

# An “Impressionist” Ethnography of Risk in the Development of Corporate Information Infrastructure

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April 2007

Dissertation submitted in the fulfillment of the requirement for the  
award of the degree of Doctor of Philosophy in the faculty of  
Economics at the University of London

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In memory of my parents:  
Comfort Osei-Mensah (1942 - 1996)  
& Daniel Osei-Mensah (1940 - 2002)

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*Now that serenely  
You rest on high  
Forgive your son  
Who couldn't say goodbye*

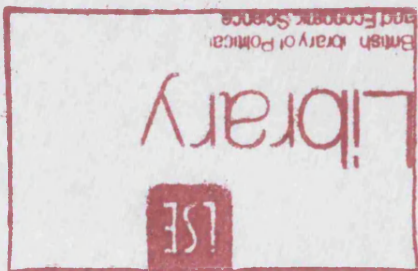
*But Death was a tyrant  
On the rich land  
And you had written  
Enigmas in my hand*

*The more they try  
To press you down  
The more beautiful  
Grows your crown*

*And now you  
Are as a spiritual dove  
Dwell forever  
In our eternal love*

Ben Okri, 1995

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# ABSTRACT

In recent years, a significant body of literature has emerged on the subject of information infrastructure (II) within the IS field. Nevertheless, issues of risk in the development of II have seldom been addressed. This dissertation addresses this important gap by drawing on recent contributions to sociological theories of risk to study the relationship between risk, culture and the occurrence of danger in the development of IT as corporate information infrastructure (CII). The thesis is established on findings from an ethnographic study of risk in the development of II with a multinational banking corporation.

This thesis makes several key contributions to the field of IS, firstly to the understanding of risk in the development of II. Secondly, to theory development in IS risk research through the novel integration of sociological theories of risk into a theoretical model for the analysis of risk, culture, and danger in the development of ICT. A further contribution to IS research is achieved through the adoption of the impressionist autoethnographic approach, as a novel means of narrative construction within IS research.

# ACKNOWLEDGEMENT

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Undertaking the PhD was always going to be a challenging journey. The most difficult challenge for me was the loss of my father and last remaining parent. This marked the beginning of a succession of personal difficulties, which at times proved too great for me to bear. It was the unremitting support of my supervisor, Professor Ian Angell that guided me through these and other obstacles. My debt can never be paid or my gratitude expressed.

# GLOSSARY OF ACRONYMS

|         |  |
|---------|--|
| AD      | Active Directory   |
| BPR     | Business Process Reengineering   |
| BRC     | Business Recovery Centre   |
| CIBC    | Canadian Imperial Bank of Commerce Plc   |
| CII     | Corporate information infrastructure   |
| CSCW    | Computer Supported Co-operative Work   |
| ESD     | Engineered Safety Devices  |
| FP      | Financial Products (a trading group specialising in derivatives products in the World Markets Investment Banking Sector of CIBC) |
| FP Tech | The technology support group of Financial Products.  |
| GEM     | Global Enterprise Management (technology management group)   |
| GT      | Global Technology (CIBC WM technology support group)   |
| II      | information infrastructure   |
| MDS     | Market Data Services   |
| MS      | Microsoft Plc  |
| NAT     | Normal Accident Theory   |
| NOS     | Network Operating System   |
| NT      | MS Windows NT (New Technology) Desktop Network Operating System  |
| OECD    | Organisation for Economic Co-operation and Development   |
| RAM     | Random Access Memory   |
| SISP    | Strategic Information Systems Planning   |
| SMS     | Systems Management Service (remote PC desktop computer management and installation application).                                 |
| STR     | Sociological Theory of Risk  |
| Windows | MS Desktop Operating System  |
| WM      | CIBC World Markets   |
| Y2k     | Year 2000  |

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# CHAPTER 1: INTRODUCTION

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The latter part of the 20<sup>th</sup> century has witnessed the introduction and widespread adoption of Information Technologies (IT) throughout all areas of society. Advances in computing and communications technologies have accompanied and enabled this rapid speed of adoption. Such developments have forced an evolution in the character of IT over the past three decades, from standalone, localised systems of the late 1970s and 1980s towards integrated, globalised networked technologies of the contemporary Internet era.

Similar, but less obvious advances can be observed in the academic discourse on risk. Previously the domain of the natural sciences, more recently the subject of risk has permeated many academic areas as more and more social scientists acknowledge its importance to understanding the dynamics of contemporary society. The widespread attention to risk within the social sciences is evidenced by developments in sociological theories of risk, and by the important contributions they have made to the risk discourse. The most significant of these has been to challenge the orthodoxy of the dominant technoscientific theories of risk rooted in the natural sciences.

These advances in IT and in theories of risk expose significant deficiencies in IS risk research, which we aim to address in this study. Firstly, the concept of IT used throughout the IS risk research literature fails to capture important characteristics inherent in contemporary IT. Rather than the globalised and open characteristics of today's Internet based ICT, the domain of IS risk research remains dominated by closed, localised notions of technology suited to an earlier

generation of computing. Secondly, we observe a lag in the adoption of new sociological theories of risk by IS risk researchers in favour of technoscientific concepts of risk inherited from the natural sciences. Despite regular findings that identify the importance of culture and other non-technical issues to understanding risk in the development of IT, IS risk research has failed to respond adequately (Boehm, 1991; McFarlan, 1981; Vitale, 1986; Willcocks and Margetts, 1994). Here we argue this failure can be explained by the limited adoption of sociological theories of risk within IS risk research.

The present study aims to address these important deficiencies within the IS risk discourse by adopting ideas from sociological theories of risk to study issues of risk in the integration of global IT. More specifically, we combine important ideas from three sociological theories of risk into a framework with which we examine the relationship between cultural practices, risk, and the occurrence of danger in the development of corporate information infrastructure (II). To achieve our objective, we draw evidence from detailed cases of corporate II development within a global corporation named CIBC World Markets.

CIBC World Markets (WM) is the investment-banking arm of the Canadian Imperial Bank of Commerce (CIBC). CIBC is a full service global financial institution comprising several business units including: Retail Banking, Small Business Banking; Wealth Management; and CIBC World Markets. Together, this group has over six million personal customers, 350,000 small business customers, and 7,000 corporate and investment-banking customers.

The banking sector has undergone extensive deregulation and globalisation over recent decades, following a long period of strict controls within national boundaries. Like many large banks, the recent history of CIBC has been influenced by the Glass-Steagall banking regulations, dating back to the early 20<sup>th</sup> century. Following the Great Crash of 1929 in the US, the government erected a

wall between the activities of commercial and investment banks through the Bank Act of 1933 (commonly referred to as the Glass-Steagall Act); in addition the Bank Holding Act was passed in 1956. These legislations effectively curbed financial services conglomerates from amassing too much power. However, in the last two decades of the century, several legislations were enacted to dismantle this wall.

The deregulation of North America's financial markets has been mirrored throughout much of the western world. Developing economies, or "emerging markets", with their often volatile, but high rate of growth, have not been excluded from these developments, as financial corporations seek new ways in which to balance investment portfolios (Macesich, 1996). All this has led to the emergence of "a legitimate worldwide market in stocks, bonds, currencies and other financial instruments" (Macesich, 1996:p9).

The significance of risk to the business of banking can in no way be understated. Such is the significance of risk to banking that the work of investment banks is commonly described as the buying and selling of risk. This significance has increased in recent decades through both deregulation and the regulatory pressures to manage new forms of risk other than the traditional credit and market risks, to which banks have long been accustomed (Michael, 2003).

For centuries, bankers have adopted various quantitative techniques originating from probability calculus. However major changes in banking operations in recent decades, and the spate of high profile failures that followed, have raised concerns over the way banks manage risk in their business operations. Such concerns can be seen in the recent reforms to banking supervision through the Basel 2 banking regulation project; and more recently, the Risk-based approach incorporated in the EU's 3<sup>rd</sup> Anti-Money laundering Directive.

Basel 2 is said to have elevated operational risk from a residual category of market and credit risk management, into a category of equivalent merit, through the requirement for banks to undertake the management and regulation of operational risk (Power, 2003). However, this has created further problems for both the banks and their regulators, who have found their traditional quantitative and technical methods of risk management ineffective in addressing issues of operational risk. It is the contention of this dissertation that, where quantitative, technical concepts of risk fail, sociological and cultural theories provide fresh opportunities to address the new forms of risks inherent in our contemporary global society.

## 1.1 STRUCTURE OF DISSERTATION

The proceeding chapters of this dissertation are organised as follows:

**Chapter 2** presents a review of literature. This chapter lays the foundations for our work in later chapters by reviewing existing research in the areas of risk, Information Infrastructures, and IS risk, which combine to form the domain of this study. Areas for further research are identified in each of the three sections. The review identifies the dominance of the technoscientific approach in the risk discourse dating back to the invention of probability calculus in the 17th century, and how this dominance is reflected in IS risk research. This is despite the emergence of alternative sociological theories of risk that challenge the assumptions of technoscientific approaches. The final part of this chapter presents the gap in research, and the research questions addressed in the dissertation.

In **chapter 3**, we construct a theoretical framework to support the analysis of ethnographic data undertaken in later chapters. This unique framework combines important contributions to the risk discourse from sociological theories of risk. The chapter centres on the Cultural Theory of Risk (CTR), which forms the primary sociological theory in our framework. Our choice of CTR as the primary source of theoretical ideas enables us to adopt a cultural perspective towards the study of

risk. CTR enables us to address matters of risk and culture, however, it is not as well adapted to the detailed analysis of the occurrence and manifestation of dangers in global information technologies. For this purpose we supplement CTR with concepts from Charles Perrow's (1984) Normal Accident Theory (NAT), and Niklas Luhmann's (1993) Sociological Theory of Risk (STR). The final sections of this chapter discusses concepts from these two additional theories.

**Chapter 4** describes the research method of ethnography and autoethnography used to gather and present empirical data. The chapter represents an effort to highlight the suitability of ethnography to the IS research field, and the benefits that may be accrued by the IS community through the adoption of autoethnography. Moreover, the chapter aims to show that rather than choosing autoethnography, the researcher found himself being chosen by this ethnographic method through his effort to convey his lived-experience as a member researcher within the corporate II development team in the chosen research site. Attention is paid to the 'crises of representation' faced by ethnographic researchers. The adopted 'impressionist' style of ethnographic text is situated amongst other writing styles to show its appropriateness as the presentational style of our ethnographic narrative.

**Chapter 5** contains the findings of our empirical study in which we present an impressionist narrative of corporate II development. The narrative unfolds within the context of CIBC, a multinational financial service corporation. The narrative charts the earliest experiences of the researcher as an employee in the Market Data Services team on the trading floor of the London office, through to the completion of fieldwork as a full-time PhD research candidate. The narrative represents a montage of events that aims to bring to life experiences of culture, risk and danger in the development of a global corporate II. In the spirit of impressionist ethnographic text, the narrative invites the reader to relive the experiences of the researcher, so as to draw their own unique and equally valid interpretation of events.

Following the presentation of empirical study, in **chapter 6** we draw on our integrated theoretical framework of sociological theories of risk to analyse issues of risk, culture and danger that emerge from the ethnographic narrative of the previous chapter. This analysis chapter divides into four main sections. The first section draws on CTR to examine the culture and risk perceptions of key groups in the corporate II development projects of concern. Analysis of the case of email infrastructure development is undertaken in this section. The second section presents a detailed analysis of disaster, and the occurrence of danger in the global MS Exchange email infrastructure using NAT and STR. In the third section, we analyse the narrative of the global Windows 2000 Active Directory network operating systems (NOS) infrastructure development using CTR. Findings from the analysis are developed and presented in the final, fourth section.

Ethnographic research, rather than commencing with a set of hypotheses, mostly proceeds towards the generation of hypotheses in its findings (Hammersley and Atkinson, 1995). Accordingly, each of the key findings in this final section of the chapter represents hypotheses regarding issues of risk, culture and danger in the development of corporate II. These key findings address the research questions formulated in the last part of the literature review chapter.

**Chapter 7** concludes the dissertation. This chapter provides a summary of the dissertation and the contributions it provides to the areas of research, theory and practice in the IS field. In concluding, we identify areas for further research based on limitations and obstacles encountered in the present study.



# CHAPTER 2: LITERATURE REVIEW

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## 2.1 INTRODUCTION

This literature review surveys the terrain of the present study, and develops a research focus through the identification of gaps in current knowledge. The structure of this chapter emerged as a response to the present lack of research on the subject of risk and the development of IT as corporate information infrastructure (CII). To address this problem, this literature review is organised around the following three topics: risk research, IS risk research, and II research.

The first section presents the story of risk. Here we focus on key developments in the modern concept of risk, from its inception in the seventeenth century to the present date. This detailed review allows us to root ideas of risk identified in the IS literature into the wider discourse of risk research. The key objective of our review of the risk discourse is to identify suitable ideas of risk with which to undertake the present study.

In the second section we undertake a review of the wider topic of IS risk research. The focus of this section is justified by the paucity of research on issues of risk in the literature on II. From this review we are able to identify limitations to the treatment of risk within the IS field.

In the third section we review the concept of II, and discuss the ‘installed base’ notion of corporate II (CII). The final section of this chapter combines findings from each of the previous three

sections to identify gaps in research within the IS field that form the focus of research addressed in this study.

## 2.2 RISK RESEARCH – A HISTORICAL REVIEW

The history of risk reveals three distinct stages of development in western societies. These three stages, which mark changes in the perception of risk, are often identified as ancient times, the modern (industrial) era, and the postmodern (contemporary) period, (Bernstein, 1996; Giddens, 1999; Hacking, 1975; Luhmann, 1993). In the following subsections we examine how ideas of risk have evolved throughout these different epochs.

### 2.2.1 Ancient Times & the Belief in Fate

Most studies of risk in ancient times focus on gambling and games of chance within ancient societies. The depiction of gambling games in Egyptian tombs and Greek mythology highlight the important role of such games to human development. Nevertheless, none of the ancient civilisations are acknowledged for developing quantitative techniques of risk management. It is generally accepted that the concept of risk in ancient times revolved around the belief in fate.

“[The concept of risk during pre-modern times denotes] an objective danger an act of God, a force majeure,” a natural event that could not be ascribed to human action.” (Luhmann 1993:p226)

“All previous cultures, including the great early civilisations of the world, such as Rome, or traditional China, have lived primarily in the past. They have used the ideas of fate, luck or the will of the gods where we now tend to substitute risk.” Giddens (1999:p22)

### 2.2.2 Renaissance & the Emergence of Probability

Since its discovery, the mathematical theory of probability remains the single most influential concept on the understanding of risk within western societies. Pascal's discovery came about through his solution of how a group of players should divide the stakes of an unfinished game of chance (Bernstein, 1996). Applying the principles of inductive method, Pascal created what we refer to today as Pascal's triangle, for determining the probability of possible outcomes.

Bernstein (1996) argues that the spirit brought about through the Renaissance movement made the discovery of probability theory by Pascal possible. Jaeger *et al* (2001:p20) identify this spirit as the basis of the rational actor paradigm, whose origins they trace back to the "extraordinary accomplishments in science and the arts" of the Italian Renaissance.

Ian Hacking (1975) undertakes one of the most rigorous studies into the history of probability. Similar to Bernstein (1996), Hacking (1975) attributes the appearance of probability theory in the mid 17th century to changes in Western thinking.

"I am inclined to think that the preconditions for the emergence of our concept of probability determined the very nature of this intellectual object, 'probability', that we still recognize and employ... The preconditions for the emergence of probability determined the space of possible theories about probability. That means that they determined, in part, the space of possible interpretations of quantum mechanics, of statistical inference, and of inductive logic." (Hacking, 1975:p9)

Hacking (1975) goes further than Bernstein (1996) to conduct an in-depth historical analysis of events leading to the invention of probability theory and subsequent developments. According to

Hacking, prior to the end of the Renaissance and the invention of probability, the term ‘probability’ was attributed to opinion rather than knowledge. Knowledge could only be gained through demonstration. He argues that the concept of probability, as we understand it today, was essentially dual:

“... on the one hand having to do with degrees of belief, on the other, with devices tending to produce stable long-run frequencies... A probable opinion was not one supported by evidence, but one which was approved by some authority, or by the testimony of respected judges” (Hacking, 1975:piii).

