the context. Organisations come in many shapes and sizes, but are typically complex systems that are made more so by the risk perceptions and cultural worldviews of their participants. Hospitals provide a challenging setting for security due to the contrast between the necessarily open nature of the environment and the need for appropriate entry and access control measures.

Security of the hospital environment has become focussed on staff safety and physical assault, as studies have shown that violence in hospitals is both underreported (Luck, Jackson, & Usher, 2008), and occurring more frequently (Benveniste, Hibbert, & Runciman, 2005; Chapman & Styles, 2006; Kennedy, 2005; Sands, 2007). Although much of the research into hospital security has been focused on staff safety and physical assault, the more fundamental issues of organisational culture and risk perceptions have not received the same attention.

1.2.1 Risk

The importance and complexity of risk management cannot be understated. The terms ‘risk assessment’ and ‘risk management’ hold different connotations for different groups (Garrick, 1997, p. 327), but regardless of the approach, the central objective of these processes is to “reach optimal decisions regarding risks” (Molak, 1997, p. 423). Research into the perception of risk has generally followed one of two schools of thought. The first is called the psychometric theory of risk, and is a psychological approach to risk perception pioneered by researchers such as Starr (1969) and Slovic

The psychometric paradigm has demonstrated that the way risks are perceived is largely a product of individual psychology, whereas the Cultural Theory of risk identifies socially defined cultural biases, or worldviews, as the source of differences in risk perceptions. However, a relatively new approach called Cultural Cognition has shown that the psychological mechanisms that people use to make judgments on their risk perceptions are inextricably linked with the cultural worldview that they hold. Cultural Cognition recognises that “social and psychological processes interact with cultural ways of life, generating individual differences in risk perception between people who subscribe to competing worldviews” (Kahan, 2008, p. 10).

The Cultural Cognition approach not only provides a methodology for finding out how people perceive risks, but also offers an explanatory framework that may provide solutions to the conflict and poor risk decision-making produced by competing worldviews, as well as increasing the effectiveness of risk communication and risk management strategies (Kahan, 2008). In order to establish a cooperative approach to risk mitigation within an organisation, the communication of risk must not only include “all messages and interactions that bear on risk decisions” (National Research Council, 1989, p. 22), but also messages concerning individual ideas and perceptions about risks.

1.3 Significance of the Study

For risk mitigation strategies to be effective, they must have the support of all participants in the security effort. The degree of participant commitment to mitigation strategies is influenced by how the risks are perceived and may affect the performance of security measures. There is therefore a need for a greater understanding of the impact that the risk perceptions of individuals have on security risk mitigation strategies and the role that cultural groups play in biasing risk judgments. Kahan, Braman, Slovic, and Gastil (2006) allude to the potential benefits of the integration of the Cultural Cognition methodology into risk management strategies, stating that such an approach would provide numerous risk communication insights and would identify “myriad new strategies for managing… impressions…of what risks are real and what risk-mitigation strategies are effective” (pp. 3-4).
However, efforts to apply the mechanisms of Cultural Cognition in a security risk context is lacking in the field of risk perception research, as are investigations into the potential utility of the theory to risk management. Studies involving the Cultural Cognition methodology have largely focused on public perceptions of risk on topical issues and emerging technologies (Kahan, Braman, Cohen, Slovic, & Gastil, 2008; Kahan, Braman, Gastil, Slovic, & Mertz, 2007; Kahan, Slovic, Braman, Gastil, & Cohen, 2007) and the theory’s implications to judicial cognition (Kahan, 2009; Kahan & Braman, 2005; Kahan, Hoffman, & Braman, 2009). A robust theoretical model describing how cultural ways of life contribute to the decay of security risk mitigation strategies would provide an important tool in creating more effective security risk management strategies.

There are several security risk management issues that are impacted by cultural bias that may directly benefit from the application of the Cultural Cognition methodology, including the decay of security through poor employee participation, the continuing effect of cultural bias on further risk mitigation strategies, and the difficulties associated with communicating a risk message to disparate cultural groups. Successful application of the Cultural Cognition methodology within a security risk management context may aid the development of risk communication strategies that will allow for a cross-cultural risk consensus to be achieved among disparate cultural groups, thereby allowing risk mitigation strategies to receive more widespread support from the participants in the security effort.

1.4 Purpose of the Study

The purpose of the study was to assess the utility of the Cultural Cognition methodology in a security risk context by measuring competing worldviews and risk perceptions towards entry and access control measures between various cohorts in a healthcare environment. This assessment was achieved by measuring the cultural biases of various cohorts within the environment and determining to what extent cultural worldviews correlated with perceptions of entry and access control risk.

The outcome of the study was to demonstrate:

- Whether the Cultural Cognition methodology is a valid and reliable tool for empirically testing the cultural theory of risk in a security context;
The relationship between risk perceptions of entry and access control and cultural biases within a healthcare environment;

Whether, in the context of the study, the findings justify further research into using Cultural Cognition for the measurement of security risk perceptions and security decay.

1.5 Research Question

Gaining an understanding of the organisational culture as part of the establishment of the context is an essential first step in any risk management process. The research question was developed to ascertain whether the diverse risk perceptions and culturally biased worldviews of security participants influence the efficacy of risk mitigation strategies and ultimately the outcome of the security effort. Therefore the research question addressed by this study was:

- Do cultural risk worldviews correlate with perceptions of entry and access control risk proposed by Cultural Cognition?

The study proposed that if the cultural risk worldviews as defined by Kahan (2008, p. 4) correlated with perceptions of entry and access control risk proposed by Cultural Cognition, then this would indicate that the identification of cultural groups within an organisation could assist in determining the potential for security decay, as well as helping to identify more effective risk management strategies.

1.6 Overview of the Methods of Study

The study utilised various methods to achieve the outcomes, including conducting a pilot study to determine the suitability of the methodology and survey instrument. The theory of Cultural Cognition, which utilises spatial mapping of data much like the psychometric paradigm, was employed as the theoretical framework for the study. The data obtained from the responses to the survey instrument (see Appendix A) were mapped onto spatial representations of the two scale grid/group typology of Cultural Cognition. Statistical tests were used to determine correlations in the data and the reliability and validity of the survey instrument. The methodology for the study was developed into a conceptual map (Figure 1.1), which details the methodology used to address the research question.
### CHAPTER 3
**Theory Supporting the Study**
- Cultural Cognition theory
- Two scale Grid/Group approach
- Cultural bias

### CHAPTER 4
**Materials and Method**
- Division of responses by cohort and Ward
- Non-probability quota sampling strategy
- Method of data collection and analysis

### CHAPTER 5
**Pilot Study**
- Methodology applied to one Ward
- Three Nurses, one PCA, one Doctor

### CHAPTER 6
**Analysis**
- Application of methodology to three Wards
- 45 Nurses, nine PCA's, six Doctors
- Statistical analysis

### CHAPTER 7
**Interpretations**
- Response to the research question
- Correlation of cultural world-views and security risk perceptions
- The influence of organisational culture
- Identity protective cognition
- Reliability and validity

---

**Figure 1.1.** Conceptual map of the study methodology.
The Cultural Cognition theoretical framework was employed to measure the worldviews of the various cohorts, and to construct a measure of entry and access control risk perceptions. Cultural Cognition is a conception of the Cultural Theory of risk and is a methodology designed to empirically test the theory. Cultural Cognition is founded on two key premises; the first is that cultural predispositions are better predictors of risk perceptions than gender, race, political or economic demographics (Kahan & Braman, 2005; Kahan, et al., 2006). The second premise is that there is a connection between an individual’s cultural outlook and their perception of risk, based on identifiable psychological processes or mechanisms, effectively addressing the question posed by Clarke and Short (1993, p. 379) of why “individuals are disposed to form risk perceptions” (Kahan, 2008, p. 10).

1.7 Outcomes of Analysis

The outcome of the analysis demonstrated that there was a significant correlation between cultural worldviews and perceptions of entry and access control risk for all cohorts, and that the cohorts had selected their risk perceptions according to their cultural adherence. The organisational stratifications of occupation and Ward were demonstrated to have an impact on both cultural worldviews and security risk perceptions. Occupational Hierarchy and differing levels of authority were found to contribute to differences in worldviews and risk perceptions among the cohorts.

Ward security measures were also demonstrated to influence worldviews and security risk perceptions. All cohorts from Wards which used entry and access control measures (closed Wards) exhibited risk perceptions that were more security risk sensitive on the Hierarchy-Egalitarian scale compared to the Ward without entry and access controls (open Ward). The only departure from this pattern was the unexpected result of the Patient Care Assistant (PCA) cohort from Ward C, demonstrating a relatively high-group and lower-grid security risk perception relative to the other PCA cohorts. This result may be attributed to the lack of technological enhancement to procedural security on the open Ward (Ward C), despite similar patient demographics to the closed Wards.

The worldviews of the Nurse and PCA cohorts from each Ward were demonstrated to be significantly similar, as were the cultural worldviews within each cohort across all three Wards. However, the presence of some significant differences between the mean worldviews of some cohorts in two of the three Wards provided evidence of identity
protective cognition among the cohorts’ self defined reference groups. The alpha coefficients calculated on the results of the study demonstrated the reliability and validity of the Cultural Cognition methodology.

1.8 Conclusion
This chapter described the contextual background to the study, as well as detailing its significance and purpose. The significance of the concepts of security and risk were discussed, especially in regard to security in the hospital setting and the theories of risk perception. The study’s research question and outcomes were discussed, and an overview of the method of the study was presented.

Risk perception cultures that may be reluctant to participate fully in the security effort create security problems. Hospitals are reluctant participants in security due to the necessarily ‘open’ nature of these albeit restricted public spaces. Strategies for mitigating these risks include the control of the entry and access of staff and visitors to different areas of the hospital environment. For risk mitigation strategies to be effective, they must have the support of all participants in the security effort.

There is a need for a greater understanding of the impact that the risk perceptions of individuals have on security risk mitigation strategies and the role that cultural groups play in biasing risk judgments. A robust theoretical model describing how cultural ways of life contribute to the decay of security risk mitigation strategies would provide an important tool in creating more effective security risk strategies. Therefore the research question addressed by this study was ‘do cultural risk worldviews correlate with perceptions of entry and access control risk proposed by Cultural Cognition?’.

The Cultural Cognition theoretical framework was employed to measure the worldviews of the various cohorts, and to construct a measure of entry and access control risk perceptions. The outcome of the analysis demonstrated that there was a significant correlation between cultural worldviews and perceptions of entry and access control risk for all cohorts, and that the cohorts had selected their risk perceptions according to their cultural adherence.
CHAPTER 2
REVIEW OF THE LITERATURE

2.1 Introduction
The review of the literature is intended to provide a contextual foundation for the study and to underscore the elements that have been fundamental in the shaping of the study. This chapter provides a summary of the concepts of security and risk, how risk is perceived, and the major theories of risk perception. The literature on security and risk presented issues relating to entry and access control and difficulties in securing the hospital environment, as well as the illustrating nexus between security risk and risk perception. The literature illustrated the nexus at which psychometric and cultural theories give rise to the theory of Cultural Cognition, which was the theory of risk perception that formed the theoretical framework for this study. The chapter concludes with a review of literature describing Cultural Cognition’s mechanisms and applications.

2.2 The Security of Public Spaces
According to Fischer and Green, the concept of security can be defined as a predictable environment “without disruption or harm and without fear of disturbance or injury” (Fischer & Green, 2004, p. 21). Although advances in security technology and the increased consideration of terrorism continue to redefine the modern security environment, security and protection “has changed little over the past centuries” (Fischer & Green, 2004, p. 34). One of the fundamental concepts of security is layered protection, an approach commonly referred to as the Defence in Depth strategy. The Defence in Depth strategy has been in use as a security strategy for many centuries (Smith, 2003, p. 9) and involves using overlapping layers of protection to surround assets with psychological, physical, procedural, and electronic barriers “equal to the value of the assets being protected” (Walsh & Healy, 2004).

The Defence in Depth approach to security can be viewed from different perspectives. The use of “successive layers employed to delay, detect, and deter intruders” (Walsh & Healy, 2004) is the broad perspective that has been adapted to various security scenarios such as physical or information security and is often referred to as deter, detect, delay, and respond (D3R). The design of physical protection systems may use the Defence in
Depth strategy to arrange “diverse security technologies and measures” (Walsh & Healy, 2004) in a complementary manner for optimal results. According to Walsh and Healy (2004), the strategy can also be used for more specific applications such as entry and access control, whereby the levels of access should be increased according to necessity and trust as one gets closer to the asset being protected.

Public hospitals are large public spaces where entry and access control systems are increasingly becoming the primary means of security risk mitigation (Fischer & Green, 2004, p. 11). Public spaces can be difficult to secure due to indistinct notions of ownership and access. Wakefield (2003, p. 23) argues that public space *ownership* is implied by the terms ‘public’ and ‘private’, while public space *access* is defined by the terms ‘open’ and ‘restricted’. Although a public hospital has large areas that could be termed public space according to this nomenclature, it is in reality a restricted public space with many areas having controlled access (Wakefield, 2003, p. 24). In order for a hospital to be a secure environment that is “free from danger” (Craighead, 2003, p. 21), while at the same time maintaining its core business objectives (Standards Australia, 2006, p. 11), the doors must remain open to recovery whilst being closed to malicious acts (Leahy & Michealman, 2003, p. 96).

Hospital security has become very much concerned with staff safety and physical assault as studies have suggested that violence towards hospital staff is both underreported (Luck, et al., 2008), and occurring more frequently (Benveniste, et al., 2005; Chapman & Styles, 2006; Kennedy, 2005; Sands, 2007). As a result, much of the research into hospital security has focused on staff perceptions on safety and physical assault (Benveniste, et al., 2005; Camerino, Estryn-Behar, Conway, van Der Heijden, & Hasselhorn, 2008; Chapman & Styles, 2006; Erickson & Williams-Evans, 2000; Farrell, Bobrowski, & Bobrowski, 2006; Hahn et al., 2008; Kennedy, 2005; Zemike & Sharpe, 1998). However, the more fundamental issue of the effect of organisational culture on security risk mitigation strategies in the hospital environment has not been studied to anywhere near the same degree, if at all.

### 2.3 Technology, Procedure and Culture

Entry and access control systems are comprised of the physical equipment and the processes used for managing authorisation and regulating the levels of access of staff and visitors to various areas within a facility (Craighead, 2003, p. 243). To operate
effectively, entry and access control systems must successfully combine technology, procedure, and culture. Essentially, the technology enables the procedure to be implemented, while the procedural element is directly related to the security culture. Procedures such as the presentation and wearing of identification cards, elimination of tailgating (holding open doors for others), and challenging potentially unauthorised persons (Fennelly, 2004, p. 123; Fischer & Green, 2004, pp. 177-178) are directly influenced by the cultural attitudes and risk perceptions of the security participants.

The technologies and processes used in entry and access control are most effective when they require a user to present something they know, something they have, and something they are (Garcia, 2008, p. 188). For example, identification numbers for an electronic lock must be tacitly known, photo ID badges with coded credentials stored on chip must be carried, and a fingerprint or other biometric characteristic must be presented to a biometric reader (Fischer & Green, 2004, pp. 178-182). However, Garcia (2008, p. 188) argues that only the use of biometric characteristics will verify a person’s identity; something a person knows or carries is not a unique identifier and merely confirms that the person presenting these items knows or carries authorisation credentials. The combination of technology and procedure is of limited use if the influence of culture negatively impacts security measures (Hopkins, 2005, p. 5). Culture should ideally align with procedure, although seldom does in practice.

The effectiveness of entry and access control systems hinges on the input and cooperation of the system users, especially in a place that is both a public space and a restricted environment (Leahy & Michealman, 2003, p. 96). The distinctive challenges of the hospital environment makes the “extent to which employees participate in the security effort” (Colling, 2001, p. 374) all the more significant. The degree of employee participation in a security effort is linked to the organisational culture which creates a “fascinating challenge to the sociological risk analyst” (Rayner, 1986, p. 573). Culture is a concept that is often understood to mean the mindset of individuals within the organisation (Hopkins, 2005, p. ix), however, Hopkins (2005) argues that organisational culture is “better seen as the collective practices of an organisation” (p. ix).

The “shared beliefs and values that justify different ways of behaving” (Dake, 1992, p. 28) may influence the procedural elements of Defence in Depth and entry and access control strategies, thereby contributing to the success or failure of security and risk
management practices. Despite the notion that security risks are democratic in nature in that “they affect all of us” (Hopkins, 2005, p. 139), they are not perceived with the same objectivity. Risk perceptions are “imperfect estimates of an objective reality” (Hopkins, 2005, p. 113) and Kahan (2002) suggests that how risks are perceived are “cognitively derivative of social norms” (p. 1297). If social norms encourage dismissal of legitimate security risks, this creates a culture of risk denial defined as a “denial of the likelihood that factors in the environment will create consequences despite those factors being perceived and the risk being foreseeable” (Leivesley, 2000, p. 3).

Hopkins (2005, p. ix) suggests that in order to change organisational culture, a change in the “shared beliefs and values that justify different ways of behaving” (Dake, 1992, p. 28) must be imposed on the participants through behavioural constraints. Hopkins (2005) states that “changing practices will in the end change values and assumptions as well” (p. 8). However, by changing “the way we do things around here” (Schein, 1992, p. 8), participants in the security effort may be more inclined to dismiss risk mitigation strategies. Kahan (2008) argues that in such a situation, participants are likely to selectively bias their assimilation of information based on their worldview adherence by “crediting information that reinforces their beliefs and dismissing as non-credible information that undermines them” (p. 12), regardless of the probability of a risk eventuating, or the consequences resulting from risk mitigation strategies being dismissed.

2.4 The Concept of Risk
Risk is a concept that originates from 17th century probability theory (Hacking, 1975). Dake (1992) defines risk as “the probability of an event occurring, combined with an accounting for the losses and gains that the event would represent if it came to pass” (p. 22). Over time, more emphasis has been placed on mitigating the potential losses associated with risk rather than focussing on the potential gains (Dake, 1992, p. 22). According to Graubard (1990):

The older idea, that risk is essentially a wager, which individuals take in the hope of gaining something significant, substantial, has almost disappeared from common parlance. Risk today is conceived principally as danger... (p. v).

According to Douglas (1990) the originally speculative term risk has now been “preempted to mean bad risks” (p. 3) and has “become a decorative flourish on the word
‘danger’” (Douglas, 1992, p. 40). This change in the risk zeitgeist from speculative to pure definitions of risk has been influenced by the work of sociologist Ulrich Beck (1992) who coined the phrase risk society to emphasise the fact that there is no class distinction or immunity to risk (p. 23), and that industrialised society is producing risks that may result in the “self-destruction of all life on earth” (p. 21).

Researchers have proposed many variations on the ‘new’ definition of risk, from those that attempt to revive the idea of ‘good risks’ (Adams, 1995, p. 30; Merkhofer, 1987, p. 2), to those that begrudgingly accept the more recent connotations (Wharton, 1992, p. 5). Ballard (1992) recommends a more quantitative definition of risk where a risk is equal to probability multiplied by harm or consequence, where “events which happen often must have a low consequence, or events involving serious consequences must be rare” (p. 100). However, such references to low or serious consequences is characteristic of the pure risk mindset. Despite risk being inherently speculative, the move towards the pure definition of risk, where risks can only have dire consequences, has suffused the language of security risk management.

The importance of risk management in the security context is summed up by Fischer and Green (2004), who state that “if security is not to be one-dimensional, piecemeal, reactive, or prepackaged, it must be based on analysis of the total risk potential” (p. 129). Environments such as hospitals are typically complex. According to Fischer and Green (2004, p. 129), complex environments without risk analysis tend to have limited security. As risk may be measured as a “combination of the consequences of an event and their likelihood” (Standards Australia, 2004, p. 4), then security may be provided by lowering the likelihood of the risk or by mitigating the consequences (Baldwin, 2001, p. 13). Security and risk management are, therefore, fundamentally related concepts. If the original speculative definition of risk is retained, and concepts of organisational culture recognised, then the nexus of security and risk can be defined as “the culture, processes and structures that are directed towards maximising benefits and minimising disbenefits in security, consistent with achieving business objectives” (Standards Australia, 2006, p. 11).

Elements that must be considered in managing risk include the potential impact of the risk consequences, the availability and cost of possible risk mitigation measures, and crucially, the foreseeability of the risk (Hopkins, 2005, p. 113). However, the
foreseeability of a risk is dependent on an individual’s perception of that risk and the cultural biases they rely on to make a risk judgement. Krimsky (1992) states that “risks may be divided in many ways, including the nature of the hazard... the route or medium of exposure... and the nature of the consequences” (p. 10) which has resulted in many variations in the way risks are perceived, assessed and treated. It may be argued that there is no risk in reality, only subjective risk (Ewald, 1991, p. 199; Sjöberg, 2000, p. 408), just as it may be argued that there is no objective security, only subjective security (Baldwin, 2001, p. 13; Wolfers, 1952, p. 485).

Whether the concept of risk is an objective reality, a social construct, or an subjective individual perception has been a matter of debate for many years (Lupton, 1999, p. 22). According to Ewald (1991) “nothing is a risk in itself; there is no risk in reality. But on the other hand, anything can be a risk” (p. 199). Hopkins (2005) states that quantitative risk assessment is “built on the assumption that risk can be objectively measured” (p. 115), however Slovic (1999) asserts that risk has no external existence “independent of our minds and cultures” (p. 690) but is a useful construct invented to aid survival. Objective assessments of risk are actually “subjective and assumption-laden... dependent on judgement” (Slovic, 1999, p. 690) and are “irrelevant to the individual who will act according to their personal qualitative risk estimates” (Hopkins, 2005, p. 117).

If the concept of risk is thus so intangible and elusive, how then can a secure environment “free from danger” (Craighead, 2003, p. 21) be created and maintained? According to Clarke and Short (1993, p. 379), this conundrum highlights the importance of social constructionism to risk scholarship. Social constructionism discards the idea of an objective reality, and instead proposes that there is a “fundamental ambiguity” (Clarke & Short, 1993, p. 379) of meaning created by social relations (Berger & Luckmann, 1967; Brehmer, 1987; Gamson & A., 1989).

One of the key themes of modern psychology is the subjectivity of perception (Weiten, 2005, p. 19), however Hilgartner (1992) asserts that treating perception as a dependant variable “ignores prior issues” (Clarke & Short, 1993, p. 379). This view is not to say that there is no real danger, but rather that “there is no such thing as ‘real risk’ or ‘objective risk.’” (Slovic, 1999, p. 690). Douglas and Wildavsky (1982) assert that although real dangers clearly exist, they are socially defined and are distinguished by
boundaries created by “social agents” (Clarke & Short, 1993, p. 379). Hilgartner (1992) suggests the term risk object to describe these socially defined dangers, and using Kaspersion et al’s (1988) Social Amplification of Risk Framework as an example, argues that many approaches to risk perception accept the risk object as an objective reality rather than a socially defined construct.

Probability is the basis of risk assessment, and it is often referred to as if it were a rational and objective process rather than a product of “mental and social creations, despite even the most ardent realist’s exhortations on behalf of objectivity and rationality” (Smithson, 1989, p. 41). Smithson (1989, p. 55) and Morgan and Henrion (1990) argue for the inherent impossibility of calculating the probability of a single event if probability is understood in terms of “odds of a particular event in the long run” (Botterill & Mazur, 2004, p. 3). However, Smithson (1989) also argues that risk probability is subjective and defined by “degrees of belief” (p. 59) stressing the role of individual and cultural values “as part of the equation” (Botterill & Mazur, 2004, p. 3). Essentially, the concept of real or objective risk “is strongly influenced by our perceptions” (Hopkins, 2005, p. 114).

2.5 Theories of Risk Perception
The perception of risk can be defined as beliefs, judgements, and attitudes about risk that are held individually and collectively (Kahan, 2002, p. 1297). There are two broad approaches to risk perception research; the psychometric theory of risk pioneered researchers such as Starr (1969) and Slovic (1987) which “uses psychophysical scaling and multivariate analysis techniques to produce quantitative representations... of risk attitudes and perceptions” (Slovic, 1987, p. 281); and the Cultural Theory of Risk originating from the work of Mary Douglas (1978) and Aaron Wildavsky (1982) which “links disputes over... risks to clusters of values that form competing cultural worldviews” (Kahan, et al., 2006, p. 17).

The psychometric paradigm’s foundations rest on a psychological approach to risk perception which “originated in empirical studies of probability assessment, utility assessment, and decision-making processes” (Slovic, 1987, p. 281). The psychometric paradigm focuses on “cognitive factors that influence individuals' perception of risk” (Rippol, 2002, p. 147) and asserts that risk is subjective and “subjectively defined by individuals” (Sjöberg, Moen, & Rundmo, 2004, p. 10). In one of the seminal papers on
risk perception, Starr (1969) attempted to respond to the fundamental risk issue of “how safe is safe” (Slovic, 1992, p. 118) and found that society defines risk objects through an almost Darwinian process of trial and error that he called *revealed preference* (Slovic, 1992, p. 118; Starr, 1969). Criticisms of the revealed preference approach led to comparable psychometric analysis of individual risk perceptions which resulted in an *expressed preference* approach (Slovic, 1987, p. 281).

Psychometric research has shown that individuals rely on heuristics or mental models to make risk judgements (Tversky, Kahneman, & Slovic, 1974). A significant study in psychometric risk research conducted by Fischhoff, Slovic, Lichtenstein, Read, and Combs (1978) identified the two major contributing factors to risk perceptions as *dread* and *familiarity*, a finding which led to the use of a “two factor analytical representation, with the factor one axis being defined as *dread risk* and factor two axis being defined as *familiarity to risk*” (Brooks & Smith, 2002, p. 29) in many subsequent psychometric risk studies. The psychometric paradigm makes a distinction between the risk perceptions of experts and lay people, often finding the dread factor to be more dominant in the latter category (Slovic, 1992, p. 121). However, despite producing “coherent and interesting results” (Slovic, 1992, p. 119), the psychometric paradigm does not actually assess risk behaviours, but rather cognitions of risk (Slovic, 1992, p. 119) which may vary depending on cultural influences.

Several studies have found variations in risk perceptions between different countries using the psychometric approach (Englander, Farago, Slovic, & Fischhoff, 1986; Goszczynska, Tyszka, & Slovic, 1991; Hayakawa, Fischbech, & Fischhoff, 2000; Keown, 1989; Sivak, Soler, Trnkle, & Spagnhol, 1989; Teigen, Brun, & Slovic, 1988) substantiating the assertion of Marris, Langford, Saunderson, and O’ Riordan (1997) that the risk characteristics identified in the psychometric paradigm “may not be universal” (Sjöberg, et al., 2004). Other criticisms of the psychometric approach to risk perception include Sjöberg’s (2006) assertion that the model does not explain the majority of the variance of perceived risks, and Rippl’s (2002) observation that psychometric risk “neglects social and cultural influences on risk perception” (Rippl, 2002, p. 147). Essentially, the psychometric paradigm’s cognitive variables cannot reveal why a particular risk is feared in one social context, but not in another (Rippl, 2002, p. 147).
An approach often viewed as the alternative to the psychometric paradigm is the Cultural Theory of Risk. This theory, proposed and developed by Douglas (1978) and Douglas and Wildavsky (1982), is a sociological approach to risk that asserts that the risk perceptions are fundamentally influenced by values and the social context. The Cultural Theory of Risk has been put forward as a theory that can “predict and explain what kinds of people will perceive which potential hazards to be how dangerous” (Wildavsky & Dake, 1990, p. 42), although it has often been criticised for its “relatively low explanatory and predictive power” (Oltedal, Moen, Klempe, & Rundmo, 2004, p. 33). According to Rayner (1992), the Cultural Theory of Risk argues that “risks are defined, perceived, and managed according to principles that inhere in particular forms of social organisation” (p. 84).

The Cultural Theory of risk states that our reality of risk is determined by our prior commitments towards different types of social solidarity (Wilkinson, 2001, p. 1). The theory features four worldviews, known variously as solidarities, myths of nature, or ways of life, which are defined by their position within the ‘grid’ and ‘group’ typology (Douglas & Wildavsky, 1982, p. 138). The characteristics of the worldviews are defined by their positions in the grid/group typology, being either high or low group (indicating degrees of binding to social groups), and either high or low grid (indicating degrees of socially defined circumscription) (Thompson, Ellis, & Wildavsky, 1990).

The four worldviews that emerge from the grid/group typology are labelled Hierarchical, Individualist, Egalitarian, and Fatalist. A fifth worldview emerges when the potential for withdrawal from all social involvement is considered, and is called the Hermit; however, this worldview is seldom considered in practice (Schwarz & Thompson, 1990). The Cultural Theory of Risk states that these worldviews will hold varying perceptions of the riskiness of various activities and that adherents of particular worldviews will bias their risk perceptions according to their preferred way of life (Douglas, 1992, p. 55). These worldviews may be illustrated by a ball in equilibrium on a landscape (Figure 2.1), where the ball symbolises risk and the landscape symbolises vulnerability to risk (Steg & Sievers, 2000, p. 253).
Within the Cultural Theory of Risk are two perspectives, namely the stability view and the mobility view (Tsou, Karyda, Kokolakis, & Kiountouzis, 2006, p. 203). The stability view states that an individual’s cultural worldview remains consistent, regardless of the social context; however, this view has drawn criticism for its failure to explain the potential for individuals to move between, or express more than one of the four worldviews (Lupton, 1999, p. 51; Marris, Langford, & O’ Riordan, 1998). The mobility view states that individuals do move between cultural worldviews depending on the context (Tsou, et al., 2006, p. 203). Proponents of the former view advocate the use of quantitative research methodologies, whereas proponents of the latter view advocate a qualitative approach (Langford, Georgiou, Bateman, Day, & Turner, 2000).

A common approach to investigating risk perception using the Cultural Theory of Risk is to employ the methodology established by Dake (1991), who utilised a survey instrument which was initially designed to survey political attitudes. Dake (1991) used his research instrument to correlate the four worldviews with perceptions of environmental risk, deviancy, and market disruption. Criticisms of Dake’s (1991) approach cite the lack of internal validity found by many researchers in the use of four separate scales to measure worldviews (Kahan, 2008, p. 4), and may explain cultural risk’s poor explanatory power. As a result, other approaches to operationalising the Cultural Theory of Risk have been proposed, and although failing to increase the explanatory power of the theory, have shown that “a theoretically conforming measurement of cultural biases is possible” (Rippl, 2002, p. 162).
Another theory called the Social Amplification of Risk Framework (SARF) was developed in an attempt to fuse the psychometric paradigm, the Cultural Theory of risk, and theories of risk communication into an integrated framework in order to overcome many of the shortcomings of the cultural and psychometric approaches. Kasperson, Kasperson, Pidgeon, and Slovic (2003), state that the framework was developed to “describe the various dynamic social processes underlying risk perception” (p. 13). According to Kasperson, et al. (1988), the framework incorporates psychometric and cultural factors to describe how these elements influence the way risks are perceived in social contexts by either amplifying or attenuating the communication of risk (p. 177).

Kasperson and Kasperson (2005) postulate that risk events produce several higher order impacts or ripples that amplify impact of the initial risk. This establishes a self-correcting system of societal risk perception where the risk message is amplified through individual, social, and cultural perceptions, thereby more completely defining the risk consequences. One criticism of this approach comes from the constructionist perspective which states that there is “no risk in reality” (Ewald, 1991, p. 199), making the very idea of a ‘risk event’ to be a flawed foundation.

2.6 Cultural Cognition

An aspect of social risk perception that has only been recognised relatively recently is the way the psychometric paradigm’s psychological processes “interact with cultural ways of life, generating individual differences in risk perception between people who subscribe to competing worldviews” (Kahan, 2008, p. 10). According to Kahan, Slovic, Braman, and Gastil (2006, p. 18), the worldviews of the Cultural Theory of Risk are not an alternative explanation to the psychometric paradigm at all, but rather an integral part of the psychometric paradigm’s psychological explanations. A theory called Cultural Cognition asserts that the heuristics and mental models identified in psychometric risk research are steered by the cultural ways of life identified in the Cultural Theory of Risk perception (Kahan, et al., 2006, p. 18).

The theory of Cultural Cognition provides a methodology based on the psychometric paradigm for empirically testing the Cultural Theory of Risk perception. Cultural Cognition proposes that cultural worldviews are better predictors of risk perception than gender, race, political, or economic demographics (Kahan & Braman, 2005; Kahan, et
al., 2006), and that the relationship between cultural outlook and risk perception is based on identifiable psychological heuristics or mechanisms. Cognitive psychology describes mechanisms as mental models or schemata that simplify cognition (DiMaggio, 1997, p. 4; Eysenck & Keane, 2005, pp. 383-384). Psychometric risk perception research has shown that perceptions of the riskiness of putatively dangerous activities are largely driven by the affect heuristic (Kahan, Slovic, et al., 2007; Peters & Slovic, 1996; Tversky, et al., 1974).

In this context, affect refers to the assignment of a positive or negative connotation to a stimulus based on an emotional response (Slovic, Finucane, Peters, & MacGregor, 2007, p. 2) and substitutes systematic reasoning when time and information are limited (Kahan, Slovic, et al., 2007, p. 4). However, according to Cultural Cognition theory, the determination of a positive or negative connotation to particular stimuli is influenced by cultural worldviews which ascribe social meaning to putatively dangerous activities (Kahan, Slovic, et al., 2007, p. 6). Kahan et al. (2006), state that emotional responses “are not thoughtless surges of affect, but rather value-laden judgements shaped by social norms” (p. 18). Cultural Cognition therefore asserts that the determination of a positive or negative connotation to particular stimuli is influenced by cultural worldviews which ascribe social meaning to putatively dangerous activities (Kahan, Slovic, et al., 2007, p. 6).