Hacking (1975) argues that the missing piece in the jigsaw that enabled the invention of probability was the idea of inductive evidence, which was enabled by the transformation of signs into evidence.

“Probability is a child of the low sciences, such as alchemy or medicine, which had to deal in opinion, whereas the high sciences, such as astronomy or mechanics, aimed at demonstrable knowledge. A chief concept of the low sciences was that of sign.... At the end of the Renaissance, the sign was transformed into the concept of evidence [through the idea of the inductive evidence of things]. This new kind of evidence conferred probability on propositions, namely made them worthy of approval. But it did so in virtue of the frequency with which it made correct predictions.” (Hacking, 1975:piii)

He argues that this “transformation from sign into evidence is the key to the emergence of a concept of probability” developed by Pascal and his colleagues, and into the way it is understood today (Hacking, 1975:pii).

Bernstein (1996) suggests that the contribution of Pascal and his fellow Frenchmen led to an acceleration in the pace of developments in quantitative rules and theories that would form the basis of risk management theories in economics, medicine, insurance, law, finance, military strategy and much more, stemming from the period of the Enlightenment through to present day modern society. Many of these concepts, (some of which are represented in the following list) remain central to conventional wisdom on the subject of risk.

- Statistical sampling by John Graunt (1620 – 1674): the use of present and past information to make guesses about the future.
- Halley’s Life Tables by Edmond Halley (1656- 1742): the tables provided the necessary information for calculating life annuities.
- Utility by Daniel Bernoulli (1700 – 1782): decision-making based on a desire for wealth and opportunity. Bernoulli’s major contribution was the development of a procedure for the introduction of subjective elements into decisions of uncertain outcome.
- Priori and posteriori by Jacob Bernoulli (1710 – 1790): these ideas gave rise to the development of probabilities from limited amounts of real-life information.
- Concept of cause and effect by Jules Henri Poincare (1854 – 1912): the belief that everything has a cause. Events that appear to be fortuitous are not; instead, their causes stem from minute disturbances.
- Regression and Correlation by Francis Galton (1822 – 1911): The measurement of how any two series vary relative to one another.

Both Hacking (1970) and Bernstein (1996) associate the invention of the modern concept of risk with the discovery of probability theory and the work of Pascal in the mid 17th century. Nevertheless, there remain key distinctions in the theses of these authors. Both acknowledge the new spirit of the Renaissance as an important factor behind the invention of probability. Bernstein provides no further explanation for the spirit of the Renaissance beyond that of a natural stage in the

progress of human development (1996). Hacking on the other hand connects this spirit to the acceptance of inductive evidence as a new form of rationality. For Hacking, it is this acceptance of inductive evidence and the new form of rationality it supports that provide the force behind probability and subsequent developments in mathematical techniques of risk assessment.

The key distinction between the thesis put forward by Bernstein and that of Hacking is that Bernstein attributes to the Renaissance movement and the invention of probability an emancipating influence on western thinking. For Bernstein, the rational actor paradigm captures a more objective view of the world compared to ideas and beliefs in ancient times. Accordingly, he describes all thinking on issues of risk prior to the Renaissance and the invention of probability as “naïve belief in fate” (Bernstein, 1996).

Hacking on the other hand, by attributing the discovery of probability to the acceptance of inductive evidence and the change in rationale, does not ascribe the same value of progress to this change that is implied in Bernstein’s thesis. Whereas Hacking’s description illuminates a subjective feature in the concept of probability based on its dependence on inductive evidence, Bernstein’s interpretation of the Renaissance movement as a key stage in the development of the modern concept of risk, and more specifically, human progress, without unpacking or identifying key events behind this movement, ascribes an objective attribute to the probability calculus and the modern concept of risk.

### **2.2.3 Uncertainty and Economic Theory**

Following the invention of probability theory and the rational risk assessment techniques by Enlightenment and Victorian thinkers, the next major development in the history of risk can be

ascribed to the idea of uncertainty. A central concept born out of the Renaissance is that of the universal applicability of measurement (Bernstein, 1996). One of the earliest thinkers on the topic of risk to reject this idea through his distinction between risk and uncertainty was the American economist Frank Knight. Despite being attributed to Knight (1921), the economic distinction between risk and uncertainty appeared earlier, in the mid-nineteenth century in the work of J.H. von Thunen, through his explorations in the theory of entrepreneurship (Reddy, 1996).

Through a similar investigation on entrepreneurship, Knight, later makes a more elaborate distinction between probabilizable and non-probabilizable, or, calculable and non-calculable forms of indeterminacy. He identifies the former as “risk”, and the latter as “uncertainty” (Reddy 1996:p227). Knight argues that surprise is common in systems where decisions depend on forecasts of the future. He pointed to defects in the use of empirical studies into the frequency of past occurrences as a means to eliminating indeterminacies of the future. Knight maintained that uncertainty is a primary aspect of economic activity. He argued that no event is ever identical to an earlier event, or to an event yet to happen.

Following on from Knight, John M. Keynes (1948) joined the attack on previous rational thinkers, arguing that probability theory has little relevance to real-life situations. Similar to Frank Knight, Keynes view of economics rejected any theories of risk that discounted uncertainty. However, unlike Knight, Keynes does not distinguish between risk and uncertainty. His economic prescriptions support the idea that as we make decisions, we change the world.

Bernstein attributes the rejection of the universal applicability of measurement to a new era of ideology within Western society. This was illustrated by Einstein’s demonstration of the imperfections of Euclidean geometry, and Sigmund Freud’s declaration that irrationality is the natural condition of humanity (Bernstein, 1996). The ideals developed in classical economics of

“economics as a risk-less system that always produced optimal results” slowly began to crumble (Bernstein, 1996).

### **2.2.4 Technoscientific Perspective**

The invention of probability theory in the seventeenth century is widely acknowledged as the birth of (what is commonly referred to within the risk discourse as) the technoscientific perspective of risk. Within the social science risk discourse, technoscientific risk research is often only traced back to concepts developed in the mid-twentieth century (Lupton, 1999; Renn, 1998). However, mostly all technoscientific concepts of risk have their origins in earlier ideas of risk, which first appeared in the Enlightenment and Victorian era. This perspective captures ideas from risks to appear from fields such as statistics, engineering, actuarial science, economics and epidemiology.

Technoscientific perspectives represent the most dominant approach to risk in the social sciences, hence they warrant a detailed. In the following subsections we review some influential concepts to have emerged from technoscientific perspective over the past century.

#### *Game Theory*

Despite the achievements of authors in the economic theory of indeterminacy, the invention of game theory in the mid-twentieth century is said to mark the resurgence of rational concepts in the history of risk (Bernstein, 1996). In John von Neumann’s (1940) game theory, two or more people attempt to maximize their utility simultaneously, in conscious awareness of the activities of others. Game theory claims the true source of uncertainty lie in the intentions of others. The principles of Game Theory support the Victorian ideals and the: “classical mode of rationality, for rational



people always understand their preferences clearly, apply them consistently, and lay them out in the [same] fashion [as the actors in Game Theory]" (Bernstein, 1996:p245).

### *Diversified Portfolio*

Henry Markowitz's (1952) concept of the diversified portfolio is one such theory that follows on from the principles of game theory. The concept of the diversified portfolio assumes that diversification reduces risk. Combining these risky shares into a stock portfolio can mitigate the risk of holding individual high volatility securities. This concept of the diversified portfolio is based on the definition of risk as volatility. Bernstein argues that Markowitz's work provided the groundwork for "just about all the theoretical work in finance that followed" (Bernstein, 1996:p257). Not only in finance (as we shall see in later sections of this chapter) Markowitz's concept of the diversified portfolio has also been influential as an approach for managing corporate II (Broadbent et al., 1999; Weill and Vitale, 2002).

Both game theory and the diversified portfolio have been criticised for their obvious shortcomings rooted in the rational approach of the classical thinkers on risk. The fundamental focus of these critiques is the assumption of the rational human actor in situations of uncertainty (Bernstein, 1996:p258).

### *Psychological Perspective*

One of the most influential ideas into how people understand and come to make decisions over risks has appeared through the work of psychologists Daniel Kahneman and Amos Tversky (1979), and their concept of Prospect Theory. Here, psychological models of human behaviour are used to show how people respond cognitively and behaviourally to risk (Lupton, 1999). Prospect Theory seeks to explain why people fail to make rational decisions when faced with uncertainty.

Proponents of Prospect Theory argue that, in situations of uncertainty, people employ heuristic or ‘mental strategies’, guidelines of various sorts, rather than following the principles assumed within the rational actor model (Slovic 1987:p281) (Kahneman et al., 1982).

Key concepts to emerge from the psychological perspective to risk include:

- **Ambiguity Aversion:** refers to the idea that people prefer to take risks in situations of known, rather than unknown probabilities. Ambiguity aversion “is driven by the feeling of incompetence ... [and] will be present when subjects evaluate clear and vague prospects jointly, but it will greatly diminish or disappear when they evaluate each prospect in isolation” (Bernstein, 1996:p281).
- **Decision Regret:** psychologist David Bell’s concept of decision regret explains the behaviour of investors concentrating on the assets they would have had if only they had made the correct choice.
- **The Endowment Effect:** the disparity between prices for which people are willing to buy and sell identical items. The term (endowment effect) describes our tendency to set a higher selling price on what we own (are endowed with), than what we would pay for the identical item if we did not own it (Bernstein, 1998:p294).

Kahneman and Tversky’s work is said to have been instigated by earlier cognitive science based risk research in Chauncey Starr’s (1969) seminal paper ‘Social Benefits versus Technological Risk’. Starr’s work shows people have a greater tolerance for voluntary risks (such as sporting activities) than they do for involuntary risk (i.e. electric power generators). From this finding, Starr (1969:p1235) concludes “as one would expect, we are loath to let others do unto us what we happily do to ourselves”. Starr’s research identified differences between that risk assessment of those who were directly exposed to a particular risk and the general population. Furthermore, Starr relates

these findings to public awareness of benefits, using advertising “as a crude measure of public awareness of associated social benefits” (Starr, 1969: p1237).

A number of points have been raised against both the psychological perspective, and the psychometric models that they employ. Lupton (1999:p21) remarks that the perspective “relies upon an understanding of the human actor in which there is a linear relationship between knowledge of a risk, developing the attitude that one is at risk and adopting a practice to prevent the risk happening to oneself”.

Bradbury points to epistemological problems between the idea of risk used in psychometric and psychological research fields: “In examining the individual’s response to risk, this research provides a subjectivist interpretation within a realist paradigm.” (Bradbury, 1989)

A major problem identified with cognitive science and the wider technoscientific perspective is that they reduce the understanding of risk to an individualistic level. This is said to be only convenient for the technique of psychometric statistical testing and modelling, which results in an oversimplification of the phenomena of study. In this perspective:

“Perception is limited to how humans see and understand the world through their senses and brain-functioning, without acknowledging the ways in which cultural conceptual categories mediate judgement. People tend to be positioned outside the cultural and political frameworks, relationships and institutions within which they construct their beliefs and engage in behaviour.” (Lupton, 1999)

Furthermore scientific knowledge, in technoscientific literature, is usually given status as expert knowledge over other forms of knowledge such as the public, who are often regarded with a level of contempt.

“[The technoscientific perspective demonstrates] an ill-masked contempt for lay people’s lack of what is deemed to be ‘appropriate’ or ‘correct’ knowledge about risk. Lay people are often portrayed as responding ‘unscientifically’ to risk, using inferior and unsophisticated sources of knowledge such as ‘intuition’.” (Lupton, 1999:p19)

There is a tendency in this approach to view the risk calculations of scientific experts as objective facts, whilst ignoring the role played by the ways of seeing that may bias scientific research (Douglas, 1992). According to this perspective the understanding of risks displayed by scientific experts is “neutral and unbiased” (Lupton, 1999:p19).

Douglas (1992) also points to limitations in the concept of humans maintained by the technoscientific approach:

“Warm-blooded, passionate, inherently social beings though we think we are, humans are presented in this context as hedonic calculators calmly seeking to pursue private interests. We are said to be risk-averse, but, alas, so inefficient in handling information that we are unintentional risk-takers; basically we are fools.” (Douglas 1992:p13)

This critique shows that the view of the rational actor, which is supported under the psychological perspective, is too narrow. It should include other aspects of human judgement, such as sociological, ethical and cultural aspects (Douglas, 1992).

### 2.2.5 Sociological Concepts of Risk

Critiques of technoscientific theories of risk have been stimulated by the emergence of social and cultural theories of risk towards the latter quarter of the 20th century. Such theories are often categorised under the heading of sociological concepts of risk, as we have done here. Theories of risk that fall under this heading include the reflexive modernisation thesis, Cultural Theory of Risk, and the Social Systems Theory of Risk (Beck, 1992;1995;1999; Douglas, 1992; Douglas and Wildavsky, 1982; Giddens, 1990 148; 1999; Luhmann, 1993; Perrow, 1999). The following subsections present a review of key ideas and contributions that have appeared from this new area of the risk discourse.

#### *Reflexive Modernisation and Risk Society Perspective*

The primary exponents of this perspective are the sociologists Anthony Giddens and Ulrich Beck (1992). These authors draw on the notion of risk to discuss what they see as fundamental changes in modernity. Their works examine the structural and political features of risk in contemporary Western society. Giddens and Beck (1992) focus mostly on the macro-social processes they see as characteristics of late modern societies and their relation to concepts of risk. These processes include reflexive modernisation and individualization.

Ulrich Beck's book *Risk Society: Towards a New Modernity* (1991) remains one of the most significant contributions to studies of risk within sociology (Lash & Wynne, 1992). In this work (originally published in German in 1986, and then in English in 1992) Beck puts forward the thesis that people in contemporary Western societies are living in a period of transitions between industrial society and Risk Society. This period is captured by the term reflexive modernization (Beck, 1992). Reflexive modernization is characterised by the proliferation of man-made risks as

the outcome of modernization processes. Individuals in contemporary Western societies are more conscious of risks than ever, having to deal with risks on a daily basis: “Everyone is caught up in defensive battles of various types, anticipating the hostile substances in one’s manner of living and eating” Beck (1994: p45).

Beck distinguishes between the characteristics and manageability of risks in contemporary society, with those of early modern and pre-modern societies. In his analysis of risk and hazards in pre-modern societies, he shows agreement with the general thesis put forward by Bernstein, that this early period was characterised by a belief in fate such as magic, and gods.

Central to Beck’s thesis of Risk Society is the idea that risks have undergone a transformation from locally bounded, perceptible dangers of the early industrial period, to globally distributed risks of contemporary society. Beck’s Risk Society is characterised then, by the spread of global hazards. The key characteristic of global risks during reflexive modernisation contributes towards the breakdown in principles of risk calculation developed in the previous (classical) era.

“...the ecological and high-tech risks that have upset the public for some years now [...] have a new quality... By their nature they endanger all forms of life on this planet.” (Beck, 1992 emphasis added)

As a consequence of the incalculable nature of hazards in contemporary society, the notion of risk is reversed back to “pre-modern notions of incalculable insecurities” (Lupton, 1999). However, the distinction between the hazards of the pre-modern era and those of contemporary society is that the latter is the outcome of human action, rather than the acts of nature or supernatural forces.

Under Risk Society, the dependence on scientific institutions of the industrial epoch for identifying and controlling risks still remain. However, the incalculability of contemporary risks disables the scientific method, therefore undermining the authority of scientific experts.

Uncertainty features heavily in Beck's theory of Risk Society through concepts like unintended consequences and side-effects. The uncertainty of the Risk Society is said to result from the efforts of industrial society to achieve control via instruments of rationality; the outcome of which is unforeseen side-effects.

“...In the Risk Society the unforeseeable side effects and after-effects of this demand for control, in turn lead to what had been considered overcome, the realm of the uncertain [...] Uncertainty returns and proliferates everywhere.” (Beck, 1992)

The theory of risk society and Reflexive Modernisation is not without its critics. Like other prominent sociological theories, various limitations have been identified. Jeffrey Alexander (1996:p133), for instance, argues that Beck and Giddens assume a “simplistic modernization argument”. Furthermore, they seem to offer very little evidence to support the argument that industrial production centres are responsible for the outcome of dangers like global warming within contemporary society. A sociological theory of risk that overcomes this limitation is the Cultural Theory of Risk (CTR).

### *Cultural Perspective*

Mary Douglas, a British social anthropologist, and Aaron Wildavsky, an American political scientist, are the primary exponents of the cultural perspective in the risk discourse. The principles

of the cultural perspective are rooted in anthropological studies carried out by Douglas in the 1960s and 1970s on matters of selfhood, the body, and the regulation of danger (Lupton, 1999).

Douglas and Wildavsky draw on anthropological research on groups in primitive societies, such as the Lele tribe of Zaire, and western industrialised societies such as environmental movement groups in America. They note, for instance, people in America face more risks to their health from lung cancer through smoking than from car accidents. Nevertheless, Americans seem to pay more attention to, and place more resources on risks to health, which arise from industrial pollution (Covello and Johnson, 1987:pix). In explaining these findings, the cultural perspective transcends the basic argument that risks are selectively chosen to provide an understanding of why certain risks are chosen, and others ignored. The assertion maintained by proponents of the cultural perspective is that:

“...people’s concerns and fears about different types of risks can often be more accurately seen as ways of maintaining social solidarity than as reflecting health or environmental concerns. As such, health or environmental concerns should never be taken at face value. Instead, the analysis must look further to discover what social norms, policies, or institutions are being defended or attacked.” (Covello and Johnson, 1987:p ix)

According to cultural theory, the features of a society that form its culture, equally determine the risk profile of that society. Hence, the conventional notion of risk represents a contemporary Western approach for dealing with danger. Douglas and Wildavsky (1982) argue that judgements of risks are non-scientific. Far from constituting the objective outcomes of scientific enquiry, they argue risks are socially selected (Douglas and Wildavsky, 1982).



### *The Sociological Theory of Risk*

The systems perspective on risk is most clearly articulated by Niklas Luhmann's Sociological Theory of Risk. His work provides one of the most elaborate reviews of the concept of risk (Luhmann, 1993). Luhmann's theory of risk is based in his Social Systems Theory, which follow the functional approach of Talcott Parsons (1937).

Social systems theory differs from technoscientific understanding of risk. In the latter, risk results from the objective possibility that an undesired event occurs as a result of a chosen action, whereas in the former, risk describes an attribution process (Luhmann, 1993). One of the key functions of social systems is to provide meaning to individuals, even when the chosen course of action results in an outcome that is different from those wanted or expected (Jeager *et al*, 2001).

One of the most important contributions to the risk discourse to emerge from Luhmann's work is said to be the concept of risk he develops, based in the distinction he makes between risk and danger. This presents a framework that distinguishes between unexpected and undesired outcomes. Accordingly, the combination of these two (the unexpected and the undesired) represents the potential threat facing any system.

In the social environment of modern society the ability of actors to calculate the outcome of a particular course of action is superseded by the problem of indeterminism. Risk supports a framework that provides meaning to guide the behaviour of social actors by validating decisions and choices. Greater uncertainty becomes the norm of modern society, as an outcome of the complex formation of social systems, which disable any capacity to determine the outcome of individual action.

Luhmann's Sociological Theory of Risk has been mostly criticised for its vagueness (Luhmann, 1993). Furthermore, this theory is said to provide "little guidance for the management of specific risks", especially when compared to "the rich toolbox" of risk management techniques offered by technoscientific approaches (Jaeger *et al*, 2001: p204).

### *Normal Accident Theory (NAT)*

NAT represents an alternative systems theory that provides an elaborate set of tools for the management of risk, and therefore goes some way towards addressing the criticism against Luhmann's ideas. Developed by the sociologist Charles Perrow, Normal Accident Theory (NAT) is similar to Ulrich Beck's theory of Risk Society in that it focuses on the risks associated with hazards stemming from the process of modernisation. However, whereas Beck (1992) focuses on risk by highlighting the inadequacy of conventional risk analysis in addressing risk issues in contemporary Western societies, Perrow's NAT focuses on the types of accidents that occur in particular forms of systems.

Furthermore, Perrow's work focuses more on the identification of strategies to reduce "systems accidents", than the issue of risk. NAT points to the imperfections in systems, especially the fallibility of technical systems. According to this idea, all systems, regardless how much work is put in, are prone to failure, because nothing is perfect (Perrow, 1999). Because NAT holds no hope for the total elimination of accidents in any system, it places emphasis on the development of the systems in such a way that the system is able to accommodate accidents, and reduce potentially catastrophic accidents.

### **2.2.6 Key Findings from Risk Research Review**

From our review of the risk discourse, we find an imbalance of research in favour of technoscientific, natural science notions of risk. Although risk has been extensively documented throughout social science fields, such as economics (over the past century) and psychology (from the mid-twentieth century on), the notions of risk expressed in these fields have their origins in earlier natural science ideas of Enlightenment and Victorian thinkers.

As such we argue that, even in the social science risk discourse, the dominant concept of risk is firmly rooted in the natural scientific notion of risk as probability. This fact can be explained by the earlier invention of risk in mathematics, and its subsequent historical development as a quantitative subject for several hundred years, before attracting the attention of social scientists.

When we chart the historical development of risk from the initial work of Pascal in 1656 through to the present day, it becomes possible to appreciate the relative infancy of alternative concepts of risk originating from social sciences, such as sociology and anthropology. Consequently we find that, as a result of this relative infancy leading to the imbalance of existing research within the risk discourse, further research that draws on and develops sociological notions of risk is warranted.

#### *Integration of Social and Anthropological Concepts of Risk*

A further finding from our review of the risk discourse is the scope for combining key ideas from the emerging sociological theories of risk. This may serve to provide a more useful theoretical framework, which can better support the analysis of specific, risk issues within contemporary society.

Elsewhere, the suggestion has been put forward for the integration of sociological and technoscientific concepts of risk (Jaeger et al., 2001). This interdisciplinary approach, it has been claimed, allows researchers to draw useful ideas from both the emerging body of sociological risk theories, and earlier technoscientific perspectives. However, this suggestion suffers from the potential of limiting the researcher to the defects of classical risk concepts, which many authors of sociological risk theories are struggling to overcome.

Here we propose an alternative strategy to overcome the deficiencies associated with sociological theories of risk. Our proposal involves the integration of different sociological theories into a theoretical framework that best meets the needs of risk analysis. This proposal goes some way towards addressing the argument that, due to their relative infancy, the different social and anthropological theories of risk remain underdeveloped in their individual capacity to provide a comprehensive toolset to address issues of risk, when compared to long standing technoscientific concepts. Moreover, it avoids the criticism of adopting the defects of technoscientific concepts through their incorporation.

A review of sociological risk research provides evidence of the exchange of ideas between deferent theories. This evidence supports the above recommendation to overcome limitations in recent sociological and cultural theories of risk. For instance, Douglas (1992) in her writing on the Cultural Theory of Risk draws on the distinction between risk and danger, put forward by Luhmann (1993) in his writing on social systems theory of risk. Additionally, Beck (2000) argues that his thesis of Risk Society is compatible with the ideas put forward by Douglas and Wildavsky (1982) in their Cultural Theory of Risk. The suggested integrated use of emerging sociological and cultural theories of risk could then be seen as a sort of continuation of existing practice of the borrowing of ideas between their authors.

## 2.3 IS RISK RESEARCH

Over the past two decades, a significant body of research has appeared on the topic of risk within the IS field (Boehm, 1989;1995; Jurison, 1995; Maguire, 2002; McFarlan, 1981; Vitale, 1986; Willcocks, 1998). However, the amount of research in this area that tackles issues of risk in the development of IT as an information infrastructure (II) remains scarce. In absence of any extensive body of risk research on the development of II, this section focuses on the wider topic of IS risk research. Categories for this review of risk research in the IS field include: IS software risk; IS management risk; IS security risk; and IS outsourcing risk. In the following subsections we aim to review present studies of risk in the IS field based on these four categories with the aim of identifying key features and areas for further research.

### 2.3.1 IS Software Risk

The field of software engineering represents one of the most established areas of risk research in the IS field. Both academics and practitioners have been writing on the issue of risk in software development since the 1970s (Keil *et al*, 1998:77). The US government's Department of Defence played an influential role during this early stage of software risk research, mostly through funding and guidance to many organisations in this area (Hall, 1998). The main focus of research on risk in software development has been on the management of risk within this process (Pressman, 1997). Common strategies support principles of planning through risk identification, followed by the identification of effective controls and their implementation. However, the implementation of control measures once a risk has been identified is generally taken for granted.

Attention towards the issue of risk in the process of software development appeared in the late 1980s. According to Pressman (1997), there has been considerable debate regarding the proper definition of software risk. Padayachee (2002) provides a clear definition of software risk as the

possibility of an outcome that will (should it occur) have a negative impact on the process of software development. Ropponen and Lyytinen (2000: p98) describe software risk management as “an attempt to formalize risk oriented correlates of development success into a readily applicable set of principles and practices”.

One of the most established researchers within IS software risk research is Barry Boehm (1991). Boehm’s work has been especially chosen for attention here because of its extensive influence on subsequent research on risk in software development. Again his initial research in this area was built on his work with the US defence industry. Boehm develops his ideas of risk from the following definition:

“...the possibility of loss or injury. This definition can be translated into the fundamental concept of risk management: risk exposure, sometimes called risk impact or risk factor. Risk exposure is defined by the relationship  $RE = P(UO) * L(UO)$  where RE is the risk exposure, P(UO) is the probability of an unsatisfactory outcome, and L(UO) is the loss to the parties affected if the outcome is unsatisfactory.” (Boehm, 1991)

The main point that can be drawn from this definition is that for Boehm, risk and “risk factors” are one of the same things, which can be accurately deduced in accordance with the principles of the probability calculus (Boehm, 1991).

The output of Boehm’s seminal work is a “risk-identification checklist with the top ten primary sources of risk on software projects” and a “corresponding set of risk management techniques that have been most successful to date in avoiding or resolving the source of risk” (Boehm, 1991:p35). The solution that Boehm presents is that following identification of a project’s risk factors, through use of a risk-identification checklist, managers must then use a “risk probability table” to develop a

probability rating of the identified project risk factor. The various ratings are then used to calculate “a probability-range estimation of whether the project has a relatively low (0.0 to 0.3), medium (0.4 to 0.6), or high (0.7 to 1.0) probability” of incurring the identified risk (Boehm B., 1991: p35). This method of risk exposure-quantification is described by Boehm as “the most effective technique for risk prioritization” (Boehm, 1991: p36). The results of the probability range estimates are used to rank identified risks through a simple process of “assessing the risk probabilities and losses on a relative scale of 0 to 10” (Boehm, 1991: p37). This process is said to allow the project manager to determine the project’s major risk items and their relative priorities.

Boehm’s findings are directed at project managers and senior managers involved in decisions over software development projects. According to Boehm, “the top-10 risk item list is a very effective way to focus higher management attention onto the project’s critical success factors” (Boehm, 1991).

The next stage in the process is to “establish a set of risk-control functions to bring the risk items under control” (Boehm, 1991: p35). Boehm breaks this stage down into “risk-management planning” and “risk resolution and monitoring”. Risk-management planning involves the development of “a set of risk management plans that lay out the activities necessary to bring the risk item under control” (Boehm, 1991:p35). The process of risk-resolution requires the implementation of whatever risk-reduction techniques identified in the risk management plans. Boehm describes risk monitoring as “tracking-risk-reduction progress and applying whatever corrective action is necessary to keep the risk-resolution process on track” (Boehm, 1991:p38). The final stage of Boehm’s approach is the implementation of risk management. This stage is said to involve “inserting the risk management principles and practices into existing life-cycle management practices.”

Despite its extensive impact on both the practitioner and research communities, Boehm's research has been criticised on various points. Ropponen and Lyytinen (1997), for instance, point out the following drawbacks in Boehm's work.

“There is some lack of rigor in developing the list. Boehm only mentions that the list is ‘based on a survey of several experienced project managers’ (Boehm, 1991, p35). The list is derived from interview data and available project data base (Boehm, 1995). Yet the ranking procedure is not systematic. The limitations also include that it covers only a software production oriented part of software development and ignores implementation and political risks that were emphasized by some project managers in interviews ... **Therefore the ranking of Boehm's top-ten risk items should not be understood as a complete ranking of all potential risk items but of those that Boehm found in his studies.** There may also exist a possible bias in the selection of risk items due to the emphasis on large software projects.” (Ropponen and Lyytinen, 1997)

Despite these criticisms, most of the subsequent body of research in this area share much of the same characteristics, and draw heavily on the principles laid down by Boehm. For instance Ropponen and Lyytinen (2000) reinforce the value of Boehm's contribution by replicating his earlier work with more recent data. Elsewhere, Lyytinen et al (1998) claim to have adopted a novel approach to software risk by focussing on the perception of software risk managers. They use a social-technical model of organisational change to develop “a generic list of risk items and risk resolution techniques that cover an extensive set of aspects” (Lyytinen, 1998). This research differs from Boehm's in that it follows a more interpretive epistemology. However, similar to Boehm's earlier contribution, the outcome of this novel approach is yet another list of risk factors and their corresponding resolution techniques.



Padayachee (2002) adopts a phenomenological perspective to investigate the risk perception of software development managers. Again, this research follows the basic principle of identifying risk factors. The findings of Padayachee's (2002) study extend the earlier work of Ropponen and Lyytinen (2000), by identifying further factors that influenced risk in software development (Padayachee, 2002).

### **2.3.2 IS Management Risk**

Risk research in the IS management literature is conducted under a variety of headings with equally varied definitions. Ward and Griffiths (1996), who discuss risk under the title of strategic information systems, adopt a definition of risk as the threat of failure to information systems projects or the probability of loss. Turban, McLean and Wetherbe (1996:p702) offer a similar definition of risk as a threat: "The likelihood that a threat will materialise". From this basis they present a definition of risk management as the analysis of "threats and deciding which ones to ignore, reduce and eliminate [...] based on the balance between the cost of controls and the need to reduce or eliminate threats" (Turban, McLean and Wetherbe, 1996:p725).

Ahituv and Neumann (1994) discuss IS risk management under the heading of "operational risk". In their definition of operational risk, they assert "Any IS development project carries with it operational (technical) risks that the project will be a failure when implemented" (Ahituv and Neumann 1994:p212).

Laudon and Laudon (2000) discuss the issue of risk under the heading of risk assessment. Here, risk assessment is defined as "determining the potential frequency of the occurrence of a problem and the potential damage if the problem were to occur" (Laudon and Laudon, 2000). They also

include in their discussion the idea of risk aversion, which they describe as taking the "...action that produces the least harm, or the least potential cost" (Laudon and Laudon, 2000).