Cultural Cognition theory also describes mechanisms that provide the explanation of why there is variation in risk perceptions and how heuristics and worldviews interact (Kahan, 2008, p. 10). The four best evidenced mechanisms of Cultural Cognition are:

1. identity-protective cognition:
2. biased assimilation and group polarisation:
3. cultural credibility: and
4. cultural identity affirmation (Kahan, Braman, Gastil, et al., 2007; Kahan, Slovic, et al., 2007; Kahan et al., 2008).

Using these mechanisms, Cultural Cognition may offer practical models for mitigating much of the conflict and poor risk decision making that arises from the disparity between risk perceptions, allowing “collective management of the role that culture plays in risk perception” (Kahan, 2007, p. 128; 2008, p. 2).
Identity-protective cognition is the tendency of individuals to believe that their worldview is correct and beneficial to society, and to conform to risk perceptions that are dominant within “self-defining reference groups” (Kahan, 2008, p. 11). Biased assimilation and group polarisation shows that individuals selectively bias their assimilation of information, and that groups will adhere more strongly to their preferred worldview when presented with balanced information (Kahan, 2008, p. 12). Cultural credibility shows that individuals gravitate towards the opinions of risk experts whom they perceive as sharing their own cultural values, while cultural-identity affirmation shows that a self affirming experience reduces the feeling of threat when exposed to “information that challenges beliefs dominant within an important reference group” (Kahan, 2008, p. 18).

Cultural Cognition combines the Cultural Theory of Risk’s grid/group topology with the psychometric paradigm’s two-axis spatial representation approach creating the two continuums of Hierarchy-Egalitarianism (high-low grid) and Individualism-Communitarianism (low-high group) (Kahan, 2008, p. 6). Similar to the psychometric paradigm’s spatial representations of risk perceptions, cultural cognitive risk perceptions are plotted as discrete points within the quadrants defined by the intersecting grid/group axes. If respondents are selecting their risk perceptions according to their cultural adherence, these points will be “significantly correlated with how high or low a point that individual’s worldview occupies along the relevant worldview dimensions” (Kahan, 2008, p. 6). Cultural Cognition’s two-scale approach has been found to be highly reliable (Kahan, 2008), and solves the issues of internal validity associated with the Dake’s (1991) methodology.

The Cultural Cognition approach alters Douglas and Wildavsky’s (Douglas & Wildavsky, 1982) initial conception of the fatalist worldview to one that is “strongly resistant to regulation of affairs by remote, collectivist-oriented authorities, but... still organise[s]... local institutions in highly regimented, and highly stratified, ways” (Kahan, 2008, p. 9). It is thus labelled as ‘Communitarian’ rather than ‘fatalist’. Cultural Cognition asserts that individual risk perceptions reflect and reinforce the cultural worldviews of Hierarchists, Egalitarians, Individualists, and Communitarians (Kahan, Slovic, et al., 2007, p. 7). These worldviews may be characterised by their skepticism or sensitivity to a variety of risks.
The worldviews tend to take opposite stances on a variety of risks, such as health risks and risks associated with social deviancy. However, the worldviews will not side with the same partner for all risks. For example, Hierarchists and Individualists will square off against Egalitarians and Communitarians on environmental and technological risks, whereas Hierarchists will side with Communitarians and Individualists with Egalitarians on health and social deviancy risks (Kahan, Braman, Slovic, Gastil, & Cohen, 2007, p. 10), (Kahan, et al., 2006, p. 22).

2.7 Conclusion

This chapter provided a summary of the concepts of security and risk, how risk is perceived, and the major theories of risk perception. The concept of security can be effectively implemented through the Defence in Depth strategy which has practical application in entry and access control. The issues of security and safety that drive hospital security are complicated by the difficulties in the securing a space that is both public and restricted. The concrete concept of security is fundamentally related to the concept of risk; however, risk can be a nebulous concept, highlighting its fundamental relationship with perception. Cognitive psychology shows that the perception of risk is influenced by psychologically constructed categories that are reliant on many social factors.

The psychometric approach to risk perception has been shown to have strong explanatory power using cognitive heuristics, but is criticised for its disregard of social factors and its limited capacity to explain variations in risk perceptions. The Cultural Theory of Risk held much promise for explaining variations in risk perceptions, but has been shown to have relatively limited explanatory power overall. Cultural Cognition is a relatively new conception of Cultural Risk Theory which explains variations in psychometric theory’s cognitions of risk as resulting from the cultural biases defined by Cultural Theory.
CHAPTER 3
THEORETICAL FRAMEWORK

3.1 Introduction
This chapter outlines how the study was structured and discusses how the theoretical framework supported the methodology. The study made use of the theory of Cultural Cognition, which provides a methodology for empirically testing the Cultural Theory of Risk perception using similar methodologies to the psychometric paradigm. Cultural Cognition theory applies spatial representations of the grid/group typology to ascertain the influence of cultural bias on security risk perceptions. The grid/group typology and effect of cultural biases on security risk are discussed. The theories that supported the research methodology are also discussed, before the chapter is concluded with a summary of how the theoretical framework was employed.

3.2 Cultural Cognition as a Theoretical Framework
Cultural Cognition is a conception of the Cultural Theory of risk and is a methodology designed to empirically test the theory. The characteristics of the worldviews are defined by their positions in the grid/group typology. Cultural Cognition may offer practical models for mitigating much of the conflict and poor risk decision-making that arises from the disparity between risk perceptions, allowing “collective management of the role that culture plays in risk perception” (Kahan, 2007, p. 128; 2008, p. 2).

The Cultural Cognition approach combines the Cultural Theory of Risk’s grid/group typology with psychometric risk’s two-axis spatial representation approach — rather than the four scale approach typical of other conceptions of Cultural Theory — creating the two continuums of Hierarchy-Egalitarianism (high-low grid, or degrees of socially defined circumscription) and Individualism-Communitarianism (low-high group, or degrees of binding to social groups) (Kahan, 2008, p. 6).

Cultural Cognition’s two-scale approach has been found to be highly reliable (Kahan, 2008) and solves the issues of multiple expressions of worldviews associated with Dake’s (1991) methodology. Cultural Cognition risk perceptions may be plotted on a spatial map as discrete points within the quadrants defined by the intersecting grid/group axes (Figure 3.1) in much the same way as risk perceptions may be plotted
on a spatial representation of the psychometric paradigm’s two factors of *dread risk* and *familiar risk* (Figure 3.2).

**Figure 3.1.** Cultural Cognition’s two scale grid/group spatial representation (Kahan, 2008).

**Figure 3.2.** The psychometric paradigm’s two-factor dread/familiarity spatial representation (Slovic, 1987, p. 236)
The spatial representation of the grid/group typology allows risk perceptions to be classified as 'Hierarchical-Individualists', 'Hierarchical-Communitarians', 'Egalitarian-Individualists', or 'Egalitarian-Communitarians' depending on their location within the spatial map. Whether a particular quadrant represents skepticism or sensitivity to risk is dependent upon the way in which the risk perception is influenced by the cultural bias associated with the worldviews of that quadrant. For example, Egalitarians and Communitarians tend to square off against Hierarchists and Individualists in their perceptions of technological and environmental risks. Egalitarians view these risks as high because they feel that they generate inequalities, and Communitarians because they feel that they “symbolise unconstrained pursuit of individual self interest” (Kahan, Slovic, et al., 2007, p. 7). However Hierarchists view these risks as low because they feel that the assertion of technological and environmental issues as risks represents a challenge to authority and social Hierarchy, and Individualists because of tendency to resist regulation of commerce and industry (Kahan, et al., 2006, p. 20).

However, the worldviews also tend to take opposite stances on health risks and risks associated with social deviancy. Egalitarians and Individualists are skeptical of risks associated with HPV vaccination (Kahan, Braman, Slovic, et al., 2007, p. 10), abortion risks, contracting AIDS from surgery, and marijuana smoking (Kahan, et al., 2006, p. 22), seeing opposition to these issues as rigidly stratifying people and constraining individual choice. Hierarchists and Communitarians are sensitive to these risks, as Hierarchists feel these behaviours morally defy conventional norms, and Communitarians view these behaviours as risking the wellbeing of the community for individual self interest (Kahan, et al., 2006, p. 22). The worldviews also divide along these same lines in their perceptions of security risks (Table 3.1).

Table 3.1

<table>
<thead>
<tr>
<th></th>
<th>Hierarchist</th>
<th>Egalitarian</th>
<th>Individualist</th>
<th>Communitarian</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Environmental Risks</strong></td>
<td>Skeptical</td>
<td>Sensitive</td>
<td>Skeptical</td>
<td>Sensitive</td>
</tr>
<tr>
<td><strong>Technological Risks</strong></td>
<td>Skeptical</td>
<td>Sensitive</td>
<td>Skeptical</td>
<td>Sensitive</td>
</tr>
<tr>
<td><strong>Health Risks</strong></td>
<td>Sensitive</td>
<td>Skeptical</td>
<td>Skeptical</td>
<td>Sensitive</td>
</tr>
<tr>
<td><strong>Social Deviancy Risks</strong></td>
<td>Sensitive</td>
<td>Skeptical</td>
<td>Skeptical</td>
<td>Sensitive</td>
</tr>
<tr>
<td><strong>Security Risks</strong></td>
<td>Sensitive</td>
<td>Skeptical</td>
<td>Skeptical</td>
<td>Sensitive</td>
</tr>
</tbody>
</table>
Egalitarians view security controls as representing a threat to their sense of equity and are likely to display a limited adherence to security procedures (Tsohou, et al., 2006, p. 209). Likewise, Individualists are reluctant participants in the security effort due to a perception that security controls are a restriction of individual freedom, and will tend to bypass security procedures (Tsohou, et al., 2006, p. 209). According to Mars (1996, p. 4), Individualists are likely to promote their own short term self interest over the benefit of the organisation. Conversely, Hierarchists are likely to see breaches of security controls as a threat to the established social order and a challenge to authority (Tsohou, et al., 2006, p. 209). Communitarians are likely to perceive security controls as a benefit to the collective, and breaches of security as risking the wellbeing of the community for individual self interest (Kahan, et al., 2006, p. 22).

3.3 Cultural Bias in Security Risk Perception Proposition

The study proposed that a correlation between cultural biases and security risk perceptions relating to access control would be demonstrated by the clustering of risk perceptions and cultural worldviews within the spatial map. The study measured the cultural worldviews and security risk perceptions of three cohorts, being Doctors, Nurses and Patient Care Assistants (PCA’s) from three hospital Wards with different access control requirements. The three Wards all had similar general patient profiles which provided a relatively stable baseline of risk perception to be established across the three departments. For example, the influence on the security risk perceptions of staff members of high security risk patients in one Ward versus low security risk patients in another was reduced due to the fact that the patients and visitors for all three departments generally represented similar security risks.

The data collection instrument used was a questionnaire based on an instrument developed by the Cultural Cognition Project (Kahan, 2008; Kahan, Braman, Slovic, et al., 2007) for the theory’s two-scale approach (see Appendix A). Items from the original questionnaire (see Appendix B) that measured similar opinions were removed, and others that were deemed to be too strongly worded were revised, resulting in eight of the fourteen items from the Hierarchy-Egalitarian scale, and eight of the twelve Individualist-Communitarian scale items being retained. In addition to these questions, a further four questions (two for each scale) were developed, based on the cultural biases of each worldview.
For the Hierarchy-Egalitarian scale, the questions developed were:

\begin{itemize}
  \item \textit{a) Those who do not follow security and access control procedures have a disregard for authority.}
  \item \textit{b) Everyone should follow security and access control procedures equally, regardless of rank or status.}
\end{itemize}

Hierarchists are likely to see breaches of security controls as a threat to the established social order and a challenge to authority (Tsouhou, et al., 2006, p. 209), therefore a respondent who rated a high level of agreement with question (a) would be more likely to have a Hierarchical than an Egalitarian worldview of security and access control procedures. Similarly, a respondent who rated a low level of agreement to question (a) would be more likely to be an Egalitarian in terms of security and access control due to Egalitarians viewing security controls as representing a threat to their sense of equity (Tsouhou, et al., 2006, p. 209). The same is true for Hierarchists who rated their agreement as low and Egalitarians who rated their agreement as high for question (b).

The questions developed for the Individualist-Communitarian scale were:

\begin{itemize}
  \item \textit{c) Individuals should be able to make their own judgements on whether to follow security and access control procedures depending on the situation.}
  \item \textit{d) Management should put measures in place that ensure staff members follow security and access control procedures.}
\end{itemize}

As with the Hierarchy-Egalitarian scale, respondents with an Individualist view of security and access control would rate high agreement with question (c) and low agreement with question (d), and respondents with a Communitarian view would rate low for (c) and high for (d).

It was intended that the mean scores of the two questions on each scale be measured and the results mapped onto a spatial representation. These could then be compared with the mean scores from each scale of the Cultural Cognition questions. This allowed any correlation between cultural biases and security risk perceptions of a cohort to be demonstrated by the clustering of risk perceptions around cultural worldviews within the spatial map. In order to facilitate interpretation of the results, a reference spatial map of the expected security risk perceptions according to Cultural Cognition worldviews was developed (Figure 3.3).
The map shows that Hierarchical-Communitarians and Egalitarian-Individualists would represent security risk sensitivity and skepticism respectively. The Hierarchical-Individualist and Egalitarian-Communitarian quadrants represent mixed risk perceptions. These were interpreted according to their relative position in relation to:

- high-low grid, or degrees of socially defined circumscription, where high grid = Hierarchism, which results in security risk sensitivity, and low grid = Egalitarianism, which results in security risk skepticism; and
- low-high group, or degrees of binding to social groups, where high group = Communitarianism, which results in security risk sensitivity, and low group = Individualism, which results in security risk skepticism.

If the mean responses of a particular cohort identified that cohort as being, on average, Hierarchical-Communitarians, then the responses of that same cohort should be clustered near the discrete point plotted for their worldview. If respondents selected their risk perceptions according to their cultural adherence, these points would be “significantly correlated with how high or low a point that individual’s worldview occupies along the relevant worldview dimensions” (Kahan, 2008, p. 6).
3.4 Conclusion

This chapter outlined how the theoretical framework supported the study methodology. The utilisation of spatial representations of the grid/group typology to ascertain the influence of cultural bias on security risk perceptions was discussed, as was the grid/group typology and effect of cultural biases on security risk. The theories supporting the research methodology were also presented. Cultural Cognition is a conception of the Cultural Theory of risk and is a methodology designed to empirically test the theory. The Cultural Cognition approach combines the Cultural Theory of Risk’s grid/group typology with psychometric risk’s two-axis spatial representation approach to create the two continuums of Hierarchy-Egalitarianism (high-low grid, or degrees of socially defined circumscription) and Individualism-Communitarianism (low-high group, or degrees of binding to social groups). The spatial representation of the grid/group typology allows risk perceptions to be classified as ‘Hierarchical-Individualists’, ‘Hierarchical-Communitarians’, ‘Egalitarian-Individualists’, or ‘Egalitarian-Communitarians’ depending on their location within the spatial map. Cultural cognitive risk perceptions may be plotted on a spatial map as discrete points within the quadrants defined by the intersecting grid/group axes.

The study proposed that a correlation between cultural biases and security risk perceptions relating to access control would be demonstrated by the clustering of risk perceptions and cultural worldviews within the spatial map. The data collection instrument used was a questionnaire based on an instrument developed by the Cultural Cognition for the theory’s two-scale approach. Eight of the original fourteen items from the Hierarchy-Egalitarian scale and eight of the original twelve Individualist-Communitarian items of the Cultural Cognition instrument developed by Kahan, Braman, et al. (2007) were used in the research instrument. In addition to the sixteen Cultural Cognition questions, a further four questions designed to test security risk perceptions were developed based on the cultural biases of each worldview. It was intended that the mean scores of the two questions on each scale be measured and the results mapped onto a spatial representation. These could then be compared with the mean scores from each scale of the Cultural Cognition questions. This approach allowed any correlation between cultural biases and security risk perceptions of a cohort to be demonstrated by the clustering of risk perceptions around cultural worldviews within the spatial map.
CHAPTER 4
MATERIALS AND METHOD

4.1 Introduction
This chapter details the methodology used in the study. It presents a discussion of the sampling strategy employed, together with the methods of data collection and analysis. The method of determining reliability and validity of the study is presented, and the chapter concludes with a discussion of the ethical issues.

4.2 Methodology
The study methodology was modelled on the interpretive paradigm of sociological research which, according to Graziano and Raulin (2004, p. 135), is primarily concerned with subjective experience and the meaning that can be ascribed to actions through intention. According to Klein and Myers (1999), the interpretive research approach enables researchers to "understand human thought and action in social and organisational contexts" (p. 67). Interpretive research also provides a greater understanding of the context of the problem and the processes that influence and are influenced by it (Walsham, 1993, pp. 4-5). As interpretive research essentially attempts to understand individuals' interpretations of reality (Cohen, Manion, & Morrison, 2007, p. 22), the use of this research paradigm to investigate perceptions of risk was most fitting.

The study utilised various methods to achieve the outcomes. The theory of Cultural Cognition, which utilises spatial mapping of data much like the psychometric paradigm, was employed as the theoretical framework for the study. Cultural Cognition theory was used to measure worldviews and as a framework for the construction of a measure of entry and access control risk perceptions. Participants in the study were asked to rate their responses to the survey instrument (see Appendix A) by indicating the relative position of their opinion on a 10-point Likert scale.

The mean worldviews were then measured onto spatial maps representing the two Cultural Cognition scales of Hierarchy-Egalitarian and Individualist-Communitarian, which creates the four distinct worldviews (and their associated security risk perceptions) of Hierarchical-Individualism, Hierarchical-Communitarianism, Egalitarian-Individualism, and Egalitarian-Communitarianism. The Cultural Cognition
worldview maps were then overlayed with the mean risk perceptions towards access control.

The data collection instrument used was a questionnaire based on an instrument developed by the Cultural Cognition Project (Kahan, 2008; Kahan, Braman, Slovic, et al., 2007) for the theory's two-scale approach. In addition, a further four questions relating to entry and access control risk perceptions were developed based on the Cultural Cognition theoretical framework. The responses were made by the respondent marking their level of agreement or disagreement with the statements on a 10-point Likert scale. It was determined that in order for the sample to reflect the wider population in its proportional representation of various cohorts, non-probability quota sampling would be employed as a suitable sampling method in order to "give weighting" (Cohen, et al., 2007, p. 114) to the selected cohorts reflecting the wider population.

The standard deviations of the opinions for each of the cohorts were measured to determine the amount of variance in opinions. Statistical analysis was then used to "discover whether there [were any] statistically significant differences between the means of two groups" (Cohen, et al., 2007, p. 543). Statistical tests were performed on combinations of pairs of cohorts identified to determine whether differences in worldviews and responses to Cultural Cognition and access control questions were statistically significant.

4.2.1 Likert Scale

The responses to the Cultural Cognition and security access control questions in the research instrument were captured using a 10-point Likert scale with the lower end labelled strongly disagree and the upper end of the scale labelled strongly agree. Participants in the study were asked to rate their responses to the Cultural Cognition statements (see Appendix A) by indicating the relative position of their opinion by making a mark anywhere along the Likert scale to indicate their level of agreement or disagreement with each question (Figure 4.1).
A physical measurement was then taken of the distance between the beginning of the scale and the respondents’ marks in order to gain a numerical value of their level of agreement or disagreement with each statement. The three groups of cohorts from the three hospital departments were then divided into the fifteen cohorts (Table 4.1).

Table 4.1
Fifteen cohorts derived from the three groups in the three departments.

<table>
<thead>
<tr>
<th>All Doctors</th>
<th>All Nurses</th>
<th>All PCA’s</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Ward 1 Respondents</td>
<td>All Ward 2 Respondents</td>
<td>All Ward 3 Respondents</td>
</tr>
<tr>
<td>Ward 1 Doctors</td>
<td>Ward 1 Nurses</td>
<td>Ward 1 PCA’s</td>
</tr>
<tr>
<td>Ward 2 Doctors</td>
<td>Ward 2 Nurses</td>
<td>Ward 2 PCA’s</td>
</tr>
<tr>
<td>Ward 3 Doctors</td>
<td>Ward 3 Nurses</td>
<td>Ward 3 PCA’s</td>
</tr>
</tbody>
</table>

### 4.2.2 Sampling Strategy

More than 548,000 Australians work in the health sector, with Australian hospitals employing almost 20,000 medical practitioners, 140,000 nursing workers, and 30,000 other health workers (Australian Institute of Health and Welfare, 2009). Western Australia has a population in excess of two million people and a health workforce of more than 50,000 (Australian Institute of Health and Welfare, 2009). Western Australia’s health workforce includes around 20,000 nursing staff, 5,500 Patient Care Assistants (PCA’s), and around 5,500 medical practitioners (Australian Institute of Health and Welfare, 2009). The target population of the study was around 4,700 (About Us, 2006), and consisted of staff from a major Western Australian hospital.

To achieve a statistically valid sample of the target population with a 95% confidence level and a +/-5% confidence interval, a sample of 355 respondents would have needed to be surveyed (Creative Research Systems, 2009). This number was not achievable due not only to resource limitations, but also the fact that the number of staff employed on a hospital Ward, such as a Burns unit, would not typically exceed 60 staff members, with between 36 and 50 of those comprised of Doctors, Nurses, and PCA’s (A. Willis, personal communication, October 14, 2009).
Therefore a non-probability quota sampling strategy was used (Cohen, et al., 2007, p. 113). The sample also needed to reflect the wider population in its proportional representation of various cohorts, therefore quota sampling was selected as the type of non-probability sampling method for the study in order to “give weighting” (Cohen, et al., 2007, p. 114) to the selected cohorts, reflecting the wider population.

The total number of Doctors, Nurses and other health workers such as PCA’s working in Australian Hospitals is 185,364 (Australian Institute of Health and Welfare, 2009, p. 14). Of this figure approximately 74% are Nurses, 15% are other health workers, and 11% are Doctors (Australian Institute of Health and Welfare, 2009, p. 14). Given that the target cohorts represented approximately 36 staff members in a typical Ward (A. Willis, personal communication, October 13, 2009), an achievable sample was estimated as 20 respondents from each Ward, giving a total of 60 respondents. Using the percentages for the proportions of cohorts generally present in Australian hospitals as a guide, the minimum number of respondents from each cohort was calculated (Table 4.2).

Table 4.2
Minimum number of respondents from each cohort based on the proportions of each cohort working in hospitals Australia-wide

<table>
<thead>
<tr>
<th>% of hospital staff population</th>
<th>Minimum total respondents</th>
<th>Minimum respondents from each Ward</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctors</td>
<td>11%</td>
<td>6</td>
</tr>
<tr>
<td>Nurses</td>
<td>74%</td>
<td>45</td>
</tr>
<tr>
<td>PCA’s</td>
<td>15%</td>
<td>9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
<td><strong>60</strong></td>
</tr>
</tbody>
</table>

4.2.3 Data Collection

The data were collected by making the questionnaires available within a central place in each department to the appropriate number of each cohort. Potential participants were able to read the information sheet (see Appendix D), and if they chose to participate, sign the participant consent form (see Appendix C) and complete the survey in their own time. Once the survey was completed, it was returned to the staff development Nurse in each department who then placed the completed questionnaire with the signed consent form into a plain envelope. When the questionnaires were completed for a particular cohort, the plain envelopes were sealed and handed over to a collector. At the request of the hospital’s ethics committee, a person independent from the researcher
was tasked with collecting the envelopes and passing them onto the researcher. In this way the anonymity of the participants was preserved. Approximately 78% of the surveys issued were completed and returned (Table 4.3).

Table 4.3

Percent of returned questionnaires

<table>
<thead>
<tr>
<th>Questionnaires issued</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completed questionnaires returned</td>
<td>47</td>
</tr>
<tr>
<td>Percent returned</td>
<td>78%</td>
</tr>
</tbody>
</table>

4.2.4 Data Analysis

The data from the three groups of cohorts from the three departments were divided into 15 cohorts (see Table 4.1). A physical measurement was taken of the distance between one end of each Likert scale and the respondents’ mark in order to gain an empirical figure of their level of agreement or disagreement with each statement. The Egalitarian and Communitarian questions in the survey instrument were essentially “reverse phrased” (Field, 2009, pp. 675-676) compared with the Hierarchical and Individualist questions, requiring the Egalitarian and Communitarian responses to be reversed scored for the purposes of statistical analysis. The collected data were analysed using the SPSS statistical analysis software.

The mean of the responses from the two Cultural Cognition scales for each of the three groups of cohorts in each department were measured to obtain the mean worldview of each group. The mean of these responses were then measured onto spatial maps. The standard deviations of occupation and Ward were also measured to determine the amount of variance in opinion.

A Shapiro-Wilk normality test was performed on the collected data to determine which statistical tests would be most robust for the data. Statistical analysis was then used to determine whether there were any statistically significant differences between the means each group. Further analysis was performed in order to compare responses to the Cultural Cognition questions with responses to the access control questions within each group. Finally, a reliability analysis using Cronbach’s alpha coefficient was conducted on each of the Cultural Cognition scales.
4.2.5 Reliability and Validity

Reliability may be defined as "dependability, consistency, and replicability over time, over instruments, and over groups of respondents" (Cohen, et al., 2007, p. 146). Assessing the utility of Cultural Cognition as a risk management tool requires a method of determining the controllability, predictability, consistency and replicability in a quantifiable way. Validity may be defined as the careful use of sampling, instrumentation and statistical analysis of the data (Cohen, et al., 2007, p. 133).

In order to demonstrate internal validity, the study needed to provide evidence that it is cultural worldviews that are contributing to risk perceptions and not extraneous variables (Graziano & Raulin, 2004, p. 138). For external validity, the study needed to show that the results could be generalised to some degree (Cohen, et al., 2007, p. 136). It was reasoned that if the alpha coefficients calculated on the results of the study could approach the alpha scores of the Cultural Cognition instrument identified by Kahan (2008, p. 7), such a correlation may provide evidence of replicability and indicate that it is indeed cultural worldviews that are contributing to risk perceptions, and not extraneous variables, as well as showing that the results may be generalised to some degree. This would provide evidence of the instrument's reliability as well as internal and external validity. Therefore, the study utilised Cronbach's alpha coefficient to determine the reliability and validity of both the survey instrument and the data.

The studies conducted by the Cultural Cognition Project (Yale Law School, 2009) have shown the two-scale survey instrument to have a high level of reliability using Cronbach's alpha coefficient. Cronbach's alpha coefficient is a statistical measure which, according to Gliem and Gliem (2003), provides "a unique estimate of the reliability of a given test" (p. 84). The test yields an alpha coefficient between 0 (unreliable) and 1 (perfectly reliable) (Cohen, et al., 2007, p. 506). The Cultural Cognition instrument developed by the Cultural Cognition Project yield alpha coefficients of $\alpha = .89$ for the Hierarchy-Egalitarian scale, and $\alpha = .88$ for the Individualist-Communitarian scale (Kahan, 2008, p. 7).
4.2.6 Research Study Ethics

Participation in the study was through "voluntary choice" (Australian Government, 2007b). Information on the study was provided in an information letter to participants and an informed consent document presented on Edith Cowan University letterhead paper containing the project title, contact details of the chief investigator, the site supervisor, the faculty, and the principle supervisor (see Appendix D). The informed consent document contained a statement indicating consent of the participant, stating that the participant:

- freely agreed to participate in the study and clearly understood the risk involved;
- were provided with, and had read and understood information on the research study;
- understood what was required of them;
- understood that their identity and the information they provided would be kept confidential;
- understood how the information they provided would be used; and
- understood that they were free to withdraw their participation at any time.

Participants were able to keep the information letter and obtain a copy of their signed informed consent document upon request. Participants were to remain anonymous and no associative link between participants and the study was recorded. The data and primary research materials associated with the study were retained separately in safe and secure storage in the appropriate repository at Edith Cowan University’s Joondalup campus, and scheduled for secure and safe disposal after the applicable period of time from the date of publication.

In accordance with the guidelines for ethical research (Australian Government, 2007a, 2007b), potential risks to participants were identified. The study was deemed to be ‘low risk research’ where the only foreseeable risk was one of mild psychological discomfort. There was the possibility that the Cultural Cognition survey instrument would cause some individuals to feel a mild level of psychological discomfort should they strongly disagree with a particular statement. In order to minimise any potential risk of psychological discomfort, some statements in the Cultural Cognition survey instrument (Kahan, 2008) were modified from their original versions (see Appendix A). The research study was approved to proceed by both the Edith Cowan University Human Research Ethics Committee Edith and the Ethics Committee of the Hospital involved.
4.3 Conclusion

This chapter outlined the study methodology, and discussed how the Likert scale was employed in the research, together with a discussion of the sampling strategy used. A discussion of the methods of data collection and analysis were presented, along with a discussion of the method used for determining the reliability and validity of the research instrument and the data. Finally the ethical considerations of the study were presented and examined.

A non-probability quota sampling strategy was used to reflect the wider population in its proportional representation of various cohorts. The responses to the Cultural Cognition and security access control questions in the research instrument were captured using a 10-point Likert scale. The data from the three groups of cohorts from the three departments were divided into 15 cohorts. The collected data were analysed for statistically significant differences and measured onto spatial maps using the Cultural Cognition grid/group typology. The research instrument was also tested for reliability and validity using Cronbach’s alpha coefficient. The study was designed and executed in accordance with the guidelines for ethical research.
CHAPTER 5
PILOT STUDY

5.1 Introduction
This chapter presents details of the pilot study that was undertaken prior to the main study. The pilot study applied the study design by acquiring responses to the survey instrument (see Appendix A) for each cohort and measuring the data onto spatial maps. Statistical analysis was then applied to the data, including comparison of means and Cronbach's alpha, and the results were interpreted according to the literature. The data collection instrument is discussed, as is the procedure used for data collection and analysis. The spatial maps that were created are presented, as are the results of the statistical analysis. Finally the chapter concludes with a discussion of the interpretation of the results and the limitations of the pilot study and modifications to the main study.

5.2 Data Collection Instrument
The data collection instrument used for the pilot study (see Appendix A) was a questionnaire based on an instrument developed by the Cultural Cognition Project (Kahan, 2008; Kahan, Braman, Slovic, et al., 2007) for the theory's two-scale approach (see Appendix B). In addition to questions from the survey instrument developed by Kahan, Braman, Slovic, et al, (2007), four questions relating to entry and access control risk perceptions were also included. These questions were designed with each of the four Cultural Cognition groups in mind and included the following for the Hierarchy-Egalitarian scale:

Hierarchist: “Those who do not follow security and access control procedures have a disregard for authority.”  
Egalitarian: “Everyone should follow security and access control procedures equally, regardless of rank or status.”

The following entry and access control questions were used for the Individualist-Communitarian scale:

Individualist: “Individuals should be able to make their own judgements on whether to follow security and access control procedures depending on the situation.”
Communitarian: “Management should put measures in place to ensure that staff members follow security and access control procedures.”
5.3 **Procedure**
The respondents were asked to make a mark anywhere along a 10-point Likert scale to indicate the extent to which they agreed or disagreed with each statement. This method was used to avoid the problem of biasing the respondents’ answers with labels on each point (Figure 5.1). Using this method, the natural tendency of individuals to shy away from extremes and mark the midpoint (Cohen, et al., 2007, p. 327) was neither encouraged by making the midpoint the ‘easy choice’, nor discouraged by eliminating the option altogether. The pilot study was completed by one Doctor, one Patient Care Assistant (PCA) and three Nurses from a single Ward.

![Figure 5.1. The Likert scale used in the data collection instrument.](image)

5.4 **Data Analysis**
According to Cohen et al. (2007) the Likert scale “provides a range of responses to a given question or statement” (p. 326), although the measurement of attitude on a Likert scale does not infer that each point on the scale is an equal interval of equal weighting. The Likert scale does, however, allow for greater detail in the response. Although the pilot study used a 10-point Likert scale, respondents were free to mark the degree of their opinion anywhere along the scale. In the pilot study, four of the five respondents marked their opinions as directed (Figure 5.2) whereas one respondent marked their opinions in accordance with the indicator marks (Figure 5.3). This response was of no consequence, with both methods of marking the Likert scale giving equally valid responses.

![Figure 5.2. Example of respondent marking the Likert scale at any point.](image)

It seems like the criminals and welfare cheats get all the breaks, while the average citizen picks up the tab.

![Figure 5.3. Example of respondent marking the Likert scale at an indicator mark.](image)
A physical measurement was taken of the distance between one end of the scale and the respondents' mark in order to gain an empirical figure of their level of agreement or disagreement with each statement. For each of the two Cultural Cognition scales, some responses had to be reverse scored to ensure all responses were being measured in the same direction. For example, if a respondent scored an 8 on a Hierarchy question then this would indicate that their opinion is more Hierarchical and less Egalitarian. If the same respondent scored a 2 on an Egalitarian question, this would also indicate that the respondent is more Hierarchical than Egalitarian. The Egalitarian and Communitarian questions in the survey instrument were essentially "reverse phrased" (Field, 2009, pp. 675-676) compared with the Hierarchical and Individualist questions, requiring the Egalitarian and Communitarian responses to be reversed scored for the purposes of statistical analysis. The collected data results were analysed using the SPSS statistical analysis software (Table 5.1).