Moynahan (1993) addresses the issue of risk as part of the process of systems analysis. Systems analysis risk management aims "...to protect computer systems from the risks of damage and fraud. Risk analysis is the process of identifying, measuring, and controlling 'pure' risks in business" (Moynahan, 1993:p 102). Moynahan (1993) goes on to provide a definition of risk analysis in which he distinguishes between 'pure' and 'speculative' forms of risk:

"Risk analysis is the process of identifying, measuring, and controlling 'pure' risks in business. Examples of pure risks are theft, fraud, vandalism, fire damage, and the accidental loss of computer data. Pure risks only involve the prospect of harmful results. By way of contrast 'speculative' risk can have either good or bad outcome. An example of speculative risks is making a financial loss on trading, but there is of course the probability of profit." (Mornihan E., 1993).

In one of the most popular IS management text book, Corporate Information Systems Management 5th Ed, Applegate, McFarlan and McKenney (1999) provide one of the most comprehensive discussions of risk in the IS management literature. The ideas of IS risk presented in this book is mostly drawn from two earlier works on risk within the IS management field. Firstly, it draws on Warren McFarlan's (1981) "Portfolio approach to information systems". In this seminal work, McFarlan makes the following argument:

"Despite business's more than 20 years of experience with information systems (IS), disasters in that area still occur with surprising regularity. According to this author, managers, both general and IS, can avert many of these fiascos by assessing the risks –

singly and as a portfolio – in advance of implementation. Also, he notes that different projects require different management approaches.” (McFarlan, 1981:p142)

The outcome of McFarlan’s research is a set of heuristic guidelines aimed at supporting managers to manage risks in IS projects better.

“Companies can use a series of questions to assess risk and to build a risk profile that will help them choose the best management tools for projects of differing risk” (McFarlan, 1981:p142).

Amongst his findings, McFarlan identifies a list of factors that he argues determines risk in an IS project. “The chief determinants of risk are the size and structure of the project and the company’s experience with the technology involved.” (McFarlan, 1981: p142).

In his MIS Quarterly article “The Growing Risks of Information Systems Success” Vitale (1986: p327) identifies what he refers to as “the risks of information system success achieved in the absence of appropriate regard for the potential impacts”. He puts forward a framework for assessing such risks.

Vitale and McFarlan’s contributions both illustrate a characteristic feature of research in the IS management literature: the focus on planning through the corporation’s management team. Consequently, lower levels of the organisation’s hierarchy and the details of implementation are mostly ignored (Ciborra, 1997).

### 2.3.3 IS Security Risk

Dhillon and Backhouse (2001) undertake an extensive review of IS security research in which they divide this literature into the categories of checklists, risk analysis, and evaluation (Dhillon and Backhouse, 2001). The understanding of risk within the IS security literature mostly supports the technical, mathematical notion of risk as probability. Consequently, much of the IS security risk research suffers from the same deficiencies identified in technoscientific concepts of risk.

“Whatever the claim of one risk analysis method compared with another, very little difference appears in the basic theoretical assumptions. A careful consideration of most risk analysis approaches suggests that the boundaries between different classes of risk analysis are uncertain. Despite the diversity reflected in the literature, the issues that separate the different classes are of minor, rather than major significance.” (Dhillon and Backhouse, 2001:p136)

The various models, concepts and approaches to risk found within the IS security literature draw heavily from the technoscientific concepts of risk. For instance, Dhillon and Backhouse (2001) identify the following risk definition, proposed by Courtney (1977), which they argue, is now widely accepted throughout the IS security field amongst both academics and practitioners.

“...Courtney defines risk ( $r$ ) in terms of the probability ( $p$ ) of an exposure in a year and the cost ( $c$ ) or loss associated with the exposure” (Dhillon and Backhouse, 2001).

### 2.3.4 IS Outsourcing Risk

Willcocks and Lacity (1999:p161) examine risk in IT outsourcing. They argue that “despite growing evidence of wide disappointment and difficulty” with outsourcing, the topic of risk in this area has received little systematic attention (Willcocks and Lacity, 1999:p161).

The general definition of risk in the IT outsourcing literature is limited to the conventional understanding of risk as a negative outcome associated with a known or estimated probability of occurrence (Willcocks & Margetts, 1994; Carrie & Willcocks, 1998). The exception we find is Jurison (1995), who extends the conventional (technoscientific) notion of risk to encompass uncertainty:

“...risk is broadly to include uncertainty and the results of uncertainty because this definition appears to reflect the way managers consider risk in decisions regarding cost and benefit issues”. Jurison (1995)

Jurison (1995) develops an IT outsourcing risk model to “assist managers in determining whether outsourcing or insourcing was a better choice for a particular IT function” based on transaction cost theory (Williamson, 1975) and the risk-return model from financial theory.

Similar to risk research in IS software and IS management, research in this area is mostly oriented towards the identification of risk factors. However, the objective is to support management decisions over IT outsourcing. For instance, Willcocks and Lacity (1999) draw on previous research and evidence from structured interviews with over 40 IT managers and operational staff, to identify and evaluate 10 key factors of risk in IT outsourcing. Additionally, Currie and Willcocks (1998) elicit a typology of IT sourcing and proceed to identify risk factors for each form of sourcing and strategies to mitigate these risks.

### 2.3.5 Alternative IS Risk Research

Further, important contributions to IS risk research, which do not fit clearly into the above taxonomy, are presented here as alternative IS risk research. One of the earliest uses of sociological concepts of risk within IS research was made by Enid Mumford in her article *Risky Ideas in the Risk Society* (1996). In this paper, Mumford (1996) draws on key ideas from Beck's (1992) Risk Society thesis to examine risks associated with the adoption of IT management strategies. The contribution that Mumford makes to IS risk research in this paper should not be understated. In this seminal work, Mumford (1996) identifies the task of "choosing an appropriate problem solving method" for the purpose of managing contemporary information technologies as a "new kind of risk...associated with ideas".

Mumford's work is innovative in the IS field because it opens a plethora of IS management and development approaches to the application of sociological theories of risk. She argues our world has:

"...now passed from the 'industrial society' to the 'Risk Society' [in this new society] the logic of wealth production is being gradually displaced by the logic of 'risk avoidance' and 'risk management (Beck, 1992)" (Mumford, 1996:p330).

Mumford focuses her analysis on "institutional risk incurred in an attempt to reduce a global risk" (*ibid*). She draws on the example of BPR as an idea of how to increase business success. Mumford (1996) finds that although the idea of BPR is presented as a solution to risk faced by contemporary organisations, it only serves to increase risk by supporting the false assumption that BPR can reduce such risk.

Susan Scott also draws on the thesis of Risk Society (Beck, 1992) and reflexive modernisation (Beck, Giddens and Lash, 1994) in her study on “IT-enabled credit risk modernisation in a commercial retail bank” (Scott, 2000: p221). She draws on concepts from the Risk Society thesis to examine the role of IT in the modernisation of credit risk processes (Scott, 2000).

Scott’s analysis does not highlight the risk associated with the hazards or dangers that occur through the development of new ICT. Instead, she focuses attention on the risks associated with changes in the work and careers of the bank’s lending advisors, whose jobs are impacted on by the adoption of a new technology to support their work. On the basis of her findings, Scott (2000) raises questions over the risk implications concerning the continued adoption of information communication technologies in contemporary society.

### **2.3.6 Key Findings from IS Risk Research**

This review shows how the topic of risk has been incorporated into many different areas of IS research. These include software development, IS management; IS security; and outsourcing. The concept of risk, which we find throughout these different areas of IS risk research, mostly supports the technoscientific notion of risk as the probability of incurring loss.

Throughout the IS research literature the idea of risk as a scientific endeavour comprehensible only through expert knowledge is accepted as self-evident. Status is privileged to scientific expertise over all other groups involved in the development of IT. At present, little IS risk research draws on recent sociological or cultural theories of risk that challenge this perspective.

Consequently, we find the present body of IS research to be dominated by technically oriented research aimed at producing prescriptive solutions for the identification or resolution of risks favoured by the technoscientific approach. This existing body of IS risk research represents a significant contribution in the innovative ways in which they have incorporated ideas from the risk discourse into various areas of IS research. However, we find the existing IS risk research to be limited by the lack of research that seeks to elucidate the non-technical, less formal aspects of IS risk, such as culture or politics.

This lack of attention exists even though these non-technical issues have been identified as significant throughout the IS risk literature. For instance several authors of seminal works in the IS literature highlight the importance of culture to issues of risk in the process of IT development. McFarlan (1981), in the following statement, is more explicit in his reference to culture.

“The need to deal with the corporate culture within which both IS and project management operate further complicates the problems. Use of formal project planning and control tools is much more likely to produce successful results in a highly formal environment than in one where the prevailing culture is more personal and informal. Similarly, the selection and effective use of integrating mechanisms is very much a function of the corporate culture. Thus the type of company culture further complicates my suggestions as to how different types of projects should be managed”. (McFarlan, 1981: p150)

McFarlan’s reference to culture here clearly acknowledges its importance to issues of risk in the development of IT within any corporations. Moreover, McFarlan goes further, warning against managerial efforts to redesign a corporation’s culture:



“Too many former IS managers have made the fatal assumption that they were in an ideal position to reform corporate culture from their position”. (McFarlan, 1981, p150)

Despite this obvious acknowledgement of the important role of culture to matters of risk in the IS project, McFarlan limits his discussion of culture only to the above comments in the final page of his article (McFarlan, 1981). Vitale (1986), can be interpreted as making an indirect reference to the influence of culture in his concluding statement:

“Along with these rewards [of successful exploitation of IT], however, come the risks of project failure, amplified by the large size, low structure, and new technology that characterize many high-yield systems, and the potential risks of strategic disadvantage arising from unanticipated effects on industry structure and competitive positioning. To be truly successful, developers of strategic information systems **have to look beyond technical issues to arrive at a deeper understanding of both risks and rewards before proceeding.**” (my bolding) (Vitale, 1986, p334)

Another seminal work, which makes reference to culture, is that of Boehm (1991). In his article “Software Risk “Management: Principles and Practices” Boehm (1991, p40) develops his “framework for life-cycle risk management”. In one of the final steps of this framework (implementing risk management) Boehm makes the following remarks regarding implementation strategy.

“...the best implementation strategy is an incremental one, which lets an **organisation’s culture** adjust gradually to risk-oriented management practices and risk-driven process models.” (Boehm, 1991: p40)

In the above statement, Boehm clearly picks up on the importance of culture by highlighting that an organisation's culture must be allowed to adjust to any new approach to risk.

The present lack of attention to non-technical issues in the IS risk literature might be attributed to the limited adoption of recent sociological theories of risk. The limited adoption of sociological theories of risk within IS risk research can also be attributed to the recent history of such theories. Nevertheless, our finding remains that at present, the IS risk discourse requires further research drawing on sociological concepts of risk to unpack the role of non-technical issues associated with risk in the development of information systems.

## 2.4 THE CONCEPT OF INFORMATION INFRASTRUCTURE

The concept of information infrastructure (II) has gained much popularity in recent years, not only within academia, but also, amongst governments and the corporate sector. Concepts such as national II, global II, and corporate II often serve to mystify, rather than clarify, distinctions. For example, what is the difference between a global II and a corporate information infrastructure, and what type of II is the Internet? (Ciborra and Associates, 2000; Hanseth and Monteiro, 1998; Henderson and Thomas, 1992; Kahin and Abbate, 1995; Venkatraman, 1991)

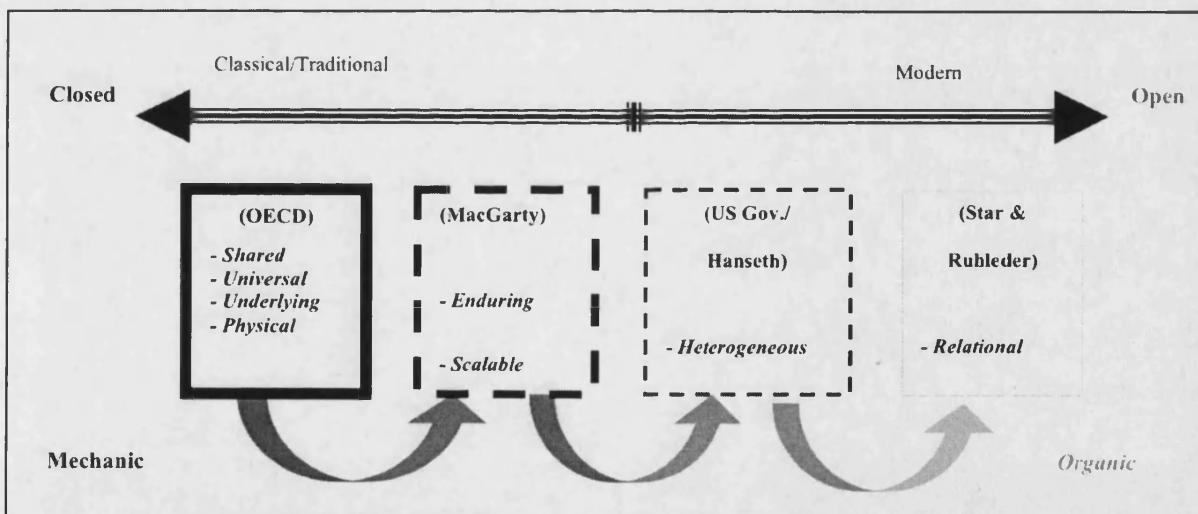
Within the IS field, differences in the use of these terms are rife. Even amongst those who belong to the same 'school of thought' we can identify contradictory definitions and terms. For example, whilst Ciborra (2000:p15) poses the question "*what* is an infrastructure?" Star and Ruhleder (1996:p113) assert "...we ask *when* – not *what* – is an infrastructure?" Due to the relative infancy of research on the subject of II, there exist very few fixed lines of contestation. All these factors make the effort of classifying the debate on information infrastructure very difficult (Kahin and Abbate, 1995).

Accepting this difficulty, it is, nevertheless, possible to identify a fracture between the different uses of this term within the IS field. In the sections below, we aim to illuminate this fracture by

reviewing the different concept of information infrastructure within the IS field. This review allows us to situate better the installed base notion of infrastructure within the IS discourse on II.

The different notions of II are represented in the following typological diagram, which identifies the key features of each approach. The diagram places the various concepts of information infrastructure discussed in the following subsections along a continuum spanning open/organic to closed/mechanistic notions. Here, we distinguish between notions of infrastructure that demonstrate a classical, (*closed*) concept of infrastructure, and those that emphasise the modern, (*open*) aspects of infrastructure.

Fig 2.1 Characteristics of (information) Infrastructure definitions



### 2.4.1 Classical/Traditional Notions of II

Classical notions of II are identified more closely with the traditional (dictionary) definition of infrastructure. This concept of infrastructure, we argue, captures a closed and mechanic model of

II. Classical models of II support a structured, planned approach to infrastructure design and development (Hanseth, 1998; Hanseth 1996).

### *OECD Concept of II*

In a “Special Session on Information Infrastructures”, the OECD comment that, until very recently, the term ‘infrastructure’ was used to refer to “fixed collective installations and logistic facilities necessary to support and supply operations of a country, or even an alliance of countries” (OECD, 1997). The OECD identifies four main characteristics common to this “classical” notion of infrastructure as: shared, universal, underlying, and physical. *Shared*: the infrastructure is a resource *shared* by different groups/users. *Universal*: the infrastructure is a resource that is accessible throughout the country. *Underlying*: the OECD refers to this notion of infrastructure as being “...confined to the *underlying* ...foundation for specific operations”. *Physical*: this notion of infrastructure refers to an infrastructure as a physical entity (OECD, 572-573). This (OECD) notion of infrastructure “puts emphasis on *predictability*, *procedures*, and *efficiency of delivery* – in short, on a more mechanistic model of infrastructure” (OECD, 574).