Table 5.1
*Statistical Analysis Program*

<table>
<thead>
<tr>
<th>SPSS for Windows Student Version 17.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Release 17.0.1 (11 December 2008)</td>
</tr>
<tr>
<td>Product limit to 50 cases, 1500 variables</td>
</tr>
<tr>
<td>Copyright © 2010 SPSS Inc., an IBM Company All rights reserved.</td>
</tr>
</tbody>
</table>

5.4.1 Spatial Maps and Statistical Tests

The mean of the responses from the two Cultural Cognition scales for each of the three cohorts (Doctor, Nurses, and PCA) were measured to obtain the mean worldview of each group (Table 5.2).

Table 5.2
*Mean of the responses for each cohort on each scale*

<table>
<thead>
<tr>
<th>Hierarchist-Egalitarian</th>
<th>Doctor</th>
<th>Nurses</th>
<th>PCA</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.87</td>
<td>4.96</td>
<td>5.09</td>
<td></td>
</tr>
<tr>
<td>Individualist-Communitarian</td>
<td>4.44</td>
<td>4.27</td>
<td>5.21</td>
</tr>
</tbody>
</table>

The standard deviations of occupation and Ward were also measured to determine the amount of variance in opinion. A small standard deviation infers that there is relatively little variation in the opinions of a particular group, whereas a large standard deviation infers a wider variation of opinions within that group. As the pilot study obtained responses from a single Ward with one Doctor, one PCA, and three Nurses responding,
only the standard deviation of the Nurses (Table 5.3) and a single Ward were obtained (Table 5.4).

Table 5.3
*Standard deviation (SD) of Nurses for each Cultural Cognition scale.*

<table>
<thead>
<tr>
<th>Nurse</th>
<th>SD of Hierarchy-Egalitarian</th>
<th>SD of Individualist-Communitarian</th>
<th>Mean of the SD’s</th>
<th>Total Standard Deviation of the Cohort</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurse 1</td>
<td>2.44</td>
<td>2.57</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nurse 2</td>
<td>1.62</td>
<td>2.28</td>
<td>2.09</td>
<td>0.39</td>
</tr>
<tr>
<td>Nurse 3</td>
<td>1.79</td>
<td>1.81</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5.4
*Standard deviation (SD) of the Ward for each Cultural Cognition scale.*

<table>
<thead>
<tr>
<th>Doctor</th>
<th>SD of Hierarchy-Egalitarian</th>
<th>SD of Individualist-Communitarian</th>
<th>Mean of the SD’s</th>
<th>Total Standard Deviation of the Ward</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurse 1</td>
<td>2.06</td>
<td>1.65</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nurse 2</td>
<td>2.44</td>
<td>2.57</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nurse 3</td>
<td>1.61</td>
<td>2.28</td>
<td>2.17</td>
<td>0.48</td>
</tr>
<tr>
<td>PCA</td>
<td>3.14</td>
<td>2.29</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

It was initially intended that the spatial maps be constructed using the midpoint of the Likert scale to define the position of the X and Y axis. However, Kahan, Braman, Gastil, Slovic, & Mertz (2007) state that respondents should be classified as ‘Hierarchical-Individualists’, ‘Hierarchical-Communitarians’, ‘Egalitarian-Individualists’, or ‘Egalitarian-Communitarians’ depending on where respondents scores fall in relation to “the median scores of both scales” (Kahan, Braman, Gastil, et al., 2007, p. 477). In keeping with this reasoning, the spatial maps were constructed using the median score of each scale of the results to define the position of both the X and Y axis. Therefore, the means of the responses were measured onto a spatial map using the Hierarchy-Egalitarian median score of 4.8 and the Individualist-Communitarian median score of 4.6 (Figure 5.4).
Figure 5.4. Mean responses of groups measured onto a spatial map in relation to median scores.

It was intended that a paired t-test would be used to discover whether there were any statistically significant differences between the means each group (Cohen, et al., 2007, p. 543). The data was tested for normality using a Shapiro-Wilk test which revealed that the data from the Hierarchy-Egalitarian scale $W(50) = 0.56, p > 0.05$ were significantly normally distributed, but the data from the Individualism-Communitarianism scale $W(50) = 0.03, p < .05$, were significantly non-normal. Given that the sample was well below 30 respondents, this indicated that the t-test would not be robust to the violation of the assumption of normality (Field, 2009, p. 139). As a result, non-parametric tests of statistical significance were employed. The Mann-Whitney test was used to determine whether there were any statistically significant differences between the means each group. According to Field (2009), the Mann-Whitney test is “useful when your data violate the assumptions of parametric data” (p. 345).
The scale of the spatial map was reduced to better show the detail of the results (Figure 5.5).

![Spatial Map Diagram]

**Figure 5.5.** Mean responses of groups measured onto a spatial map in relation to median scores (enlarged).

The Mann-Whitney test was used to compare the mean worldviews, and the results showed that the mean worldviews were significantly similar for all cohorts (Table 5.5).

**Table 5.5**  
*Mann-Whitney test between all cohorts*

<table>
<thead>
<tr>
<th>Cohort</th>
<th>Scale</th>
<th>Mann-Whitney test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctor &amp; PCA</td>
<td>Hierarchy-Egalitarian</td>
<td>$U = 48.5$</td>
</tr>
<tr>
<td></td>
<td>Individualist-Communitarian</td>
<td>$z = -0.11$</td>
</tr>
<tr>
<td>Doctor &amp; Nurses</td>
<td>Hierarchy-Egalitarian</td>
<td>$U = 43.0$</td>
</tr>
<tr>
<td></td>
<td>Individualist-Communitarian</td>
<td>$z = -0.53$</td>
</tr>
<tr>
<td>Nurses &amp; PCA</td>
<td>Hierarchy-Egalitarian</td>
<td>$U = 48.0$</td>
</tr>
<tr>
<td></td>
<td>Individualist-Communitarian</td>
<td>$z = -0.15$</td>
</tr>
</tbody>
</table>

43
The responses to the Cultural Cognition questions were then separated from the access control questions and mapped together (Figure 5.6).

![Figure 5.6. Mean responses of individuals to Cultural Cognition and access control questions.](image)

The Wilcoxon signed-rank test was used to determine whether there was any statistically significant differences in the responses of the three cohorts to the Cultural Cognition and access control questions. Field (2009) states that the Wilcoxon signed-rank test is useful in situations where “there are two sets of scores to compare, but the scores come from the same participants... [it is] the non-parametric equivalent of the dependent t-test” (p. 552).
The scale of the spatial map with the responses to the Cultural Cognition and access control questions was then reduced to better show the detail of the results (Figure 5.7).

![Figure 5.7](image)

**Figure 5.7.** Mean responses of individuals to Cultural Cognition and access control questions (enlarged).

The Wilcoxon signed-rank test showed that the responses of the each cohort to the Cultural Cognition questions were significantly similar to their responses to the access control questions (Table 5.6).

<table>
<thead>
<tr>
<th>Cohort</th>
<th>Wilcoxon signed rank test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctor</td>
<td>$T = 5$</td>
</tr>
<tr>
<td>Nurses</td>
<td>$T = 11.5$</td>
</tr>
<tr>
<td>PCA</td>
<td>$T = 1.5$</td>
</tr>
</tbody>
</table>
5.4.2 Reliability and Validity

A reliability analysis using Cronbach's alpha coefficient was conducted on each of the Cultural Cognition scales (Table 5.7).

Table 5.7
Cronbach's alpha coefficient for each Cultural Cognition scale.

<table>
<thead>
<tr>
<th>Scale</th>
<th>( \alpha )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hierarchy-Egalitarian</td>
<td>-0.86</td>
</tr>
<tr>
<td>Individualist-Communitarian</td>
<td>0.77</td>
</tr>
</tbody>
</table>

Cronbach's alpha coefficient is a statistical measure which, according to Gliem and Gliem (2003), provides "a unique estimate of the reliability of a given test" (p. 84). The test yields an alpha coefficient between 0 (unreliable) and 1 (perfectly reliable) (Cohen, et al., 2007, p. 506).

5.5 Interpretation

In order to interpret the results of the pilot study in light of the research question, 'do cultural risk worldviews correlate with perceptions of entry and access control risk proposed by Cultural Cognition?', a reference map was developed using the expected risk perceptions of Cultural Cognition worldviews for security risks (see Chapter 3, Figure 3.3). Whether a particular quadrant represents skepticism or sensitivity to security risk is dependent upon the way in which risk perception is influenced by the cultural bias associated with the worldviews of that quadrant (Table 5.8).
Table 5.8
*Influence of cultural bias on perceptions of security risk for each world view*

<table>
<thead>
<tr>
<th>Worldview</th>
<th>Perception of Security Risk</th>
<th>Influence of cultural bias on security risk perception</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egalitarian</td>
<td>Skeptical</td>
<td>Perceive security controls as a threat to their sense of equity (Tsohou, et al., 2006, p. 209).</td>
</tr>
<tr>
<td>Individualist</td>
<td>Skeptical</td>
<td>Perceive security controls to be a restriction of individual freedoms (Tsohou, et al., 2006, p. 209). Are likely to promote their own short term self interest over the benefit of the organisation (Mars, 1996, p. 4).</td>
</tr>
<tr>
<td>Hierarchist</td>
<td>Sensitive</td>
<td>Perceive breaches of security controls as a threat to the established social order and a challenge to authority (Tsohou, et al., 2006, p. 209).</td>
</tr>
<tr>
<td>Communitarian</td>
<td>Sensitive</td>
<td>Perceive breaches of security controls as risking the wellbeing of the community for individual self interest (Kahan, et al., 2006, p. 22).</td>
</tr>
</tbody>
</table>

5.5.1 The Influence of Cultural Bias on Risk Perception

When the data from all responses to the research instrument were mapped onto the spatial representation of Cultural Cognition’s Grid/Group typology (Figure 5.5), the spatial map revealed that the Doctor and Nurses could be identified as Hierarchical-Individualists, and the PCA could be identified as being a Hierarchical-Communitarian (Table 5.9).

Table 5.9
*Worldview of cohorts according to spatial map quadrants.*

<table>
<thead>
<tr>
<th>Hierarchical-Individualists</th>
<th>Nurses</th>
<th>Doctor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hierarchical-Communitarians</td>
<td>PCA</td>
<td>x</td>
</tr>
<tr>
<td>Egalitarian-Communitarians</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Egalitarian-Individualists</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

The Wilcoxon signed-rank test was then used to determine the correlation between cultural risk worldviews and perceptions of entry and access control risk as proposed by Cultural Cognition by comparing responses to Cultural Cognition and access control questions (see Table 5.6). It was found that the three cohorts’ perceptions of entry and access control risk were “significantly correlated with how high or low a point [their Cultural Cognition] worldview occupied along the relevant worldview dimensions” (Kahan, 2008, p. 6). This finding was supported by previous Cultural Cognition studies which have demonstrated that individuals select their risk perceptions according to their cultural adherence (Kahan, 2002; Kahan, Braman, Gastil, et al., 2007; Kahan, Braman,

It was reasoned that as there was no statistically significant difference between the Cultural Cognition and access control responses, the questions used in the survey instrument could give an accurate comparison of cultural worldviews and security risk perceptions as proposed by Cultural Cognition. When the data which had been divided into Cultural Cognition and access control responses were mapped onto the spatial representation, it was demonstrated that the PCA cohort occupied a higher grid location than the Nurse cohort, and the Nurse cohort a higher grid location than the Doctor cohort in their responses to Cultural Cognition questions (see Figure 5.6).

This finding was supported by Bovens (1998, p. 121), who states that the greater an individual’s authority, the fewer inhibitions they have in regards to their position within the organisation. The PCA cohort held the least authority of the three cohorts, and as such, would be more likely to be bound by the social order (Douglas, 1978; Kahan, Slovic, et al., 2008, p. 4). The Nurse cohort was demonstrated to have less preference for Hierarchism than the PCA cohort, but more than the Doctor cohort, indicative of their greater authority than PCA’s, but lower than Doctors. The Doctor cohort had the most authority, and therefore less of a preference for authority-based social organisation than the PCA or Nurse cohort (Kahan, Slovic, et al., 2008, p. 4).

This finding is supported by Douglas (1978, p. 8) and Bovens (1998, p. 121) who suggest that authority and adherence to high-grid ways of life and related, and that those with the least decision making authority, such as PCA’s, are generally feel a greater sense of being bound by rules than do those with greater decision making authority, such as Doctors and Nurses (Douglas, 1978, p. 8).

When the responses to the access control questions were mapped onto the spatial representation, it was demonstrated that the Doctor and PCA cohorts perceived security controls as a restriction of individual freedoms (see Figure 5.8). However, they saw security risks as a threat to their preference for forms of social organisation that reflect authority (Kahan, Slovic, et al., 2008, p. 4) (see Figure 5.8). The Nurse cohort also considered security controls as a threat to their individual freedoms, but perceived security risks as less of a threat to social order and authority than did PCA’s and
Doctors, and more of a threat to their sense of equity (Tsohou, et al., 2006, p. 209) (see Figure 5.8).

It was found that the standard deviation of the Nurse cohort revealed a smaller variance in opinion ($SD = 0.39$) (see Table 5.3) compared to the variance in opinion of those surveyed in the Ward ($SD = 0.48$) (see Table 5.4). This finding was supported by previous studies in Cultural Cognition which have found that *identity protective cognition* occurs in cohesive groups which tend to form more homogeneous beliefs and conform to worldviews that are dominant within their own self-defined reference groups (Kahan, 2008, p. 11; Kahan & Braman, 2005, p. 154). The results of the reliability analysis revealed a high alpha coefficient on the Individualist-Communitarian scale ($\alpha = 0.77$), which was an encouraging indication that the modified Cultural Cognition survey instrument used in this study had validity and might approach the reliability of the instrument developed by Kahan, Braman, Slovic et al. (2007) when used with a larger sample size.

**5.6 Study Limitations and Modifications**

There were several aspects of the pilot study that limited the analysis of results. As the pilot study comprised of only 5 respondents from a single Ward, determining whether there was any statistically significant difference in opinion between cohorts on different Wards was unattainable. In addition, there was only one respondent for the Doctor cohort and one for the PCA cohort, making it impossible to determine whether the opinions and risk perceptions of those individuals was representative of those cohorts, and whether the interpretation of the results was accurate. The Cronbach's alpha coefficient (see Table 5.5) revealed the Individualist-Communitarian scale to be highly reliable ($\alpha = 0.77$). However the reliability of the Hierarchy-Egalitarian scale ($\alpha = -0.86$) could not be determined as the reliability analysis returned a negative result. As no coding or data errors could be identified, the negative alpha was determined to be a result of the small sample size (Garson, 2010).

The pilot study revealed several unexpected issues but also helped to clarify the methodological approach for the main study. From the analysis of the pilot study results, it was decided that should the data of the main study not met the assumptions of normality for the paired t-test, then non-parametric tests would be used to determine any correlations. It was determined that when a response fell within either the Hierarchical-
Individualist or Egalitarian-Communitarian quadrants of the spatial map, the response should be assessed according to its position relative to each scale. For example, the PCA cohort’s access control response would be considered more risk sensitive (Hierarchical) than skeptical (Individualist), and the Nurse cohort’s response more risk skeptical (Individualist) than sensitive (Hierarchical) on the grid scale (see Figure 5.8). It was also decided that using the median score of each scale was a more defensible approach than using the midpoint of the Likert scale for the X and Y axis of the spatial maps. The pilot study also highlighted the need to reverse-score the responses to the Egalitarian and Communitarian questions.

5.7 Conclusion
This chapter presented details of the pilot study which applied the study design by measuring responses to the survey instrument onto spatial maps and performing statistical analysis, including normality, non-parametric, and reliability tests. The results were interpreted according to the literature. The data collection instrument, collection procedure, and data analysis were discussed, and spatial maps presented the results of the analysis. Finally, discussion on the interpretation of the results, the limitations of the pilot study, and modifications to the main study were presented. The pilot study was completed by one Doctor, one PCA and three Nurses from a single Ward. The data collection instrument based on Cultural Cognition included four access control risk perception questions developed for this study. The mean worldview of each cohort was calculated along with the standard deviations of occupation and Ward. The means of the responses overall were measured onto a spatial map, and then separated into Cultural Cognition and security risk perception questions which were mapped and overlayed.