### *Engineering Concept of II*

McGarty (1992) draws on engineering concepts to provide a definition of infrastructure very similar to that of the OECD. He argues that an infrastructure represents a resource with seven key characteristics (shareable, common, enabling, physical embodiment of architecture, enduring, scale, and economically sustainable). *Shareable*: the resource must be able to be used by any set of users in any context consistent with its overall goals. *Common*: the resource must present a common and consistent interface to all users, accessible by standard means. Thus the term common may be synonymous with standard. *Enabling*: the resource must provide the basis for any user or set of users to create, develop, and implement any applications, utilities, or services consistent with its

goals. *Physical embodiment of architecture*: the infrastructure is the physical expression of an underlying architecture. It expresses a world-view. This world-view must be balanced with all the other elements of the infrastructure. *Enduring*: the resources must be capable of lasting for an extensive period of time. It must be capable of growing incrementally, and in an economically feasible fashion to meet the slight changes of the environment, consistent with the world-view. In addition, it must change in a fashion that is transparent to users. *Scale*: the resource can add any number of users or uses and can by its very nature expand in a structured manner in order to ensure consistent levels of service. *Economically sustainable*: the resources must have economic viability. It must meet all the needs of both customers and providers of information products. It must provide for all the elements of the distribution channel, bringing the product from the point of creation to the point of consumption. It must have all the elements of the food chain (McGarty, 1991).

The above definition opens up the concept of infrastructure by highlighting the need to grow “incrementally [in accordance] with slight changes of the environment” (McGarty, 1991). Even so, this definition is still very traditional in that it shares characteristics from earlier definition. Ole Hanseth (1999) points out that MacGarty’s requirement that “the infrastructure is the physical expression of an underlying architecture” represents a “closed” concept of infrastructure, because “this definition is only open as far as one uniform coherent architecture is applicable and acceptable” (Hanseth, 1999).

### **2.4.2 Modern Concept of II**

Concepts of II that deviate from the traditional dictionary definition are identified and discussed here under the title of modern notions of II. Modern concepts of II support a less mechanistic model of II. Furthermore, they imply a more organic and less determined approach to infrastructure development. A key feature of modern notions of II is their openness.

### *Heterogeneous Concept of II*

The US government provides a far more embracing description of II than traditional notions. Ole Hanseth (1999) notes that this broad definition reflects the heterogeneous character of II. That government identifies four key areas in their policy vision of II as follows:

“ (1) thousands of interconnected, interoperable telecommunications networks; (2) computer systems, television, fax machines, telephones and other information appliances; (3) software, information services and databases (e.g. “digital libraries”) and (4) trained people who can build, maintain and operate these systems.” (Kahin, 1995:p573)

### *Installed Base Concept of II*

Proponents of the installed base view argue that IIs develop by extending and improving the installed base because infrastructures are never created from scratch (Hanseth 2000: p203). Accordingly, II are always considered to already exist.

“When ‘designing’ a ‘new’ infrastructure, it will always be integrated into or replace part of and existing one. This has been the case in the building of all transport infrastructures. Every single road – even the first one, if it makes sense to speak of such a thing – has been built in this way; when air-traffic infrastructures have been developed, they have been tightly interwoven with road and railway networks – for these are needed for travel between airports and travellers’ destinations”. (Hanseth 2000:p203)

The installed base view of II has important consequences for the development of IT as II (Hanseth 2000:p203). Infrastructures cannot be changed instantly. The infrastructure must adapt to

accommodate new elements, and new elements must be connected to the old. This means building a large infrastructure becomes a *timely process*. This means that the existing (installed base) old infrastructure plays a very important role in determining how the new infrastructure may be designed (Hanseth 2000: p203).

Hanseth (2000) identifies five characteristic features that distinguish the installed base notion of II. These are: enabling, shared, standardised interfaces, openness, and heterogeneous. The first aspect of infrastructure, which Hanseth draws from the traditional dictionary definition, is that they have a supporting or *enabling* function. An infrastructure is enabling in the sense that it supports a variety of activities. As a technology, it is designed not only to improve or automate an existing function, rather, it is intended to open up a field of new activities (Hanseth, 2000: p200). This enabling feature plays a central role in policy documents, such as the Bangemann Report (1994) on the European II.

Another characteristic of infrastructure that Hanseth draws from the dictionary definition is that an infrastructure is *shared* by a larger community, such as a collection of users or user groups. In this sense, the infrastructure represents the same single object to all its users, although it may be presented in different ways.

“...infrastructures should be seen as irreducible; they cannot be split into separate parts to be used independently by different groups [except for analytical or design purposes]. An e-mail infrastructure is one such shared irreducible unit. An example of something that can be shared is the various installations of a word processor that may be used completely independently of each other... “ (Hanseth, 2000: p200).

According to the installed base notion of II, the various components that make-up the infrastructure are connected through *standardized interfaces*. In order that the infrastructure function effectively, various technical components must be integrated through *standardized interfaces* such as protocols. Standards are economically important because they make the II cost effective compared to alternative (bilateral) arrangements.

A defining characteristic of infrastructures is their *openness*. They are *open* in the sense that there is no limit to the number of users, computers and other technical components. This also applies to the purpose and function of the infrastructure. The *openness* of an infrastructure is expressed by the lack of any clear boundary. There is no obvious distinction between “...what is included in the infrastructure and what is not, and who can use it and for which purpose or function” (Hanseth & Lundberg 2001, p349). This characteristic does not suggest that everything can be included in an II. Nevertheless it highlights the difficulties involved in drawing boundaries between different infrastructures.

“Whatever the numbers of and infrastructure’s user groups, application areas, designers and manufacturers, network operators, service providers, and so on, there will always be someone or something outside that should be involved or to which the infrastructure should be connected.” (Hanseth 2000, p201)

Infrastructures are open in that there is no clear limitation to the numbers of stakeholders, components, developers, and users. The openness of infrastructure leads to its *heterogeneity* and *complexity*. Information Infrastructures are made up of humans, organisations, institutions, as well as technical components. These different components make the infrastructure



“...more than ‘pure’ technology ... it is true for most technologies in general – they will not function without support staff. Neither will an information system work if the users are not using it appropriately” (Hanseth 2000).

Another important aspect of infrastructures that leads to their heterogeneity is their interconnected and interrelated feature.

“One infrastructure is composed of (sub) infrastructures by; building one infrastructure as a layer on top of another; linking logical related networks; integrating independent components, making them dependent... [As a consequence, each infrastructure is composed of “ecologies of] (sub) infrastructures” (Hanseth 2000, p202).

Infrastructures are *heterogeneous* because identical logical functions can be implemented in multiple ways. Also, they are heterogeneous because “larger components or infrastructures are built on existing smaller, independent components” (Hanseth 2000: p203). Smaller infrastructures are often developed into larger ones by connecting them with other smaller infrastructures. This heterogeneous character means that II constitute highly complex systems.

### *Relational Concept of II*

Although similar in many ways to the installed base notion of II, Star and Ruhleder (1996) adopt a more radical approach by discounting altogether the traditional (machine metaphor) notion of infrastructure based on the dictionary definition:

“What is an infrastructure? Common metaphors present it as a substrate: something upon which [note the link with the above dictionary definition] something else runs or operates, such as a system of railroad tracks upon which rail cars run.” (Star and Ruhleder, 1994)

Star and Ruhleder protest that the classical concept of II is “neither useful nor accurate” (ibid p.253). Instead, they assert, the term “infrastructure is a fundamentally relational concept. It becomes infrastructure in relation to organized practices” (Star and Ruhleder, 1996: p113). They identify eight characteristics, relating to this ‘relational’ notion of infrastructures as (embeddedness, transparency, reach or scope, links with conventions of practice, learned as part of a membership, embodiment of standards, built on an installed base, becomes visible upon breakdown). *Embeddedness*: an infrastructure exists within other structures, social arrangements and technologies. *Transparency*: the infrastructure is transparent in its use, in that, it appears as invisible to the users/tasks it supports.

“A system is transparent if the user does not have to be bothered with the underlying *stuff* driving it, just as an automobile is transparent when one sits down, turns the key, and drives of without the foggiest notion of how internal combustion works.” (Star, Bowker and Neumann, in press)

*Reach or scope*: the infrastructure possesses reach (spatial or temporal) beyond a single event/site. *Links with conventions of practice*: the infrastructure both impacts, and is impacted on, by the conventions of a community of practice. *Learned as part of a membership*: new users acquire familiarisation with the infrastructure by joining the community of practice. *Embodiment of standards*: “infrastructure takes on transparency by plugging into other infrastructures and tools in a standardised fashion”. *Built on an installed base*: the infrastructure is always built on an already existing infrastructure (the installed base). The new infrastructure grapples with the “inertia of the installed base”. Therefore, the new infrastructure always inherits properties from the old infrastructure (Hanseth et al., 1996). *Becomes visible upon breakdown*: even in the case where

backup procedures are in place, the existence of infrastructures (such as computer networks, and rail lines) becomes apparent in the event of breakdown.

## 2.5 IS CORPORATE INFORMATION INFRASTRUCTURE (CII)

### RESEARCH

The concept of CII is said to have appeared in the early 1980s alongside the design and development of large-scale corporate information systems (Ciborra and Associates, 2000). Nevertheless, it was not until the early 1990s that the notion of IT, or IS, as infrastructure began to appear in mainstream IS and management literature.

Interest in issues of CII within IS research can also be linked to developments in research on strategic information system (SIS). Although the field of SIS has existed for several decades, the idea of the corporate information infrastructure, possessing strategic value mostly appears in the 1990s (Broadbent et al., 1999; Ciborra, 1996; Galliers, 1991).

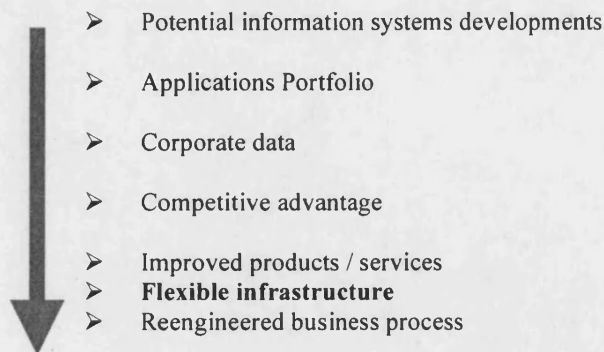
### 2.5.1 Infrastructure in Strategic Information Systems Research

In his review of SIS, Galliers (1991) presents a chronology of key developments in IS management and strategic information systems planning (SISP) research. Here, Galliers highlights the growing concern for matters of corporate infrastructure development.

“Current thinking recognises that elements of each of these foci are likely to be more or less required in different circumstances ...the very nature of SISP is now seen to be more complex than formerly ...Human, organisational and *infrastructural* issues are now seen as critical components of the task.” (Galliers, 1991)

Evidence of notions of corporate information infrastructure in studies of IS management is illustrated more clearly in the following diagram presented by Galliers (1993). The large arrow (depicting the chronological order of concepts) illustrates concern for “*flexible infrastructure*” and *business process reengineering*; argued to be a key issue of corporate information infrastructure development (Broadbent *et al.*, 1995).

Fig 2.2 Trends in IT strategy: the changing nature of desired outcomes (Galliers, 1993)



The concept of “IT-induced Business Reconfiguration” developed by Venkatraman (1991) exemplifies the findings in Galliers’ (1991) review of SIS thinking, which identifies the increasing focus on infrastructure issues in strategic information systems planning (SISP) at that time. In this popular work, Venkatraman uses the term (IT/electronic) *infrastructure* to discuss issues of information systems management and development within organisations. He argues that due to the common use of IT, an organisation’s management team “must consciously align its business strategy with its technology ...[in order for it to] remain competitive through the 1990s” (Venkatraman, 1991).

In this now dated, but seminal work, Venkatraman (1991) identifies a hierarchy of business reconfiguration levels as (1) *localised exploitation*; (2) *internal integration*; (3) *business process redesign*; (4) *business network redesign*; and (5) *business scope redefinition*. Venkatraman describes the second level as “2...building the electronic infrastructure, or platform, that permits the integration of tasks, processes, and functions” (Venkatraman, 1991:p123). Venkatraman highlights the importance of the creation of an electronic infrastructure to the further development of the

1990s' corporation. These levels are not conceptualised as a stages-of-evolution model, although he identifies the first two stages as sequential, forming the base foundation for the remaining three.

“The combination of stages 1 and 2 is the springboard for the remaining three stages. Without this base there is no evidence that an organization has the necessary foundation for the future. Stages 3, 4, and 5 are not sequential. Given that stages 1 and 2 have been accomplished, organizations have the option of deciding among the remaining three options.” (Venkatraman, 1991:p123).

Venkatraman (1991) does not provide any explicit definition of his use of the term (*electronic infrastructure*). However, his description of the five levels of IT-induced reconfiguration nevertheless supports a specific notion of infrastructure. Terms such as base, platform and foundation, which he uses to describe the electronic infrastructure of stage two, clearly support the *classical* notion of infrastructure.

The influence of Venkatraman's work on the understanding of CII throughout the 1990s to the present date cannot be understated. A review of IS management literature reveals it as the dominant notion of infrastructure. As IS research into issues of CII began to increase, most studies on this topic incorporate not just the basic understanding of IT as infrastructure suggested by Venkatraman (1991), but also the underlying developmental strategy of BPR that it supports. Consequently, although this work can be seen as innovative in its recognition of information systems development within organisations as “electronic infrastructure”, the concept of corporate information infrastructure management and development implied by Venkatraman suffers from all the problems associated with the assumptions of previous rational, formal models of strategy formulation (Ciborra, 1997).

Amongst the most published IS researchers on the topic of corporate information infrastructures are Peter Weill and Marianne Broadbent (1993; 1996; 1998). Their works mostly follow on from the principles laid down by Venkatraman (1991). Throughout the past decade, these two authors have developed various frameworks and concepts to support managers: assess the value of their organisation's information infrastructure (Weill et al., 1996); manage the development of their organisation's information infrastructure and design the corporation's information infrastructure for strategic advantage (Broadbent and Weill, 1993; Broadbent *et al.*, 1995;1999). Weill and Broadbent use the term "IT Infrastructure" to refer to CII, which they describe as "the *base foundation of budgeted-for* IT capability (both technical and human) shared throughout the business in the form of reliable services that are centrally coordinated" (Weill, Subramani and Broadbent, 2002:p2). Elsewhere, Weill and Vitale (2002), develop this definition as follows:

"The foundations of an IT portfolio is the firm's *information technology infrastructure* [...] this internal IT infrastructure is composed of elements. Starting from the bottom, they are: *IT Components* (the technologists' view of the infrastructure building blocks); *Human IT Infrastructure* (the intelligence used to translate the IT components into services that users can draw upon); *Shared IT Services* (the users' view of the infrastructure); *Shared and standard Applications* (fairly stable uses of the services). Above this four-part infrastructure are *Local Applications* (fast-changing applications that draw on the infrastructure)." (Weill and Vitale, 2002:p18)

The concept of CII put forward by Weill and Broadbent represents the conventional understanding of CII found in the IS management literature (1998; 2002). Similar to Venkatraman, this definition supports the traditional (classical) notion of infrastructure. The idea of infrastructure as a physical foundation of supporting components, that the traditional notion of infrastructure maintains, is

clearly expressed in this definition through its emphasis on infrastructure as the “*base ...of IT capability*” (*ibid*).

### 2.5.2 Installed Base Notion of CII

The definition of CII that will form the working definition of CII for the purpose of this research is the *installed base* notion of CII proposed by Hanseth (2000). This notion of CII emerged from the period of the mid 1990s onwards, as an alternative to this conventional notion (Weill, Broadbent, 1998; Venkatraman, 1994). The installed base notion of CII clearly occupies the same position as a modern concept on the continuum as the installed base notion of II. Hanseth argues that as a result of ICT evolution, public and corporate II should be considered as the same (Hanseth, 2000).

“The aspects of infrastructures *identified* are derived from how we see traditional public infrastructures. Are public and corporate infrastructures essentially of the same nature, so that these aspects are also the most important ones for corporate information infrastructures? We believe so.”

Hanseth argues that the most important aspect of the CII that distinguishes it from that of the more traditional information systems is *openness*. The aspect of openness is seen by Hanseth (2000) to reflect an important character of contemporary global corporations. Corporations operating within the context of globalisation demonstrate the characteristics of open rather than closed communities, especially in terms of their IT infrastructure. The large size and complexity of today’s global corporations prohibit their management as a single, coherent system (Hanseth, 2000:p61). Instead, he argues, global corporations often consist of numerous independently managed divisions needed to support the dynamics of modern management models requiring flexibility, rapid decision making and local autonomy (*ibid*). Furthermore, companies are now more integrated than ever with their



customers and suppliers through the evolution of computing technology into integrated ICT, which has dissolved the distinction between the corporate information system and the public information system (Hanseth, 2001).

This evolution has enabled users distributed across wide geographical areas to have access to the same information resources, throughout many regions of the world. Consequently, contemporary ICT should now be considered as II, based on the installed base notion of II and the associated aspects of II.

### **2.5.3 Critique of the Concept of IT as II**

This concept of contemporary information technologies as an infrastructure has attracted the attention of critics such as Bo Dahlbom (2000). In his analysis of the notion of infrastructure and its role in our understanding of contemporary and industrial societies, Dahlbom argues:

“...the notion of infrastructure, obviously useful as it is in theorizing about industrial society, can be very misleading when used in theories about information society”.

(Dahlbom, 2000: p218)

He concentrates his critique on four key aspects of infrastructure: the idea of infrastructure as a foundation of society; the idea of infrastructure as a stable structure; the idea of infrastructure as a common resource, and the idea of infrastructure as a common standard. Dahlbom argues that the combination of these four aspects “lead our thinking seriously astray” when used to comprehend the role of IT in contemporary societies (Dahlbom 2000, p219).

Dahlbom makes the distinction between industrial society and contemporary society, identified as the information society. He argues that the concept of infrastructure is a machine metaphor that is better suited to understanding the industrial age. “If we want to understand the role of technology in post-industrial society, we have to break out of industrial age thinking” (Dahlbom 2000: p222).

Dahlbom builds his critique around the idea that society has evolved from an industrial based society, characterised by the ‘Factory Metaphor’, namely industrial production factories and distribution systems, to an information society, characterised by “lightness and flexibility [...] made possible by its light, flexible and inexpensive technology” (Dahlbom, 2000:p336). According to Dahlbom, the industrial society, which we are leaving, “is dominated by machine technology” and the information society, which we are entering “...is dominated by information technology” (Dahlbom, 2000:p218).

Following the traditional notion of infrastructure, Dahlbom defines an infrastructure as “...a stable foundation, a common resource, and a standard for business activities” (Dahlbom, 2000). He argues that this notion of infrastructure is an industrial age concept, and as such is better suited to capturing the qualities of industrial society.

“There is nothing wrong with (or very much wrong) with the acknowledged perceptions of infrastructure as applied to a typical mid-20<sup>th</sup> century [...] So, let us keep the notion of infrastructure more or less as it is, but instead realize that the society we are now building, is sufficiently different from the industrial society we are leaving, to be characterized as a society with no infrastructure.” (Dahlbom, 2000)

The information age of contemporary society, according to Dahlbom (2000), is “...characterised by its ethereal qualities rather than by its weight and inertia” (Dahlbom 2000: p218; Quah 1999). He

argues that in such a society, thinking of information technology as infrastructure becomes problematic (*ibid*).

Dahlbom acknowledges that the alternative definition of infrastructure put forward by Hanseth (2001) and Star and Ruhleder (1996) represent "...an attempt to question the [traditional] entrenched notion of infrastructure in favour of a more flexible and complex notion more suitable for analysing the role of information technology in the information society" (Dahlbom, 2000: p218). However, he goes on to suggest a more "radical" notion of networking. He argues that the notion of networking "...is a more flexible and complex notion [than infrastructure] more suitable for analysing the role of information technology in information society" (Dahlbom 2000, p218).

Here, Dahlbom puts forward a convincing argument aimed at challenging the open notion of information infrastructure put forward in the work of Susan Leigh Star (1996; 1999) and Ole Hanseth (2000). However, Dahlbom's argument is focussed on a notion of infrastructure that conforms to the traditional (mechanistic) definition. Consequently, this argument fails to undermine the alternative (open) notion of infrastructure.

We agree with the argument that the concept of networking is a useful notion with which to analyse ICT in contemporary society. However, we do not agree that the point of this argument undermines installed base concept of II. Instead we find Dahlbom's (2000) argument more relevant to the traditional (closed) notion of infrastructure than it is to the installed base (open) concept of II. Moreover we find that, despite its validity, Dahlbom's argument does not undermine the installed base notion of infrastructure as a valuable concept with which to analyse the role of information technology in contemporary society.

## 2.5.4 Findings from Review of II Research

The above review of II definitions classifies the different definitions along a continuum from classical and modern notions. Both types have their strengths and weaknesses with regards to the aims of our study. Classical notions of II maintain a more objective view of II as a form of large-scale information technology: something physical and tangible. This view tends to focus more on the technical aspects of the II and less on the human, sociological factors. Modern definitions of II, on the other hand, emphasise the relational qualities of II. In the more radical modern notions, the II does not have to encompass computer technologies. The strength of these modern concepts of II is their focus on the human and sociological aspects of an II. In so doing, they capture an important feature of contemporary information technologies that has been identified as pivotal to their success (Aanstad and Hanseth, 2000; Broadbent *et al.*, 1999; Ciborra and Associates, 2000; Hanseth, 2000; Kahin and Abbate, 1995; Karimi and Konsynski, 2003; Strader *et al.*, 1998). In line with the findings of these authors, we argue that any study addressing the development of IT as II, must adopt a notion of II sensitive to the human and sociological aspects that form an II.

The installed base notion of II, although based on the traditional, dictionary definition of infrastructure, embraces a more open concept of II than the engineering definition put forward by MacGarty (1992) or the mechanistic II notion of the OECD. However, we believe the chosen notion should not be so open as to allow for the study of things that do not contain computer technologies, which we find to be the case with the more extreme relational notion of II put forward by Star and Ruhleder (1996).

The present study draws from empirical research from the development of an email and network operating system (NOS) within a multinational corporation. In order to allow for the effective analysis of the email and NOS solutions as technologies, we find it is necessary to adopt a concept of II that is also able to capture the physical aspects of the technology, as well as its ephemeral

qualities. For these reasons we find the installed base notion of II developed by Hanseth (2000) to be most suitable concept of II amongst the above definitions for our study of corporate information infrastructure (CII). Such a concept, we argue, will prove useful for our study of risk in the development of IT within the context of a contemporary Western society.

## 2.6 RESEARCH FOCUS

This literature review has examined the topics of CII, risk and IS Risk research. For each of these three areas we have identified limitations, and suggested areas for further research. In this final section of our literature review chapter we synthesise the limitations in existing research found in the three previous sections, to form an overall gap in research from which to conduct our study.

### 2.6.1 Risk Research

Our review of the risk discourse found it to be dominated by the natural scientific notion risk rooted in the mathematics of probability. Even within the social sciences, we find the dominant concept of risk to be the technoscientific notion with its origins firmly rooted in the natural science notion of risk. We attribute this dominance to the long history of risk in the natural sciences, since the invention of the mathematical concept of probability in the seventeenth century.

Our review identified the emergence of sociological based theories of risk towards the latter part of the twentieth century, which challenge the conventional wisdom of the technoscientific perspective. However, due to their relative infancy, sociological concepts of risk have been found to lack extensive tools that aid the process of risk management, unlike their natural science counterparts. We find the long history of natural science based concepts of risk give them an advantage over recently emerging sociological concepts.

A key finding from our review of the risk discourse was the recommendation for the integration of concepts from the different sociological theories of risk in order best to meet the needs of analysis. We argue that this strategy serves as a useful means of overcoming the limitation arising from the present lack of a comprehensive toolset to support the analysis of risk amongst the emerging sociological theories of risk.

### **2.6.2 IS Risk Discourse**

Similar to the findings from our review of the risk discourse, our review of IS risk research finds it to be dominated by the technoscientific notion of risk as probability. We found the contribution to the risk discourse from sociological theories of risk have mostly been ignored by IS risk researchers.

The dominance of the technoscientific concept of risk has meant that IS risk research has tended to focus on producing prescriptive, technical, solutions (Mumford, 1996). This imbalance of focus towards technical issues is despite the fact that IS risk researchers recognise other (less technical) issues, such as culture, to be of significance to the process of risk analysis and management in the development of information technologies (Applegate *et al.*, 1999; Boehm, 1991; McFarlan, 1982; Vitale, 1986). A possible explanation of this present lack of research could be the difficulties involved in studying 'softer' issues like culture, which often require more demanding research methodologies, like ethnography (Kuper, 1999). From this finding, we argue that further research within this area that draws on sociological theories of risk is needed to examine softer cultural issues.

### **2.6.3 II Research**

The idea of IT development as infrastructures has been identified by more and more prominent researchers within the IS field as central to our understanding of IT in contemporary society,

(Hanseth *et al.*, 1996; Star and Ruhleder, 1996; Venkatraman, 1991; Weill and Broadbent, 1999). Despite this growing recognition, the IS community has still to direct its focus towards an infrastructural understanding of IT.

The review of II research identified the need for further research in this area based on the installed base notion of II. The present study aims to contribute to research within the IS field through an investigation of corporate IT development based on the installed base concept of II (Hanseth, 2002a; Hanseth and Braa, 1999; Hanseth *et al.*, 1996). We argue that the installed base notion of II presents a useful notion with which to conduct our study because it combines important (physical and relational) qualities of contemporary information technologies.

## 2.7 RESEARCH QUESTIONS

To address the gaps in research identified in the above review of literature, this study will investigate issues of risk in the development of corporate II through the following primary research question:

How can we understand the relationship between risk, culture and the occurrence of danger in the development of IT as II?

From this primary question, the following secondary research question will also be addressed in this study:

How can we develop strategies to support the management of risk in the development of IT as II?

## 2.8 CHAPTER SUMMARY

We have mapped the story of risk over three epochs from premodern through to the postmodern era. We argued that following the invention of probability in the mid 17<sup>th</sup> century, the discourse on risk has been dominated by technoscientific ideas from the natural sciences. This domination has been challenged with the advent of sociological and cultural theories of risk rooted in the post-modern critique of modernisation and scientific methods. However, despite these recent contributions, IS risk research remains dominated by technoscientific ideas. Consequently there remains a pressing need for research into issues of risk within the IS field that draws on sociological and cultural ideas of risk.

The installed based notion of CII has been chosen from a continuum of II concepts as a useful notion with which to capture key characteristics of contemporary IT. Findings from the literature review were then synthesised to develop a research focus that aims to draw on sociological theories of risk to examine the issue of risk in the development of corporate II. Based on this research focus we then developed research questions with which to conduct the proposed study.

This brings to an end the literature review chapter. In the next chapter we develop an integrated model of sociological theories of risk to address the research questions derived from the review of literature undertaken in this chapter.



# CHAPTER 3: THEORETICAL FRAMEWORK

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## 3.1 INTRODUCTION

This chapter presents concepts that combine to form the theoretical framework of this dissertation. The chapter is focused on the Cultural Theory of Risk (CTR), which forms the basis of our proposed theoretical framework. This framework is further supplemented with Normal Accident Theory (NAT) and the Sociological Theory of Risk (STR). CTR is identified as the centrepiece of the proposed theoretical framework because we incorporate all the ideas it supports in our effort to adopt a cultural perspective towards understanding risk in the development of the corporate information infrastructure (CII). The adoption of NAT and STR allows for a more rigorous analysis of dangers in the development of CII, which CTR does not easily support.

The strategy behind the design of this theoretical framework was to enable the integration of concepts from the different emerging sociological theories of risk so as to allow for the most productive analysis of the empirical data. We find this framework allows for a more insightful analysis by providing a wider selection of theoretical tools with which to examine the rich source of ethnographic data.

In the sections that follow, we first present a detailed review of the Cultural Theory of Risk (CTR) developed by Mary Douglas and Aaron Wildavsky (1982). A central feature of the Cultural Theory of Risk is the concept of institution developed by Douglas (Douglas, 1987), hence the following section provides a detailed discussion of the idea of institutions presented in CTR. This will include

a definition of institution and a discussion of key philosophical and sociological concepts, which underpin the Cultural Theory of Risk (CTR).

Following this discussion of CTR we introduce concepts from other sociological theories of risk used to supplement CTR. The theoretical concepts in this section have been chosen in order to support the analysis of dangerous events within the development of the CII. Charles Perrow's theory of high-risk complex systems and normal accidents, which has been created for the analysis of systems dangers, is discussed in detail. This is followed by a discussion of important concepts from STR before summarising the achievements of this chapter.

## 3.2 CULTURAL THEORY OF RISK (CTR)

The ideas behind CTR originate in anthropological studies carried out by Mary Douglas on matters of selfhood, the body, and the regulation of danger (Douglas, 1966). Following this earlier work, Douglas worked with the political scientist Aaron Wildavsky to develop Douglas's initial ideas into a more comprehensive theory of risk, which they present in their seminal book: *Risk and Culture* (1982). These authors refer to this work as "a social theory of risk perception" (Douglas and Wildavsky, 1982). Since then, both authors have gone on to develop their theory into a more comprehensive approach. Douglas, especially in her later book, *How Institutions Think*, roots the key concepts presented in *Risk and Culture* into sociological and philosophical ideas developed by Emile Durkheim, Ludwig Fleck, and Herbert Simon.

Cultural theory explains "the selection of dangers among people who are without the benefit of modern science" (Douglas and Wildavsky, 1982:p29). It provides a framework for comparing the risk management approach of one society with another. According to cultural theory, the features of a society that form its culture equally determine the risk portfolio of that society. As such,

judgements of risks are described, according to cultural theory, as “essentially social rather than scientific [as] risks are socially selected” (Douglas and Wildavsky, 1982:p14). Far from constituting the objective outcomes of scientific enquiry these authors argue choices over risks are always socially selected (*ibid*).

According to Douglas and Wildavsky (1982), the conventional notion of risk represents “a contemporary western approach for dealing with danger and otherness”. CTR aims to transcend the culture in which the risks are being debated in order to identify the value judgements and moral codes that lead to a cultural bias in decisions of risk.

According to the cultural perspective, views over risk are not the independent ideas of individual actors, instead they are “public statements supporting different social structures” (Douglas and Wildavsky, 1982:p74). What is important to understand are the loyalties people have to a particular society and institutional form. Individuals occupying different positions in the typology of cultural institutions fail to reach agreement because they are arguing from different premises. Once adjusted towards a particular institution “people buy a whole package of political judgements about nature, human and physical, that go with the particular institutional form.” (Douglas and Wildavsky, 1982).

Here, the exercise of individual freedom occurs in the selection of social institutions. Following this choice, individuals adjust their decisions to meet the arguments that support their chosen institutional rationale. Each of the different cultures presented in the typology of cultural theory incorporates a theory of how society should be organised and a set of templates into which a life style can be cast.

### 3.2.1 Risk and Culture

In their book, *Risk and Culture* (1982), Douglas and Wildavsky commence their investigation with the question “what would be needed to make us understand the risks that face us?” Cultural theory asserts that there is no single correct conception of risk because “there is no way to get everyone else to accept it ... No person can know more than a fraction of the dangers that abound. To believe otherwise is to believe that we know (or can know) everything” (Douglas and Wildavsky, 1982).