A Shapiro-Wilk normality test was performed before using a Mann-Whitney and Wilcoxon signed-rank test to determine statistical significance of the results. Finally, Cronbach’s alpha coefficient was used to determine the reliability of the research instrument. The analysis of the results revealed a significant correlation between cultural risk worldviews and the perceptions of entry and access control risk proposed by Cultural Cognition, indicating that the cohorts had selected their risk perceptions according to their cultural adherence. Although the pilot study was limited by a small sample size from a single Ward, it clarified the comparison of worldviews and risk perceptions, refined the statistical approach to be taken with the main study, and helped to identify the best approach for defining the axes of the spatial maps.
CHAPTER 6
ANALYSIS OF RESULTS

6.1 Introduction
This chapter presents the results of the analysis of data from the main study. A brief overview of the environment in which the survey was conducted is presented, together with an overview of the data collection procedure. The results of the statistical measures and tests performed on the data are then presented, together with spatial maps based on Cultural Cognition's grid/group typology. This chapter concludes with a summary of the results presented.

6.2 The Surveyed Environment
The surveys were conducted in a large metropolitan public hospital within three of its general specialist Wards. The hospital employs around 4,700 staff members, with each Ward not typically exceeding 60 staff members and between 36 and 50 of those comprised of Doctors, Nurses, and Patient Care Assistants (PCA’s). Each of the Wards in which the surveys were conducted typically care for patients of a similar demographic. A sample of Doctors, Nurses and PCA’s were surveyed from each of the three Wards. The responses to the research instrument were further subdivided into 15 cohorts for analysis (see Table 4.1).

6.3 Data Collection Procedure
The data collection instrument used for the main study (see Appendix A) remained unchanged from the questionnaire used in the pilot study (see Chapter 5, Section 5.2). The questionnaire was based on an instrument developed by the Cultural Cognition Project (Kahan, 2008; Kahan, Braman, Slovic, et al., 2007) for the theory’s two-scale approach (see Appendix B), and included four questions relating to entry and access control risk perceptions (see Chapter 3, Section 3.4).

The procedure for data collection also remained unchanged from the pilot study. Respondents were asked to make a mark anywhere along a 10-point Likert scale to indicate the extent to which they agreed or disagreed with each statement. The survey was completed by five Doctors, eight PCA’s and 34 Nurses from three different Wards with a 78% response rate. Of the 47 surveys completed, three were either incomplete or completed incorrectly.
6.4 Analysis of Data

The data were obtained from the questionnaires by making a physical measurement of the distance between one end of the scale and the respondents' mark, allowing their level of agreement or disagreement with each statement to be rated between 1 and 10. The responses to the Egalitarian and the Communitarian questions were reverse scored to ensure the responses on each scale were being measured in the same direction. The collected data results were analysed using the SPSS statistical analysis software (see Table 5.1). The mean scores of the responses on each scale were measured for the three Wards (Table 6.1).

Table 6.1
Mean scores for each Cultural Cognition scale.

<table>
<thead>
<tr>
<th>Ward</th>
<th>Scale</th>
<th>Doctor</th>
<th>Nurses</th>
<th>PCA</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Hierarchist-Egalitarian</td>
<td>5.11</td>
<td>5.35</td>
<td>5.63</td>
</tr>
<tr>
<td>A</td>
<td>Individualist-Communitarian</td>
<td>5.75</td>
<td>4.78</td>
<td>4.70</td>
</tr>
<tr>
<td>B</td>
<td>Hierarchist-Egalitarian</td>
<td>4.37</td>
<td>5.39</td>
<td>5.87</td>
</tr>
<tr>
<td>B</td>
<td>Individualist-Communitarian</td>
<td>6.51</td>
<td>5.68</td>
<td>5.32</td>
</tr>
<tr>
<td>C</td>
<td>Hierarchist-Egalitarian</td>
<td>3.44</td>
<td>4.86</td>
<td>6.95</td>
</tr>
<tr>
<td>C</td>
<td>Individualist-Communitarian</td>
<td>5.67</td>
<td>5.48</td>
<td>6.41</td>
</tr>
</tbody>
</table>

The standard deviations of each cohort for each scale were then measured, together with the mean response for each Ward and the overall standard deviation for each Ward. A standard deviation that is close to the mean infers that there is relatively little variation in the measured opinions, whereas standard deviations further from the mean infer greater variation. The amount of variance in opinion within each Ward was determined by measuring the standard deviations of each cohort within each Ward, and of the Ward overall (Table 6.2).
Table 6.2
*Standard deviations by Ward.*

<table>
<thead>
<tr>
<th>Ward</th>
<th>Cohort</th>
<th>SD of Hierarchy-Egalitarian</th>
<th>SD of Individualist-Communitarian</th>
<th>Mean response for Ward</th>
<th>Total SD of Ward responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Nurses</td>
<td>2.64</td>
<td>2.80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>Doctors</td>
<td>2.12</td>
<td>2.31</td>
<td>5.11</td>
<td>0.54</td>
</tr>
<tr>
<td>A</td>
<td>PCA's</td>
<td>2.74</td>
<td>3.67</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Nurses</td>
<td>2.26</td>
<td>2.40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Doctors</td>
<td>1.54</td>
<td>1.25</td>
<td>5.53</td>
<td>0.66</td>
</tr>
<tr>
<td>B</td>
<td>PCA's</td>
<td>2.78</td>
<td>2.86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Nurses</td>
<td>2.19</td>
<td>2.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Doctors</td>
<td>1.40</td>
<td>2.11</td>
<td>5.23</td>
<td>0.39</td>
</tr>
<tr>
<td>C</td>
<td>PCA's</td>
<td>2.39</td>
<td>1.51</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The variance in opinion within the cohorts was determined by measuring the standard deviation of each cohort for each scale across all Wards, together with the mean response and standard deviation for each cohort (Table 6.3).

Table 6.3
*Standard deviations (SD) by cohort.*

<table>
<thead>
<tr>
<th>Cohort</th>
<th>Mean response of the cohort</th>
<th>Total standard deviation of the cohort</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurses</td>
<td>5.26</td>
<td>0.27</td>
</tr>
<tr>
<td>Doctors</td>
<td>5.26</td>
<td>0.44</td>
</tr>
<tr>
<td>PCA’s</td>
<td>5.58</td>
<td>0.74</td>
</tr>
</tbody>
</table>

6.4.1 Statistical Tests and Spatial Maps

The data was tested for normality using a Shapiro-Wilk test which revealed that the data from the Hierarchy-Egalitarian scale $W (440) = 0.00, p < 0.05$, and the data from the Individualism-Communitarianism scale $W (440) = 0.00, p < 0.05$, were both significantly non-normal. It was also found that although the amount of skew for the Hierarchy-Egalitarian scale ($z = 1.25, p > 0.05$) and the Individualist-Communitarian scale ($z = 0.99, p > 0.05$) were small, and the sample size was greater than 30 respondents, there was significant Kurtosis for the Hierarchy-Egalitarian scale ($z = 3.84, p < 0.05$) and the Individualism-Communitarianism scale ($z = 4.25, p < 0.05$), indicating that the t-test would not be robust to the violation of the assumption of normality (Field, 2009, p. 139). As a result, non-parametric tests of statistical significance were employed.
The Mann-Whitney test was used to determine whether there were any statistically significant differences between the means of each group. According to Field (2009), the Mann-Whitney test is “useful when your data violate the assumptions of parametric data” (p. 345). The Wilcoxon signed-rank test was also used to determine whether there was any statistically significant differences in the responses of the three cohorts to the Cultural Cognition and access control questions. Field (2009) states that the Wilcoxon signed-rank test is useful in situations where “there are two sets of scores to compare, but the scores come from the same participants... [it is] the non-parametric equivalent of the dependent t-test” (p. 552).

In addition to these statistical tests, the mean responses were mapped onto spatial representations of Cultural Cognition’s grid/group typology. In creating the spatial maps for the pilot study (see Chapter 5, Section 5.4.1), it was determined that Kahan, Braman, Gastil, Slovic, and Mertz’s (2007, p. 477) approach of using the median score of each scale as the reference point for the X and Y axis, was both logical and defensible. As a result, mean responses were measured onto spatial maps using the median scores of the data set from the Hierarchy-Egalitarian ($Mdn = 5$) and Individualism-Communitarian ($Mdn = 5.6$) scales for the X and Y axis. A spatial map was developed based on the mean scores of the Doctor cohort from each Ward (Figure 6.1).
Figure 6.1. Overall mean responses of the Doctor cohort from each Ward.

The Mann-Whitney test was used to compare the responses of the three cohorts between the three Wards. The test showed that the mean responses of the Doctor cohort from each Ward were significantly similar on both scales (Table 6.4).

Table 6.4
Mann-Whitney test for the Doctor cohort.

<table>
<thead>
<tr>
<th>Wards</th>
<th>Scale</th>
<th>Mann-Whitney test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ward A &amp; Ward B</td>
<td>Hierarchy-Egalitarian</td>
<td>U = 36.5, z = -1.04, p &gt; 0.05</td>
</tr>
<tr>
<td></td>
<td>Individualist-Communitarian</td>
<td>U = 37.0, z = -0.99, p &gt; 0.05</td>
</tr>
<tr>
<td>Ward A &amp; Ward C</td>
<td>Hierarchy-Egalitarian</td>
<td>U = 26.5, z = -1.78, p &gt; 0.05</td>
</tr>
<tr>
<td></td>
<td>Individualist-Communitarian</td>
<td>U = 50.0, z = 0.00, p &gt; 0.05</td>
</tr>
<tr>
<td>Ward B &amp; Ward C</td>
<td>Hierarchy-Egalitarian</td>
<td>U = 25.5, z = -1.88, p &gt; 0.05</td>
</tr>
<tr>
<td></td>
<td>Individualist-Communitarian</td>
<td>U = 50.0, z = 0.00, p &gt; 0.05</td>
</tr>
</tbody>
</table>
The data was then separated according to the questions that determined attitudes towards access controls, and the Cultural Cognition questions unrelated to security. These were then overlayed on a single spatial map (Figure 6.2).

Figure 6.2. Mean responses of the Doctor cohort from each Ward to access control and Cultural Cognition questions.

The Wilcoxon signed-rank test revealed that mean responses of the Doctor cohort to the Cultural Cognition and access control questions were significantly similar (Table 6.5).

Table 6.5

<table>
<thead>
<tr>
<th>Ward</th>
<th>Wilcoxon signed rank test</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>( T = 1 ) ( p &gt; 0.05 )</td>
</tr>
<tr>
<td>B</td>
<td>( T = 1 ) ( p &gt; 0.05 )</td>
</tr>
<tr>
<td>C</td>
<td>( T = 4 ) ( p &gt; 0.05 )</td>
</tr>
</tbody>
</table>
A spatial map was then developed based on the mean scores of the Nurse cohort from each Ward (Figure 6.3).

![Spatial Map Diagram]

**Figure 6.3.** Overall mean responses of the Nurse cohort from each Ward.

The Mann-Whitney test showed that the mean responses of the Nurse cohort from each Ward were significantly similar on both scales (Table 6.6).

<table>
<thead>
<tr>
<th>Wards</th>
<th>Scale</th>
<th>Mann-Whitney test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ward A &amp; B</td>
<td>Hierarchy-Egalitarian</td>
<td>$U = 47.0$</td>
</tr>
<tr>
<td></td>
<td>Individualist-Communitarian</td>
<td>$z = -0.23$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$p &gt; 0.05$</td>
</tr>
<tr>
<td>Ward A &amp; C</td>
<td>Hierarchy-Egalitarian</td>
<td>$U = 37.0$</td>
</tr>
<tr>
<td></td>
<td>Individualist-Communitarian</td>
<td>$z = -0.98$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$p &gt; 0.05$</td>
</tr>
<tr>
<td>Ward B &amp; C</td>
<td>Hierarchy-Egalitarian</td>
<td>$U = 37.0$</td>
</tr>
<tr>
<td></td>
<td>Individualist-Communitarian</td>
<td>$z = -0.99$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$p &gt; 0.05$</td>
</tr>
</tbody>
</table>

Table 6.6  
*Mann-Whitney test for the Nurse cohort.*
The access control and Cultural Cognition responses for the Nurse cohort were then overlayed on a single spatial map (Figure 6.4).

![Diagram showing access control and Cultural Cognition responses for the Nurse cohort on a single spatial map.]

**Figure 6.4.** Mean responses of the Nurse cohort from each Ward to access control and Cultural Cognition questions.

The Wilcoxon signed-rank test revealed that mean responses of the Nurse cohort to the Cultural Cognition and access control questions were significantly similar (Table 6.7).

<table>
<thead>
<tr>
<th>Ward</th>
<th>Wilcoxon signed rank test</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$T = 4$</td>
</tr>
<tr>
<td>B</td>
<td>$T = 3$</td>
</tr>
<tr>
<td>C</td>
<td>$T = 4$</td>
</tr>
</tbody>
</table>

Table 6.7

**Wilcoxon signed-rank test for the Nurse cohort.**
A spatial map was then developed based on the mean scores of the PCA cohort from each Ward (Figure 6.5).

![Spatial Map](image)

**Figure 6.5.** Overall mean responses of the PCA cohort from each Ward.

The Mann-Whitney test showed that the mean responses of the PCA cohort from each Ward were significantly similar on both scales (Table 6.8).

**Table 6.8**

*Mann-Whitney test for the PCA cohort.

<table>
<thead>
<tr>
<th>Wards</th>
<th>Scale</th>
<th>Mann-Whitney test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ward A &amp; Ward B</td>
<td>Hierarchy-Egalitarian</td>
<td>U = 45.0 z = -0.38 p &gt; 0.05</td>
</tr>
<tr>
<td></td>
<td>Individualist-Communitarian</td>
<td>U = 40.0 z = -0.76 p &gt; 0.05</td>
</tr>
<tr>
<td>Ward A &amp; Ward C</td>
<td>Hierarchy-Egalitarian</td>
<td>U = 49.0 z = -0.08 p &gt; 0.05</td>
</tr>
<tr>
<td></td>
<td>Individualist-Communitarian</td>
<td>U = 40.0 z = -0.75 p &gt; 0.05</td>
</tr>
<tr>
<td>Ward B &amp; Ward C</td>
<td>Hierarchy-Egalitarian</td>
<td>U = 37.5 z = -0.95 p &gt; 0.05</td>
</tr>
<tr>
<td></td>
<td>Individualist-Communitarian</td>
<td>U = 26.0 z = -1.81 p &gt; 0.05</td>
</tr>
</tbody>
</table>
The access control and Cultural Cognition responses for the PCA cohort were then overlayed on a single spatial map (Figure 6.6).

![Figure 6.6](image.png)

**Figure 6.6.** Mean responses of the PCA cohort from each Ward to access control and Cultural Cognition questions.

The Wilcoxon signed-rank test revealed that mean responses of the PCA cohort to the Cultural Cognition and access control questions were significantly similar (Table 6.9).

<table>
<thead>
<tr>
<th>Ward</th>
<th>Wilcoxon signed rank test</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$T = 2$</td>
</tr>
<tr>
<td>B</td>
<td>$T = 6$</td>
</tr>
<tr>
<td>C</td>
<td>$T = 1$</td>
</tr>
</tbody>
</table>
The overall mean responses of each cohort from each Ward were then overlayed on a single spatial map to determine spread of the various cohorts (Figure 6.7).

*Figure 6.7.* Overall mean responses of each cohort from each Ward.
The spatial map of the overlayed mean responses of each cohort from each Ward was then enlarged for detail (Figure 6.8).

Figure 6.8. Overall mean responses of each cohort from each Ward (enlarged for detail).

The Mann-Whitney test was used to compare the three cohorts within each Ward. The results of the test demonstrated that the mean responses of each cohort from each Ward were significantly similar apart from Ward B Doctors and Nurses, Ward C Doctors and PCA’s, and Ward C Doctors and Nurses on the Hierarchy-Egalitarian scale (Table 6.10).
Table 6.10
Mann-Whitney test between all cohorts within each Ward.