#### *Assumption of Culture*

Amongst the key assumptions of cultural analysis is the understanding of culture as a system of people holding each other mutually accountable. People try to conduct their lives to a standard that makes them accountable and matches the standard they expect of others in their society. From this perspective:

“...culture is fraught with the political implications of mutual accountability. Instead of imagining the isolated individual testing every piece of news without bias or moral commitment, the person is assumed to be sifting possible information through a collectively constructed sensor set to a given standard of accountability. It is as if a kind of constitutional scanning device inside the person’s head were busy testing incoming news. The criteria for assimilating knowledge or rejecting mere noise is whether the new idea or fact will reinforce the subject’s preferred political scheme.” (Douglas, 1992: p10)

Hence, culture is said to represent a ‘mnemonic system’ that aids people in the calculation of risks (Douglas, 1992: p81). Accordingly, the issue becomes focussed on cultural issues such as conflict between political, aesthetic and moral judgements concerning risks. To address these issues,

Douglas (1987) develops her concept of institutions, which we examine in detail in the following section.

### 3.3 HOW INSTITUTIONS THINK

The term institutional thinking is used by Douglas to capture the common or shared ideas (rationality) that classify people into social groups. Douglas uses the terms institutions and culture interchangeably to mean the same things. Her concept of institution insists on the shared basis of knowledge and moral standards of social actors. She argues that individual social actors are not able to take many key decisions on their own. Rather, they place their trust in institutions (Douglas, 1987). “An answer is only seen to be the right one if it sustains the institutional thinking that is already in the minds of individuals as they try to decide” (Douglas 1986:p4).

This idea of institutions challenges the conventional idea of rational behaviour, which forms the basis of economic analysis and political theory. Douglas (1986) highlights an anomaly that exists between collective will or behaviour, and the self-regarding motives of the theory of rational behaviour, according to which social actors think and act in accordance with their individual self-interest. Douglas contends that this idea of rational behaviour contradicts key assumptions of collective behaviour underpinning Marxist and democratic theory.

“Our intuition is that individuals do contribute to the public good generously, even unhesitatingly, without obvious self-serving. Whittling down the meaning of self serving behaviour until every possible disinterested motive is included merely makes the theory vacuous.” (Douglas 1986:p9)

Key thinkers whose ideas Mary Douglas draws on in her theory of institutions include Emile Durkheim (1903; 1912), Ludwig Fleck (1935), David Hume (1739; 1751) and Herbert Simon (1955).

### 3.3.1 Definition of Institution

Douglas provides a clear definition of institution used in her work as referring to a type of “legitimised social grouping” (Douglas 1986:p46). She excludes from this definition “...any purely instrumental or provisional practical arrangement that is recognised as such” (Douglas 1986:p46). The principal assumption underpinning this definition is that providing they are established, institutions are able to “rest their claims to legitimacy on their fit with the nature of the universe” (Douglas 1986:p46). This definition begins with the initial idea that at its most basic an institution represents a convention, based on the following definition.

“A convention arises when all parties have a common interest, and none will deviate lest the desired coordination is lost (Lewis 1968). Thus, by definition a convention is to that extent self-policing.” (Douglas 1986:46)

Drawing on evidence from the work of Thomas Schelling, Douglas makes the argument that the conditions from which stable conventions arise are more stringent than they otherwise seem.

“Communities do not grow up in little institutions and these do not grow into big ones by any continuous process. For a convention to turn into a legitimate social institution it needs a parallel cognitive convention to sustain it.” (Douglas 1986:p4)

Douglas links concepts from Emile Durkheim (1903, 1912) and Ludwig Fleck (1935), on social groups, to wider discussions on institutions through her definition of institution as a sort of legitimated social grouping. In so doing, she is able to bring Durkheim's and Fleck's ideas to bear on the discourse on institutions. According to this perspective, the mark of an established institution, unlike a simple or self-policing convention, is that it is able to support its claim to legitimacy through recourse to some sort of fit with the natural state of the world.

“Why do you do it like this?” although the first answer may be framed in terms of mutual convenience, in response to further questioning the final answer refers to the way the planets are fixed in the sky or the way that plants or humans or animals naturally behave.” (Douglas 1986:p47).

### **3.3.2 Alternative Notions of Institution**

Douglas distinguishes her notion of institution from more commonly established ideas of institutions such as institutional economics. Oliver E. Williamson (1975) stimulated thinking on the subject of institutions through his ideas on the implications of the supply of information on the workings of the market with his book *Markets and Hierarchies: Analysis and Antitrust Implications*. Two key aspects of Williamson's theory are the cost associated with gaining useful information about the market, and the number of firms to choose from. In situations where the firms are plentiful with freely available information then profit can be found through operating as an independent contractor. However, in the opposite situation, where there are only a small number of firms and information is costly then the costs associated with transactions become inflated. In this situation, it pays to take up a service with a large operator that can reduce the cost of transactions and control information.

This analysis draws on the original work of Herbert Simon (1955) in which he argues that human rationality is inherently bounded. In his critique of the rational choice model, Simon (1955) protests that the rational approach attributes too much capability to the individual for handling information. Following this now famous complaint, the organisation of institutions is commonly treated as a means of resolving the problem of bounded rationality (Douglas, 1987).

Another, alternative concept of institution is provided by Schotter (1981). His information theoretical concept perceives information not specifically as a form of available commodity, but instead, it is whatever is found to be newsworthy. Douglas (1987) observes that Schotter's contribution has diverted the focus of study from the "flow of information (which is rather like the flow of commodities in Williamson's sense) to studying the amount of information carried by a particular item seen against the background of standard expectations" (Douglas, 1987: p47). Schotter's ideas treat institutional structures as types of informational complexity. Here, history is programmed as institutional rules, which serve as guides in determining the course of the future. In this situation the uncertainty of the future is seen to be controlled through a comprehensive encoding of expectations. The resulting effect is that behaviour tends to match the institutional template: providing that the degree of coordination is achieved, chaos and confusion vanish.

According to this perspective institutions represent "entropy-minimising devices" (Douglas, 1987: p47). Institutions emerge from basic heuristics into comprehensive information systems holding all relevant information. Once everything is institutionalised, where no past experience or alternative storage devices are needed, Schotter claims that at this stage "the institution tells all" (Schotter 1981: p139). Douglas accepts this idea as agreeable with Durkheim's analysis (Douglas, 1987). She does however challenge the thought that this popular idea of institutions can provide an adequate explanation of how institutions begin to gather sufficient stability to do all the things Schotter claims.



“Schotter thinks that [institutions] develop quite easily from conventions and from other strategies described in game theory. His suppositions develop naturally out of an equilibrium of conflicting powers and interests. Schotter is one among many others who subscribe to this contemporary version of functionalism that assumes in social forces a drive towards equilibrium... If there is such a drive, its realization is very precarious. Equilibrium cannot be assumed; it must be demonstrated and with a different demonstration for each type of society.” (Douglas, 1987: p47)

Douglas’s contention is that before it can reach the stage where it is able to carry out its entropy-reducing work, the fledgling institution requires some stabilising principle in order to avoid a premature ending (Douglas, 1986). According to Douglas, institutions acquire essential stabilising principles through naturalisation of social classifications:

“There needs to be an analogy by which the formal structure of a crucial set of social relations is found in the world, or in the supernatural world, or in eternity. Any where, so long as it is applied back and forth from one set [of] social relations to another and from these back to nature, its recurring formal structure becomes easily recognised and endowed with self-validating truth.” (Douglas 1987:p48)

In order to overcome this limitation in the general idea of institutions Douglas draws on the work of Emile Durkheim (1912) and Ludwig Fleck (1935).

### 3.3.3 Philosophical Underpinnings

CTR is based on the assumption that individuals do not think and act independently, but instead acquire their ideas and thoughts over decisions of risk from one amongst a typology of institutional forms. Both Durkheim and Fleck maintained that real solidarity is possible only when the individuals concerned share the categories of their thought (Douglas, 1987). By drawing on the work of Durkheim and Fleck, Douglas is aiming to resolve the conflict between this idea of sharing thought and the axiom of the theory of rational behaviour, according to which each individual is treated as a sovereign individual.

#### *Durkheim's Doctrine of the Sacred*

The way in which Durkheim chose to address this tension between individual and society was to think of them as conflicting elements inside a person. Durkheim found error in theories that denied the social origins of individual thought. According to Durkheim individuals acquired their guiding metaphors, classification schemes, and logical sense from their social environment. Durkheim maintained that an outrageous reaction arising out of any challenge to maintained judgements is a 'gut' response resulting from a person's commitment to a social group.

So, for Durkheim the solution was to accept the social origins of individual thought. Durkheim contended that rational model theories, such as utilitarianism, could not explain the underpinnings of a civil society. For him the idea that social order can be produced automatically from the self-interested activities of rational individuals was incomplete because it didn't provide an explanation for group solidarity (Douglas, 1987). Durkheim's thesis focused on sacredness and social evolution. The solution, which Durkheim proposes was based on a distinction between primitive and modern society.

“For Durkheim the division of labour accounts for the big difference between modern and primitive society: to understand solidarity we should examine those elementary forms of society that do not depend on exchange of differentiated services and products.” (Douglas, 1987: p13).

Durkheim argued that members of primitive societies come to think alike by internalizing and sacralizing ideas of social order. In this elementary form of society, problems of legitimacy are resolved because individuals carry within them a template of the social order, which they project onto nature (Douglas, 1987). However, in modern societies (marked by advanced division of labour), the harmony of primitive societies is destroyed and replaced by solidarity based on the operation of the market (*ibid*). Individuals in primitive societies share the same classification of nature and symbolic universe, which upholds principles of authority and coordination amongst members of the society.

For Durkheim, the principle of the sacred represents an important tool of social control in primitive societies. “The character of the sacred is to be dangerous and endangered, calling every good citizen to defend it” (Douglas, 1987: p13). Durkheim argues that the sacred serves as the primary weapon in the armoury of an elementary society, drawn out from its most significant point to defend the classifications and theories that maintain the institution.

“...the sacred is essentially an artefact of society. It is a necessary set of conventions resting on a particular division of labour, which of course produces the needful energy for that kind of system (Durkheim, 1893). The sacred makes a fulcrum on which nature and society come into equilibrium, each reflecting the other and each sustaining the known.” (Douglas, 1987: p13).

Durkheim identified three characteristics by which the sacred can be recognised. Firstly, the sacred is dangerous. Terrible things will occur if the sacred is profaned, and the guilty will be met with severe punishment. Secondly, attacks on the sacred provoke an emotional defence. Thirdly the sacred is explicitly invoked through symbols that make the sacred a real and tangible thing. Examples include sacred words and totems.

### *Ludwig Fleck's Application of Sovereign Thought Style to Modern Society*

Similar to Durkheim, Fleck developed various concepts to describe how individuals acquire their pattern of thinking from their social environment. However, whereas Durkheim maintained a distinction between primitive and industrial society, Fleck does not show any interest in sacredness or social evolution. Fleck complained that Durkheim shows “an excessive respect, bordering on pious reverence, for scientific facts” (Douglas, 1987). Consequently Fleck extends Durkheim’s work by applying the Durkheimian idea of a sovereign thought style to modern society, even to science [which] would have horrified Durkheim (Douglas, 1987).

Douglas (1986) makes her contribution by integrating key ideas from Durkheim and Fleck to develop her theory of institutions. She takes the idea of a sovereign thought style, from Durkheim, and argues that institutions represent a form of sovereign thought style to which individuals are bound. However, following Fleck, Douglas argues that these ideas are equally applicable to all societies (both primitive and modern). Although Fleck shows no interest in Durkheim’s notion of the sacred, Douglas maintains the importance of sacredness as a fundamental feature that helps to stabilise institutions and maintain their form.

Douglas argues that all societies appropriate, in one way or another, concepts of the sacred to control the behaviour of its members. Hence all forms of institutions will maintain certain things as sacred, and it is these (sacred) things that maintain the institutional form of that society.

To illustrate how Durkheim's doctrine of the sacred applies equally to modern society, Douglas draws on the work of David Hume (1739, 1751) on modern society. For instance on the modern concept of justice:

“No one has much problem with this [Durkheim's] idea of the sacred [when applied to primitive society]. But, inconsistently, David Hume's teaching that justice is a necessary social construct is exactly parallel to Durkheim's idea of the sacred, but Hume clearly refers to us, ourselves. He brings our idea of the sacred under scrutiny. Our defensive reaction against Hume is exactly what Durkheim would predict. We cannot allow our precepts of justice to depend on artifice. Such teaching is immoral; a threat to our social system with all its values and classifications. Justice is the point that seals legitimacy”. (Douglas, 1987:p14)

Here Douglas shows the difficulty we face in scrutinising the concept of justice impartially, as it is a consequence of its status as sacred in our modern society. Despite the widespread belief in the loss of mystery through the progress of modernisation, the concept of justice as a sacred term helps to maintain the institutional form of modern society. The anthropological perspective, which has the aim of studying contrasting cultural/social forms, each supporting its own idea of justice or risk, is best placed to overcome this dilemma (Douglas, 1987).

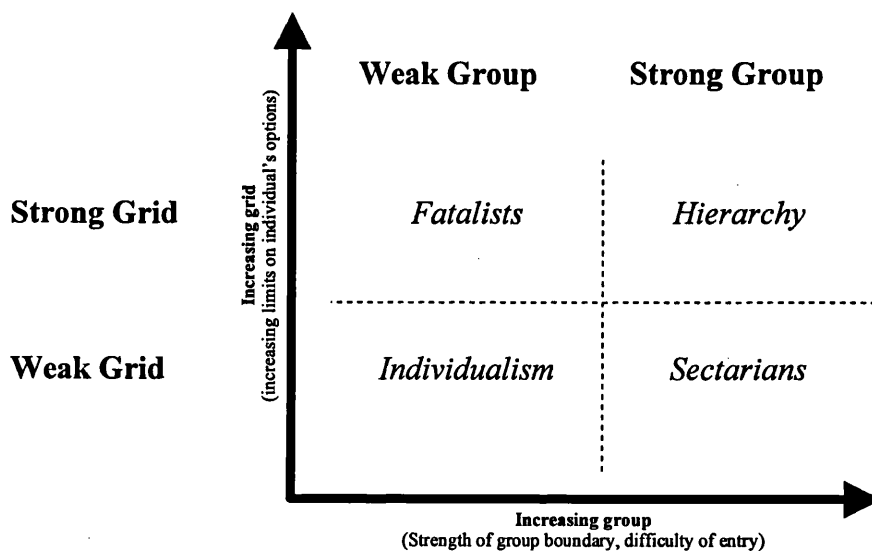
### 3.4 GRID-GROUP ANALYSIS

Having examined the philosophical underpinnings of CTR in the above section, this section presents a discussion of the grid group method, which forms the primary tool of analysis within CTR. The method of grid-group analysis is incorporated into CTR to help eliminate “local

perceptual bias” that guides people’s choices over risk (Douglas and Wildavsky, 1982). This technique works by reducing the variation of social constructs into the four cultural forms of CTR.

In grid-group analysis, control over any individual group member is expressed in two central dimensions of sociality. The vertical axis of control expresses the grid, whilst the horizontal axis of social commitments expresses the group (Douglas and Wildavsky, 1982) (ibid:p149). The combination of these two dimensions reveals the four grand cultures of CTR, which are said to sort an infinite army of social relations (Douglas and Wildavsky, 1982). The following diagram illustrates these four grand categories of CTR within the two-dimensional model of control and social commitments.

Fig. 3.1 Four cultural rationalities – Adapted from Mamadouh (2002:p335)



For Douglas, the boundaries between the four cultural forms remain firmly fixed:

“Personally, I believe the limits are real, that it is not possible to stay in two parts of the diagram at once and that the moral justification which people give for what they want to do are the hard edges of social change. If they wish for change, they will adopt different justifications, if they wish for continuity they will call upon those principles which uphold the present order.” (Douglas and Wildavsky, 1982).