<table>
<thead>
<tr>
<th>Cohort</th>
<th>Ward</th>
<th>Scale</th>
<th>Mann-Whitney test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurses &amp; PCA’s</td>
<td>Ward A</td>
<td>Hierarchy-Egalitarian</td>
<td>$U = 48.0$ $z = -0.15$ $p &gt; 0.05$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Individualist-Communitarian</td>
<td>$U = 41.0$ $z = -0.68$ $p &gt; 0.05$</td>
</tr>
<tr>
<td>Doctors &amp; PCA’s</td>
<td>Ward A</td>
<td>Hierarchy-Egalitarian</td>
<td>$U = 44.0$ $z = -0.45$ $p &gt; 0.05$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Individualist-Communitarian</td>
<td>$U = 40.0$ $z = -0.76$ $p &gt; 0.05$</td>
</tr>
<tr>
<td>Doctors &amp; Nurses</td>
<td>Ward A</td>
<td>Hierarchy-Egalitarian</td>
<td>$U = 46.0$ $z = -0.30$ $p &gt; 0.05$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Individualist-Communitarian</td>
<td>$U = 33.0$ $z = -1.29$ $p &gt; 0.05$</td>
</tr>
<tr>
<td>Nurses &amp; PCA’s</td>
<td>Ward B</td>
<td>Hierarchy-Egalitarian</td>
<td>$U = 40.0$ $z = -0.76$ $p &gt; 0.05$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Individualist-Communitarian</td>
<td>$U = 40.0$ $z = -0.76$ $p &gt; 0.05$</td>
</tr>
<tr>
<td>Doctors &amp; PCA’s</td>
<td>Ward B</td>
<td>Hierarchy-Egalitarian</td>
<td>$U = 25.0$ $z = -1.90$ $p &gt; 0.05$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Individualist-Communitarian</td>
<td>$U = 27.0$ $z = -1.70$ $p &gt; 0.05$</td>
</tr>
<tr>
<td>Doctors &amp; Nurses</td>
<td>Ward B</td>
<td>Hierarchy-Egalitarian</td>
<td>$U = 5.50$ $z = -3.42$ $p &lt; 0.05$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Individualist-Communitarian</td>
<td>$U = 32.0$ $z = -1.36$ $p &gt; 0.05$</td>
</tr>
<tr>
<td>Nurses &amp; PCA’s</td>
<td>Ward C</td>
<td>Hierarchy-Egalitarian</td>
<td>$U = 46.0$ $z = -0.30$ $p &gt; 0.05$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Individualist-Communitarian</td>
<td>$U = 34.0$ $z = -1.20$ $p &gt; 0.05$</td>
</tr>
<tr>
<td>Doctors &amp; PCA’s</td>
<td>Ward C</td>
<td>Hierarchy-Egalitarian</td>
<td>$U = 16.0$ $z = -2.60$ $p &lt; 0.05$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Individualist-Communitarian</td>
<td>$U = 45.5$ $z = -0.34$ $p &lt; 0.05$</td>
</tr>
<tr>
<td>Doctors &amp; Nurses</td>
<td>Ward C</td>
<td>Hierarchy-Egalitarian</td>
<td>$U = 19.0$ $z = -2.35$ $p &lt; 0.05$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Individualist-Communitarian</td>
<td>$U = 46.0$ $z = -0.30$ $p &gt; 0.05$</td>
</tr>
</tbody>
</table>

The access control and Cultural Cognition responses of each cohort from each Ward were then overlayed on a single spatial map (Figure 6.9).

Figure 6.9. Overall mean responses of each cohort from each Ward to access control and Cultural Cognition questions.
The spatial map presenting the overlayed responses of each cohort from each Ward to access control and Cultural Cognition questions was then enlarged to provide detail (Figure 6.10).

![ Spatial map of cohort responses to access control and Cultural Cognition questions. ]

**Figure 6.10.** Overall mean responses of each cohort from each Ward to access control and Cultural Cognition questions (enlarged).

The Wilcoxon signed-rank test revealed that mean responses of each cohort across all three Wards to the Cultural Cognition and access control questions were significantly similar (Table 6.11).

<table>
<thead>
<tr>
<th>Cohort</th>
<th>Wilcoxon signed rank test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctor</td>
<td>$T = 1$ \quad $p &gt; 0.05$</td>
</tr>
<tr>
<td>Nurse</td>
<td>$T = 4$ \quad $p &gt; 0.05$</td>
</tr>
<tr>
<td>PCA</td>
<td>$T = 3$ \quad $p &gt; 0.05$</td>
</tr>
</tbody>
</table>
6.4.2 Measure of Reliability

The reliability of both the Hierarchy-Egalitarian and the Individualist-Communitarian scales used in the survey instrument (see Appendix A) were measured using Cronbach’s alpha coefficient (α) (Table 6.12).

Table 6.12
Cronbach’s alpha for each scale using the entire data set.

<table>
<thead>
<tr>
<th>Scale</th>
<th>α</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hierarchy-Egalitarian</td>
<td>0.52</td>
</tr>
<tr>
<td>Individualist-Communitarian</td>
<td>0.65</td>
</tr>
</tbody>
</table>

6.5 Conclusion

This chapter presented the results of the analysis of data from the main study. The study was conducted in a large metropolitan public hospital within three of its general specialist Wards. A sample of Doctors, Nurses and PCA’s were surveyed from each of the three Wards, and these responses were further subdivided into 15 cohorts for analysis. The data collection instrument and collection procedure remained unchanged from the pilot study. The survey was completed by five Doctors, eight PCA’s and 34 Nurses from three different Wards with a 78% response rate. The collected data results were analysed using the SPSS statistical analysis software.

The mean scores of the responses on each scale were presented, together with the standard deviations of each cohort for each scale. Non-parametric statistical analysis techniques were used due to non-normality of the data set. The Mann-Whitney test and the Wilcoxon signed-rank test were used to test for statistically significant correlations and differences within the data. In addition to these statistical tests, the mean responses were mapped onto spatial representations of Cultural Cognition’s grid/group typology. Finally, Cronbach’s alpha coefficient was used to determine the reliability of the research instrument and of the Cultural Cognition questions.
CHAPTER 7

INTERPRETATIONS

7.1 Introduction
This chapter presents the interpretations of the analysis of data. An overview of the analysis is presented, before a reintroduction of the research question. The correlation found between cultural worldviews and security risk perceptions is presented, and the influence of organisational cultures on cultural worldviews and security risk perceptions is discussed. The chapter also presents the findings of identity protective cognition among the surveyed cohorts, before concluding with an interpretation of the reliability and validity of the results.

7.2 Cultural Cognition Theory and Operational Security Cultures
The purpose of the study was to determine whether cultural risk worldviews correlate with perceptions of entry and access control risk as proposed by Cultural Cognition. This study measured mean cultural worldviews and perceptions of entry and access control risk of three groups of cohorts from three different hospital Wards onto spatial maps based on the theory of Cultural Cognition's grid/group typology (Kahan, 2008, p. 6). The three hospital Wards had similar patient numbers and demographics. The three Wards had varying access control arrangements, with Wards A and B being closed Wards with limited public access. Ward C was an open Ward, with open public access. The entry and access control arrangements for the three Wards were based on different premises. Ward A's access control arrangements were largely in place for security purposes, whereas Ward B's access control arrangements were designed for infection control. Ward C had no access control arrangements beyond what was necessary to maintain the security of pharmaceuticals.

7.3 Response to the Research Question
The research question 'do cultural risk worldviews correlate with perceptions of entry and access control risk as proposed by Cultural Cognition?' was addressed through the creation of the spatial maps and by calculating correlations between mean cultural worldviews and perceptions of entry and access control risk using Mann-Whitney and Wilcoxon signed-rank non-parametric tests. A reliability analysis was performed to assess the reliability and validity of the research instrument and the Cultural Cognition methodology.
7.3.1 The Correlation of Cultural Worldviews and Security Risk Perceptions

The Wilcoxon signed-rank test was used to determine the correlation between cultural risk worldviews (Table 7.1) and perceptions of entry and access control risk as proposed by Cultural Cognition (see Table 5.6).

Table 7.1
The four Cultural Cognition worldviews.

<table>
<thead>
<tr>
<th>Hierarchy</th>
<th>High-Grid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egalitarian</td>
<td>“Denies that social characteristics should matter in how resources, opportunities, duties and the like are distributed” (Kahan &amp; Braman, 2005, p. 151)</td>
</tr>
<tr>
<td>Individualist</td>
<td>“Individuals are expected to secure their own needs without collective assistance, and in which individual interests enjoy immunity from regulation aimed at securing collective interests” (Kahan &amp; Braman, 2005, p. 151)</td>
</tr>
<tr>
<td>Communitarian</td>
<td>“Collective needs trump individual initiative, and in which society is expected to secure the conditions of individual flourishing” (Kahan &amp; Braman, 2005, p. 151)</td>
</tr>
</tbody>
</table>

The test demonstrated that, for all cohorts, there was a significant correlation between cultural risk worldviews and perceptions of entry and access control risk (see Chapter 6, section 6.4.1). This finding demonstrated that the cohorts had selected their risk perceptions according to their cultural adherence and that their perceptions of entry and access control risk were “significantly correlated with how high or low a point [their] worldview occupied along the relevant worldview dimensions” (Kahan, 2008, p. 6), supported by previous Cultural Cognition studies (Kahan, 2002; Kahan, Braman, Gastil, et al., 2007; Kahan, Braman, Slovic, et al., 2007, 2008; Kahan, Slovic, et al., 2008).

7.3.2 The Influence of Organisational Culture on Worldviews and Risk Perceptions

The results of the analysis also provided evidence that organisational cultures influenced worldviews and risk perceptions. This finding is supported by previous studies in Cultural Risk which have found that each mode of social organisation selects its own risk agenda as a method of expressing and reinforcing values (Douglas &
Wildavsky, 1982; Kahan, 2007). The organisational stratifications of occupation and Ward were demonstrated to have an impact on both cultural worldviews and security risk perceptions (see Chapter 6, section 6.4.1).

7.3.2.1 Occupation and Cultural Worldviews

The spatial map of the overall mean responses of each cohort from each Ward demonstrated that, with some overlap, the Patient Care Assistant (PCA) cohort generally occupied a higher grid location than the Nurse cohort, and the Nurse cohort a higher grid location than the Doctor cohort (Figure 7.1).

![Figure 7.1](image)

Figure 7.1. Mean worldviews of the three cohorts relative to the grid axis.

This finding may be ascribed to the relative differences in the occupations surveyed and their comparative levels of authority. The term grid refers to the rules which the various cohorts are subject to, and those with the least decision making authority (such as PCA's) are generally bounded by more rules than those with greater decision making authority (such as Doctors and Nurses) (Douglas, 1978, p. 8). This position is supported by Bovens (1998, p. 121), who states that the greater an individual's authority, the fewer inhibitions they have in regards to their position within the organisation. Therefore those cohorts with more authority demonstrated greater adherence to the
Egalitarian worldview, which subscribes to more equitable and less stratified forms of social organisation compared to cohorts with less authority (see Table 7.1).

It was also demonstrated that the majority of the PCA cohort was located lower on the group axis than the majority of the Nurse cohort, and the Nurse cohort was located lower on the group axis than the Doctor cohort (Figure 7.2).

![Diagram showing worldviews of three cohorts relative to the group axis.]

_Figure 7.2._ Mean worldviews of the three cohorts relative to the group axis.

This finding may also be ascribed to differences in the occupations. The ‘group’ concept is defined in terms of “the claims it makes over its constituent members, the boundary it draws around them, the rights it confers on them to use its name and other protections” (Douglas, 1978, p. 8). This view suggests that the Doctor cohort generally had a more distinct sense of group compared to Nurses and PCA’s due to their profession and relatively elevated status as autonomous practitioners (Carpenter, 1995, p. 152). Likewise the Nurse cohort generally demonstrated a more distinct sense of group compared to the PCA cohort.
7.3.2.2 Occupation and Security Risk Perceptions

The locations of the security risk perceptions of the three cohorts along the grid axis were shown to be statistically similar to the measured cultural worldviews. This finding was supported by previous studies which found that individuals select risk perceptions according to cultural adherence (Kahan, 2008, p. 6). It also indicated that security risk perceptions were influenced by the social stratification of occupation (Figure 7.3).

![Figure 7.3](image)

Figure 7.3. Location of the mean security risk perceptions of the three cohorts relative to the grid axis.

7.3.2.3 Ward Security Measures and Cultural Worldviews

The spatial maps also demonstrated that cultural worldviews were influenced by the organisational stratification of Ward. The two closed Wards (A and B) used entry and access control measures for security and infection control respectively, and the open Ward (C) used no entry and access control beyond securing pharmaceuticals. It was demonstrated that for each of the cohorts, the closed Wards (A and B) occupied more Hierarchical positions compared to the open Ward (C) (see Figure 7.1). It was expected that a difference in the worldviews between open and closed Wards would be evident, and this finding was supported by previous cultural risk studies (Kahan, et al., 2006; Tsouhou, et al., 2006, p. 209).
7.3.2.4 Ward Security Measures and Security Risk Perceptions

The security risk perceptions of the closed Wards (A and B) were demonstrated to occupy more security sensitive (see Chapter 6, section 6.4.1) locations on the grid axis (Hierarchy-Egalitarian) compared with the open Ward (C). This was not unexpected given the presence of entry and access control measures on the closed Wards; however, there was evidence of a combined influence of occupation and Ward security measures on risk perceptions. Doctors were demonstrated to be the most security risk sensitive of the cohorts on closed Wards (A and B), followed by Nurses and PCA’s (Table 7.2).

Table 7.2.
Relative positions on the grid and group axes by occupation and Ward.

<table>
<thead>
<tr>
<th>Ward</th>
<th>PCA Group</th>
<th>Nurse Group</th>
<th>Doctor Group</th>
<th>PCA Grid</th>
<th>Nurse Grid</th>
<th>Doctor Grid</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (Closed)</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
<td>High</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>B (Closed)</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
<td>High</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>C (Open)</td>
<td>High</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
<td>Medium</td>
<td>Low</td>
</tr>
</tbody>
</table>

The only departure from this pattern was the unexpected result of the PCA cohort from Ward C demonstrating a relatively high-group security risk perception in addition to the expected high-grid. However, it was shown that Ward C’s PCA cohort responded with the lowest-grid risk perception relative to the other two Wards. The three Wards had similar patient demographics, yet Ward C was the only Ward without some form of entry and access control. Therefore, without the ability to depend on technological enhancement to procedural security, the open Ward PCA cohort may have subscribed to more Communitarian security risk perceptions in lieu of the Hierarchical security risk perceptions associated with the PCA cohorts from the closed Wards.

7.3.3 Cultural Worldviews and Identity Protective Cognition

The Mann-Whitney test demonstrated that the worldviews of Nurses and PCA’s were significantly similar across all Wards. However, the Doctor cohort demonstrated a significant difference to the Nurse cohort on Ward B, and the Doctor cohort demonstrated a significant difference to both the Nurse and PCA cohorts on Ward C. When individuals engage in deliberations over risks, their individual biases are magnified and predominant risk perceptions emerge as the risk consensus, resulting in identity protective cognition (Kahan, et al., 2006, p. 12). Nurses and PCA’s work in a
similar capacity to one another compared with Doctors, and therefore Doctors are less likely than PCA’s to have their cultural worldviews polarise in the same way as Nurses (Kahan & Braman, 2005, p. 154).

Instead, Doctors are more likely to form a separate dominant worldview within their own self defined reference group. This separation is supported by the finding that although significant differences were observed between the mean worldviews of some of the Doctor, Nurse, and PCA cohorts, the cultural worldviews of Doctors, Nurses and PCA’s were significantly similar with their own cohorts across all three Wards. It was demonstrated that there was less variation in the opinions of both the Nurse cohort (SD = 0.27) and the Doctor cohort (SD = 0.44) across all three Wards than there was in either Ward A (SD = 0.54) or Ward B (SD = 0.66). This finding was supported by previous Cultural Cognition studies which have demonstrated the tendency for groups to conform to worldviews that are dominant within their own self-defined reference groups (Kahan, 2008, p. 11).

7.3.4 Reliability and Validity of the Study
The results of the study were shown to have both reliability and validity through the use of Cronbach’s alpha coefficient. For the study undertaken, the alpha scores of both the Hierarchy-Egalitarian scale (α = 0.52) and the Individualist-Communitarian scale (α = 0.65) were reasoned to be relatively high for two reasons. First, although the generally accepted value for Cronbach’s alpha is often stated to be between 0.70 and 0.80, values below 0.70 are not unexpected when dealing with psychological constructs (Field, 2009, p. 675; Kline, 1999). Second, the value of alpha is dependent on the number of items in the scale (Cortina, 1993). The research instrument used in this study (see Appendix A) relied on 10 items in each scale, whereas the original Cultural Cognition research instrument (see Appendix B) relied on 14 items for the Hierarchy-Egalitarian scale, and 15 items for the Individualism-Communitarianism scale.

When the two points above were taken into account, it was reasoned that the alpha coefficients calculated on the results of the study did approach the alpha scores of the Cultural Cognition instrument identified by Kahan (2008, p. 7). This provided evidence of replicability of results and indicated that it was likely to be cultural worldviews that were influencing risk perceptions, and not extraneous variables. It also indicated that the results of the study may be generalised, demonstrating the Cultural Cognition methodology’s reliability and validity.
7.4 Conclusion

This chapter presented the interpretations of the analysis of the data. An overview of the analysis was presented, before a reintroduction of the research question. The correlation found between cultural worldviews and security risk perceptions was presented, and the influence of organisational cultures on cultural worldviews and security risk perceptions discussed. The chapter also presented the findings of identity protective cognition among the surveyed cohorts, before concluding with an interpretation of the reliability and validity of the results. The study demonstrated that, for all cohorts, there was a significant correlation between cultural worldviews and perceptions of entry and access control risk, and that the cohorts had selected their risk perceptions according to their cultural adherence. The organisational and social stratifications of occupation and Ward were demonstrated to have an impact on both cultural worldviews and security risk perceptions. Occupational hierarchy and differing levels of authority were found to contribute to differences in worldviews and risk perceptions among the cohorts.

Ward security measures were also demonstrated to influence worldviews and security risk perceptions. All cohorts from Wards with entry and access control measures exhibited perceptions that were more security risk sensitive on the Hierarchy-Egalitarian scale compared to the open Ward. The only departure from this pattern was the unexpected result of the PCA cohort from Ward C demonstrating a relatively high-group and lower-grid security risk perception relative to the other PCA cohorts. This may be attributed to the lack of technological enhancement to procedural security on Ward C, despite similar patient demographics to the closed Wards.

The worldviews of the Nurse and PCA cohorts from each Ward were demonstrated to be significantly similar, as were the cultural worldviews of the Doctor cohort across all three Wards. However, there were significant differences between Doctors and the other cohorts in two of the three Wards, providing evidence of identity protective cognition among Nurses and PCA’s as one group, and among Doctors as another. Finally, it was reasoned that the alpha coefficients calculated on the results of the study demonstrated reliability and validity of the Cultural Cognition methodology.
CHAPTER 8
CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

8.1 Introduction
This chapter reviews the outcomes of the study and demonstrates the key findings. The limitations of this study are outlined, and recommendations are made, based on the outcomes and key findings. The key findings included the ability of the theory of Cultural Cognition to measure and represent cultural worldviews and security risk perceptions in a healthcare environment; that the social and organisational stratifications of occupation and Ward were shown to have an impact on cultural worldviews and perception of security risk; that there was evidence of identity protective cognition among the cohorts; and that the survey instrument and results were reliable and valid, demonstrating that cultural worldviews influence security risk perceptions. Limitations of the study included the small sample size and limitations of the research instrument. Finally, further studies aimed at integrating Cultural Cognition based strategies into risk management approaches are recommended. This chapter concludes with a summary of the key findings, the limitations and the recommendations of this study.

8.2 Study Outcomes
The purpose of the study was to assess the utility of the Cultural Cognition methodology in a security risk context by measuring competing worldviews and risk perceptions towards entry and access control measures between various cohorts in a healthcare environment. This was achieved by measuring the cultural biases of various cohorts within the environment and determining to what extent cultural worldviews correlated with perceptions of entry and access control risk. The study proposed that if the cultural risk worldviews as defined by Kahan (2008, p. 4) correlated with perceptions of entry and access control risk defined by Cultural Cognition, then this would indicate that the identification of cultural groups within an organisation could assist in determining the potential for security decay, as well as helping to identify more effective risk management strategies.

The methodology was designed to address the research question 'do cultural risk worldviews correlate with perceptions of entry and access control risk proposed by Cultural Cognition?', and to address the research outcomes (see Chapter 1, section 1.4).
The outcomes of the study were to determine whether the Cultural Cognition methodology is a valid and reliable tool for empirically testing the cultural theory of risk in a security context, the relationship between risk perceptions of entry and access control and cultural biases within a healthcare environment, and whether, in the context of the study, the findings justify further research into using Cultural Cognition for the measurement of security risk perceptions and security decay. The findings which supported these outcomes included significant correlations between cultural worldviews and security risk perceptions, the influence of social and organisational stratifications on risk perceptions, and evidence of the identity protective cognition mechanism identified by Cultural Cognition theory.

8.2.1 Cultural Worldviews and Risk Perception Correlations

There was a high level of correlation between cultural worldviews and perceptions of entry and access control risk (see Chapter 7, section 7.3.1). This finding demonstrated that the cohorts had selected their risk perceptions according to their cultural adherence and confirmed that, in the context of the study, cultural risk worldviews as defined by Kahan (2008, p. 4) correlated with perceptions of entry and access control risk as proposed by Cultural Cognition. This study indicated that the identification of cultural groups within an organisation could assist in determining the potential for security decay, as well as helping to identify more effective risk management strategies.

8.2.2 The Influence of Social and Organisational Stratifications

This study provided evidence that the organisational cultures and social stratifications of the surveyed cohorts had an influence on their cultural worldviews and risk perceptions. The cohorts whose occupation gave them greater authority within the organisation adhered less to socially stratified ways of life than did those cohorts with less organisational authority (see Figure 7.1). Those with less authority and status within the organisation adhered less to ways of life that promote the collective good over Individualism than did those with greater authority and status (see Figure 7.2). These differences in adherence to cultural worldviews were reflected in the responses of the cohorts to entry and access control risk perception questions (see Figure 7.3), indicating that the social and organisational stratifications that helped to define cultural worldviews of the cohorts were in turn influencing security risk perceptions.
8.2.3 **Evidence of Identity Protective Cognition**

This study found that although significant differences were observed between the mean worldviews of some of the Doctor, Nurse, and Patient Care Assistant (PCA) cohorts, the cultural worldviews of Doctors, Nurses and PCA’s were significantly similar with their own cohorts across all three Wards. This indicated that the different cohorts had formed dominant worldviews within their self-defined reference groups. The finding of identity protective cognition was also supported by results that demonstrated there was less variation in the opinions of both the Nurse cohort and the Doctor cohort across all three Wards than there was in either Ward A or Ward B. Such an outcome was supported by previous Cultural Cognition studies that have demonstrated the tendency for groups to conform to worldviews that are dominant within their own self-defined reference groups (Kahan, 2008, p. 11).

8.2.4 **The Influence of Cultural Worldviews on Risk Perception**

The results of the study were shown to have both reliability and validity through the use of Cronbach’s alpha coefficient. It was reasoned that when differences between the number of items in the research instrument used in this study (see Appendix A) and the Cultural Cognition instrument identified by Kahan (2008, p. 7) (see Appendix B) were taken into account, together with the lower alpha scores expected when dealing with psychological constructs (Field, 2009, p. 675; Kline, 1999), the results approached the reliability of Kahan’s (2008, p. 7) research instrument (see Appendix B), and suggested that it was cultural worldviews that were influencing risk perceptions and not extraneous variables. The results also suggested that the outcomes of the study may be generalised, demonstrating the reliability, validity, and replicability of the Cultural Cognition methodology.

8.3 **Study Limitations**

This section discusses the limitations of the study and the impact these limitations may have had on the results. The study was limited to a single organisation with an overall sample size of 47 respondents; however, once broken down by cohort and Ward, the sample sizes became quite small. The PCA cohort, which was anticipated to be a sample of nine respondents, was reduced to a sample size of six, due to two surveys being incorrectly completed out of the eight PCA surveys returned. Likewise the Doctor cohort, which was anticipated to be a sample of six, was reduced to a sample of five.
Splitting the responses to the survey instrument into Cultural Cognition questions and access control questions further reduced the sample size.

The distribution of the overall data set was also found to be significantly non-normal, owing to the relatively small sample size overall. A larger sample size of each cohort may provide a significantly normally distributed sample which would meet the assumptions of normality needed to use more robust parametric statistical analysis. In addition, the number of items used in the survey instrument (see Appendix A) were less than the instrument used by Kahan (2008, p. 7) (see Appendix B) by almost one third, which may have lowered the alpha scores found in this study compared with those found by Kahan (2008, p. 7) with the original Cultural Cognition survey instrument. Use of a survey instrument with the same number of Cultural Cognition items on each scale may yield alpha scores closer to those found by Kahan (2008, p. 7).

8.4 Recommendations Based on Study Outcomes

This study demonstrated that security risk perceptions are influenced by cultural worldviews, which are in turn influenced by social and organisational stratification. There are several issues associated with risk management and cultural bias that may directly benefit from the application of the Cultural Cognition methodology. These issues include the decay of security through poor employee participation in the security effort, the continuing effect of cultural bias on further risk mitigation strategies, and the difficulties associated with communicating risk messages to disparate cultural groups. Successful application of the Cultural Cognition methodology within a security risk management context may provide risk communication strategies that will allow for a cross-cultural risk consensus to be achieved among disparate cultural groups allowing risk mitigation strategies to receive more widespread support from the participants in the security effort.

An understanding of cultural-bias related risk issues should be built into risk management strategies in order to improve risk communication and employee participation in the security effort, and to reduce security decay. Achieving a greater understanding of cultural-bias related risk issues would require that larger studies which overcome the limitations of this research project be performed across several general environments in order to validate the findings of this study. Further research should then be performed to explore the potential security risk management and risk communication
applications of the Cultural Cognition mechanisms (see Chapter 2, section 2.6). Such research would provide an understanding of how Cultural Cognition mechanisms such as identity-protective cognition, biased assimilation and group polarisation may be overcome by structuring risk communication messages in culturally credible ways that enhance cultural-identity affirmation, thereby reducing the feeling of threat experienced by individuals when they are exposed to information that “challenges beliefs dominant within an important reference group” (Kahan, 2008, p. 18). Although there is no perception of risk that is free of some form of bias, the suppression of cultural cues that hamper successful risk mitigation outcomes will allow participants in the security effort to be reminded that when it comes to security, a good outcome is a good outcome for all.

8.5 Conclusion

This chapter reviewed the outcomes of the study and demonstrated the key findings, which included the ability of the theory of Cultural Cognition to measure and represent cultural worldviews and security risk perceptions in a healthcare environment; that the social and organisational stratifications of occupation and Ward were shown to have an impact on cultural worldviews and perception of security risk; that there was evidence of identity protective cognition among the cohorts; and that the survey instrument and results were reliable and valid, demonstrating that cultural worldviews influence security risk perceptions. The limitations of this study were outlined, and recommendations made, based on the outcomes and key findings. Limitations of the study included the small sample size and limitations of the research instrument. Further studies aimed at integrating Cultural Cognition based strategies into risk management approaches were recommended.
REFERENCE LIST


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APPENDIX A

Modified Cultural Cognition questionnaire

_Hierarchy-Egalitarianism_

- It seems like the criminals and welfare cheats get all the breaks, while the average citizen picks up the tab.
- We have gone too far in pushing equal rights in this country.
- It seems like ethnic and other minority groups don’t want equal rights, they want special rights just for them.
- A lot of problems in our society today come from the decline in the traditional family, where the man works and the woman stays home.
- Those who do not follow security and access control procedures have a disregard for authority.
- Discrimination against minorities is still a very serious problem in our society.
- We need to dramatically reduce inequalities between the rich and the poor, the majority and minorities, and men and women.
- Our society would be better off if the distribution of wealth was more equal.
- Everyone should follow security and access control procedures equally, regardless of rank or status.
- We live in a sexist society that is fundamentally set up to discriminate against women.

_Individualism-Communitarianism_

- People who are successful in business have a right to enjoy their wealth as they see fit
- If the government spent less time trying to fix everyone’s problems, we’d all be a lot better off.
- The government interferes far too much in our everyday lives.
- Too many people today expect society to do things for them that they should be doing for themselves.
- Individuals should be able to make their own judgements on whether to follow security and access control procedures depending on the situation.
- Our government tries to do too many things for too many people. We should just let people take care of themselves.
- Sometimes government needs to make laws to keep people from hurting themselves.
- Government should put limits on the choices individuals can make so they don’t get in the way of what’s good for society.
- It’s society’s responsibility to make sure everyone’s basic needs are met.
- Management should put measures in place that ensure staff members follow security and access control procedures.
APPENDIX B

Original Cultural Cognition questionnaire

Hierarchy-Egalitarianism

- It seems like the criminals and welfare cheats get all the breaks, while the average citizen picks up the tab.
- We have gone too far in pushing equal rights in this country.
- Society as a whole has become too soft and feminine.
- Nowadays it seems like there is just as much discrimination against whites as there is against blacks.
- It seems like blacks, women, homosexuals and other groups don't want equal rights, they want special rights just for them.
- A lot of problems in our society today come from the decline in the traditional family, where the man works and the woman stays home.
- The women's rights movement has gone too far.
- Discrimination against minorities is still a very serious problem in our society.
- It's old-fashioned and wrong to think that one culture's set of values is better than any other culture's way of seeing the world.
- A gay or lesbian couple should have just as much right to marry as any other couple.
- We need to dramatically reduce inequalities between the rich and the poor, whites and people of colour, and men and women.
- Parents should encourage young boys to be more sensitive and less "rough and tough."
- Our society would be better off if the distribution of wealth was more equal.
- We live in a sexist society that is fundamentally set up to discriminate against women.

Individualism-Communitarianism

- People who are successful in business have a right to enjoy their wealth as they see fit.
- If the government spent less time trying to fix everyone's problems, we'd all be a lot better off.
- Government regulations are almost always a waste of everyone's time and money.
• The government interferes far too much in our everyday lives.
• Free markets—not government programs—are the best way to supply people with the things they need.
• Too many people today expect society to do things for them that they should be doing for themselves.
• It's a mistake to ask society to help every person in need.
• The government should stop telling people how to live their lives.
• Private profit is the main motive for hard work.
• It's not the government's business to try to protect people from themselves.
• Society works best when it lets individuals take responsibility for their own lives without telling them what to do.
• Our government tries to do too many things for too many people. We should just let people take care of themselves.
• Sometimes government needs to make laws that keep people from hurting themselves.
• Government should put limits on the choices individuals can make so they don't get in the way of what's good for society.
• It's society's responsibility to make sure everyone's basic needs are met.
APPENDIX C

Participant consent form

Risk Mitigation and Culture:
An examination of the utility of cultural cognition theory
in determining operational security cultures in a healthcare environment.

REF: XXXXXXXX – Risk Mitigation and Culture: An examination of the utility of Cultural Cognition theory in determining operational security cultures in a healthcare environment.

Participant Consent Form

I, the undersigned, freely agree to participate in the above study. I have read and understood the Participant Information and I have been given a copy of it. I have been given the opportunity to ask questions about the study, and any questions I have asked have been answered to my satisfaction. I am aware that I am free to contact the researcher if I have any further questions. I understand that the study involves my indicating a level of agreement or disagreement with a set of statements on the questionnaire provided. I am aware that I am free to withdraw from the study at any time.

I understand that the information I provide will only be used for the purposes of this research project. I am aware that the investigator of the study will adhere to usual standards of confidentiality in the collection and handling of any personal information and that the standards of the Privacy Act 1988 will apply to the way information is handled.

Signed.................................................................................. Date..............................

Signature of Investigator.......................................................... Date..............................

Chief Investigator: Mr Mel Griffiths, BCrTerrSecurity&Intell
XXX Site Investigator: Professor XXXXX XXXX, MBBS FRACS AM
Supervisor: Dr David Brooks, PhD MSc BSc ADipEng
Institution: Edith Cowan University
Contact: 08 9562 4434 or 0422 483 441

"...This research project has been approved by the Ethics Committee at Hospital. Further information may be obtained from the Chief Investigator or from Chairman of the Ethics Committee, telephone "

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Appendix D

Participant Information Sheet

Risk Mitigation and Culture: An examination of the utility of cultural cognition theory in determining operational security cultures in a healthcare environment.

REF: XXXXXXXX – Risk Mitigation and Culture: An examination of the utility of Cultural Cognition theory in determining operational security cultures in a healthcare environment.

Participant Information Sheet

People tend to see danger and risk in different ways depending on their experiences, attitudes, and beliefs. The purpose of this study is to see if differences in opinions can help us to better understand differences in the way people see risks.

Hospitals are large open spaces where many different people come and go. This makes it difficult to ensure that only authorised people enter restricted areas. This is a prime concern for the security and safety of hospital staff. This study will use a theory called “Cultural Cognition” to see if staff members who hold similar opinions on different issues also have similar ideas of the risks associated with hospital entry and access controls (such as wearing identification cards and using swipe cards to get through certain doors). Although the statements may seem odd or irrelevant, they are designed to help assess perceptions of risks.

The study involves indicating your level of agreement or disagreement with a short set of statements. You can indicate how strongly you agree or disagree with a statement by making a mark on the line next to that statement. For example, if you disagree, but not strongly, you might mark the line as follows:

EXAMPLE: Strongly Disagree X Strongly Agree

The questionnaire takes approximately between 2 and 5 minutes to complete, and no further participation in the study is required.

Participation in the study is entirely voluntary and consent to participate may be revoked at any stage without condition. The information gathered about you by the investigator or obtained during the study will be held by the investigator in strict confidence. All the people who handle your information will adhere to traditional standards of confidentiality and will also comply with all relevant privacy legislation. In Australia this is the Privacy Act 1988. The Ethics Committee has obtained assurances from the investigator that the ‘Information Privacy Principles’ laid down in the Act will be met, and will oblige all involved to meet strict privacy standards. The Privacy Act does not apply overseas but there is equivalent binding legislation in force in the USA, the European Union and elsewhere. No reader will be able to identify individual participants in any publication, report, or presentation arising from this study.

Chief Investigator: Mr Mel Griffiths, BCrTerrSecurity&Intell
XXX Site Investigator: Professor XXXXXXX, MBBS FRACS AM
Supervisor: Dr Dave Brooks, PhD MSc BSc ADipEng
Institution: Edith Cowan University
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