Grid-group analysis does not attempt to identify the pros and cons of one cultural bias over another, or as the authors put it, this is not a tool for measuring “the cost-benefit analysis of economic and political power...” (Douglas and Wildavsky, 1982). Rather, its aim is to aid the identification of “...ideas and values that are going to surround anyone, once a pattern of social relations is chosen” (Douglas, 1987). In the following subsections, we undertake a detailed review of the four different cultural forms expressed in the grid-group typology, commencing with the hierarchy.

### 3.4.1 Hierarchical Culture

One of the most familiar cultural forms in Western social thinking incorporated into the typology of cultural theory is that of the hierarchy. Hierarchy is used in CTR to represent the behaviour of the bureaucracy (Douglas and Wildavsky, 1982). The definition of hierarchy used in CTR is taken from Louis Dumont’s *Homo Hierarchicus*, which states:

“...the characteristics of a hierarchy is that all parts are oriented towards the whole, so that formally “a hierarchical relation is a relation between larger and smaller or more precisely

between that which encompasses and that which is encompassed.” (Dumont 1966: in Douglas and Wildavsky 1982:p90)

Groups that cultural theory places under this title include industrial corporations, churches, and political hierarchies, in addition to the characteristics of the bureaucracy generally found in large organisations. A hierarchical collective survives through suppression of the internal rivalries to prevent strong individuals from destroying it, or from halting its growth (Douglas and Wildavsky, 1982). The success of a bureaucracy is dependent on its ability to tie the achievements of individual members to the collective interest of the hierarchy. Consequently, in matters of danger no single member can be attributed with all the blame. The hierarchy maintains anonymity of roles in order to facilitate this collectivisation of responsibility. No individual member should be identifiable as the decision maker, but rather the entire group. Hierarchies are seen to be more tolerant than societies of individuals (Douglas and Wildavsky, 1982:p90).

As a form of institution, the bureaucratic hierarchy deals with all matters of policy as administrative problems. It avoids politics, and is blind to backroom negotiations, compromises, and public debates of political strife (Dumont 1966, in Douglas and Wildavsky 1982:p91). To succeed a bureaucracy must coordinate many interacting subunits. The bureaucratic hierarchy must adopt the strategy of compromise: “of not pressing problems to the point of any single overriding objective...” to keep subunits from the temptation of breaking away (Douglas and Wildavsky, 1982: p91). The need to avoid stating any overriding goal comes from the need to keep subunits from questioning (doubting the compatibility of their sectional interests with the goals of the hierarchy). The hierarchy maintains a high level of tolerance, therefore, it avoids internal and external politics (Douglas and Wildavsky, 1982).



On the issue of formation, the concept of hierarchy put forward in cultural theory differs from other, traditional ideas. Whereas previous authors present the hierarchy as the response to the problem of scale, in Douglas and Wildavsky's (1982) cultural theory, the hierarchy represents a solution to the problem of voluntary organisation:

“A fully voluntary group has organizational problems that make it incapable of sustained responsibility. When some external pressure significantly reduces the voluntariness of membership, typical hierarchical procedures are invented. Bureaucratic compartments can be set up, and the universal rules and standard operating procedures developed; instead of personal leadership, authority is invoked. As soon as (and insofar as) such external pressures appear, a voluntary organisation changes its character towards hierarchy.”  
(Douglas and Wildavsky, 1982:p130)

### 3.4.2 Individualist Culture

Another widely accepted cultural form, which CTR adopts from political science, is that of the market individualist. The individualist society is one whose members seek to optimise their individual needs/profits. The individualist society upholds the rights of all its citizens to enter and withdraw from contracts, providing the terms of the contract are publicly accepted. This form of society is clearly oriented towards the free market, and against monopoly. Clear individual goals are needed to keep the free market alive. For this form of society “It helps to be able to separate the transactions ... and to be able to terminate contracts when they become unprofitable” (Douglas and Wildavsky, 1982:p100). In this type of society the values of autonomy, self-help and equity are proclaimed by all except its losers. Here, each person is held individually responsible for his or her own actions. This means they are all aware of the need to advertise their services, and to offer them to the most lucrative parties. The individualist screens out those colleagues who are not credit-worthy.

The market individualist does not shy or run away from uncertainties. Rather, the market individualist views uncertainties as opportunities, and seeks to capitalise on them. For the individualist therefore risk is opportunity. The justificatory cosmology of the individualist allows them to operate as entrepreneurs seeking to capitalise on all transactions: “The individualist in the market is traditionally supposed to be risk taking, by full intention and by calculation of profit” (Douglas and Wildavsky, 1982:p100).

Individualists do not believe in a uniform human nature, but in luck. For them, some are luckier than others. The individualist understanding of human nature and rationality supports the classic principles of utility theory: ranking objectives and selecting the one with the greatest value (Douglas and Wildavsky, 1982). The environment of the individualist discourages her from long-term planning. She does not subscribe to history or tradition, and never has enough time. Consequently, she is always ready to cut her losses and move on (Douglas and Wildavsky, 1982). All members of an individualist society are seen to have the same opportunities afforded to them, as well as the same sorts of problems. Individual societies are said to adopt a variety of strategies to common problems.

“Among solutions to their common problems, they would introduce standard measures and get legislation to protect the measures. They would manipulate the time dimension pushing repayments into some calculable but distant future.” (Douglas and Wildavsky, 1982:p95)

These strategies emerge as common or shared values amongst all members of the society. Examples of the shared values of individualist societies include: trust in qualifications; the exchange system; the role of the state as an arbiter to ratify disputes between different parties and to uphold standard measures.

### 3.4.3 Sectarian Culture

The sectarian (or sect) rationality is also referred to as egalitarianism. Douglas and Wildavsky accuse the sectarian of being armed with all the necessary “rhetoric for denouncing large organisations” as a means of luring their members through seductive preaching. The sect is a voluntary organisation, so the more voluntariness in a group, the more it conforms to sectarian values. Douglas and Wildavsky (1982) contrast the sect with a church by arguing, “Churches are inclusive, sects exclusive” (Douglas and Wildavsky, 1982:p114). Quoting from Richard Niebuhr (1975) they argue:

“By its very nature the sectarian type of organisation is valid only for one generation. The children born to the voluntary members of the first generation begin to make the sect a church long before they have arrived at the years of discretion. For with their coming the sect must take on the character of an educational and disciplinary institution, with the ideas and customs which have become traditional...” (Douglas and Wildavsky, 1982:p114)

The sect and its members focus criticisms and attack on the government and the central governing authority in the society. Sectarrians are not motivated to join the sect because of their opposition to the central governing authority and their policies. Instead, this open opposition to the centre is a consequence of difficulties they encounter through their voluntary formation and not vice versa (*ibid*).

Sectarian cultures evoke claims of God and higher spiritual status over others. With regards to the future, they anticipate discontinuity. The political motives of the sect make them dependent on a future that is different in a negative way from the present. This gloomy outcome allows sectarians to formulate their criticisms as worrying to the rest of the world, and therefore strengthening their

political standing (Douglas and Wildavsky, 1982). Established society, which is perceived by sectarians as “coercive and hierarchical”, is seen as bad. Such societies should not be replicated or allowed to continue. Douglas and Wildavsky argue that sectarian groups “have vested interest in bad news that shows the society outside is polluted and also shows that the sect inside is pure” (Douglas and Wildavsky, 1982:p122). Sectarian groups draw on disasters such as earthquakes, floods and fire as evidence of preambles of an inevitable Armageddon.

The autonomous or voluntary nature of sects distinguishes them from hierarchists and individualists, causing sect members to view risk in the world from a different perspective. Sectarians place emphasis on long-term risks and those with low probability but very high expectations of dangerous outcome. The sectarian “...assesses the long-term as something fairly close and worries about the damage, however low the probability” (Douglas and Wildavsky, 1982:p122). Sectarians draw on such future threats as their key weapon in the debate over risks. Here, the strategy of the sectarian is to gain support by identifying catastrophic dangers that can be attributed to mismanagement or corruption of the other cultural institutions.

Although sectarians paint a gloomy picture of the future, which they see as disastrous, or the present, which they judge pessimistically, the paradox is that sectarians are “optimistic about the perfectibility of human nature” (Douglas and Wildavsky, 1982:p122). They argue that “since the border [sect] is committed against organisations, it must fall back on faith in human goodness as the basis for good society” (*ibid*).

The sect remains resolute in its opposition to large organisations and social systems, which help to define them. These groups are blind to dangers associated with the reduction of the size of organisations. They threaten outsiders of the eminent destruction of their institutions because of their failure to heed their warnings of cataclysm. In order to maintain their survival, they draw

heavily on their vision of threatening dangers. Members of a sect rely on each other to confirm the validity of their belief in the threat of catastrophic disaster facing the world. Hence “the idea of global, irreversible damage serves well” (Douglas and Wildavsky, 1982:p123).

The main problems facing the sect are those of voluntary organisation, and for this they use “the whole of nature” to tackle these problems. As a result of these problems, sectarians emphasise the risks facing the world through pollution of nature, “global issues, not local ones will serve their purpose best” (Douglas and Wildavsky, 1982:p125). To invoke visions of global catastrophe sects claim to represent all of mankind. They substitute God for physical nature, because the latter is not only powerful, but also unpredictable. This alliance with nature supports its fight against the centralising tendencies of the hierarchy.

The justification for control of the sectarian group comes from their need to set a standard model of good behaviour for those outside the sect, who have yet to be saved, to follow. In the struggle for internal cohesion each member, at some point collaborates with others to defame and expel others from the group (Douglas and Wildavsky, 1982). The sect is said to use ideas of conspiracy as a way to charge disloyal members of scheming with the outside world against the interest of the sect.

#### **3.4.4 Fatalist Culture**

Contrary to the sectarian rationale Fatalists submit to fate by trying not to know or worry over matters in the future, over which they believe they have no control (*ibid*). The position of fatalists is identified in cultural theory as non-active in the sense that they do not subscribe to any particular policy, because (in the view of the fatalist) it doesn't mater anyway. Members of this category, although considered atomised, are severely constrained by their environment, “...which ascribes closely the way an individual may behave” (Douglas, 1966). Fatalists are strongly oriented towards socially assigned classifications, but with very little group identification (Ripple, 2002).

Fatalists are described as “people who find themselves subject to binding prescriptions and are excluded from group membership” (Thompson *et al.*, 1990). The social context of the fatalist is centred on coping with whatever situation life throws them in. The fatalist remains convinced in the view that nothing they do can make any difference to the world they live in. Similar to the hierarchist, fatalists are constrained in their scope for individual autonomy. Fatalists differ from hierarchists in that fatalists are not members of the group with the responsibility for decisions governing their lives (Thompson *et al.*, 1990).

An example of a fatalist is a factory worker or the hired hand of the mill owner (Thompson, Ellis and Wildavsky, 1990). The fatalist exists in a highly individualised social context. Fatalists accept the life-cycle of good and bad times, despite their skill or effort. “Ununionized, he is in a direct one-to-one relationship to his employer, but the crucial difference is that he has only one such relationship, while his employer has many” (*ibid*). For the fatalist, the events of life prescribed to him by his environment occur by chance or lottery. In the absence of any association (any bounded group that could negotiate with the mill owner on behalf of all hired hands), his strategy is inevitably one of personal survival. Because of his fatalist rationale, if he encounters any prosperity, it is never by his own design or effort.

### **3.4.5 Concerns over Risk: Individualist vs. Hierarchy**

In this section we provide further clarification of the cultural method through a comparison of the hierarchy and individualist cultures, as the two most popular cultural forms in western society. IS researchers will be familiar with these popular cultural forms through pioneering IS research incorporating concepts from transaction cost economics (Ciborra, 1996).

The individualist and the hierarchist both share a common set of ideas on danger. They are both highly sensitive to threats of any kind to the entire system. They both place a high value on public confidence, which is necessary for their survival. Both prefer to uphold universalistic rules, the difference being that “the hierarchist wants rules of instruction, while the individualist wants fair-play rules that do not stipulate what is to be done” (Douglas and Wildavsky, 1982:p97). The hierarchist and the individualist maintain imperialist tendencies because each can benefit from the strategy of expansion (either through larger markets or collectives). They both use numbers to define problems, however, the hierarchist will only accept quantification after it has been assimilated as part of the protocol.

Fears of the individualist and the hierarchist differ in that the former fears losses that impact market resources, which might prohibit the independence of her operations. Such fears correspond to those of the hierarchist’s fear for the survival of their organisation (Douglas and Wildavsky, 1982).

It is said of the hierarchist and the individualist that though both have alternative views of the present, preferring different aspects of it, and wanting it to remain the same, neither of these two cultural forms are concerned by long-term threats. Hierarchists are not able to see anything threatening the continuity of the past and present.

The hierarchist believes she is best prepared for the future by maintaining the advantages of the hierarchy in the present. The individualist on the other hand is accustomed to change, and welcomes the responsibility of undertaking long-term risks, providing she (as the risk taker) is allowed to take the rewards. The individual disapproves of legislative interference in market transactions. She views this as an impediment to important new discoveries. She places her faith in the free market: “the market will select the best and reject the worst” (Douglas and Wildavsky, 1982:p95).

In contrast to the sectarian culture, the hierarchist and the individualist both share the expectation that the threat of long-term danger may never materialise. The hierarchist relies on history and prefers to avoid rushing. The individualist on the other hand has little reason to rely on tradition, and is always in a hurry. Consequently, hierarchists maintain over individualist the “power of delay” (Douglas and Wildavsky, 1982:p97).

The cultural perspective has specific expectations of the outcome of trusting our destinies to either of these cultures. A total hierarchy believes in sacrificing the few for the benefit of the whole. It is extremely slow through its intentional use of rigid procedures. It fails to acknowledge new information, and new dangers, which makes it highly prone to surprise. It places at the top of its priorities the maintenance of the whole system, and is prepared to sacrifice individuals’ needs to meet this end (Douglas and Wildavsky, 1982). Turning in the opposite direction to a fully individualised society we encounter a society that excludes those unable to compete in the system of exchange. This is a society whose risk portfolio limits its liabilities for widows, orphans, pensioners, or the unemployed. The members of this society are expected to meet their own losses. It shares similarity with the hierarchy in that it believes strongly in the upkeep of the entire exchange system, and the punishment of those individuals who threaten it (Douglas and Wildavsky, 1982). Reflecting on the character of individualist society over matters of danger, Douglas and Wildavsky (1982:p101), remark that “...this society is too hasty to be trusted alone with dangerous technology”. Neither the hierarchist nor the individualist is bothered by low probability danger. However, both the hierarchist and individualist demonstrate strong aversion to high probability danger.



### 3.5 LIMITATION OF CTR

As a theory of risk, CTR provides an appropriate theoretical framework with which to examine the relationship between risk and culture. However, CTR appears less adapted to analysing the occurrence of real-world danger. Although its authors accept the existence of an objective reality that is realised in terms of the dangers we face, they fail to commit to any particular representation of this reality. Consequently it supports multiple cultural forms, each of which maintains its own perception of risks, and also, its own idea about nature (or the real-world). The conflict in this proposition is made evident when we consider that although different groups and people can maintain conflicting interpretations of the world, they all exist in one world, in which they experience the reality of dangers. Douglas and Wildavsky acknowledge this idea when they argue “dangers are only too real” (Thompson et al., 1990). Yet CTR fails to commit to any idea of reality and how dangers are shaped in the world. As a consequence of this limitation, CTR remains limited in its ability to support the analysis of real-world dangers.

This key limitation can represent a drawback for any analysis of risk that encompasses real dangers. In order to address this shortcoming we have chosen to supplement CTR with Normal Accident Theory as a theoretical concept for the analysis of dangers. In the following section of this chapter we undertake a detailed review of NAT, and how we aim to use it to supplement CTR.

### 3.6 HIGH RISK COMPLEX SYSTEMS AND NORMAL ACCIDENT THEORY

In his book *Normal Accidents*, Perrow (1984) outlines his “Normal Accident Theory” (NAT). In the opening paragraph of his book, Perrow lays bare, key underlying assumptions on the developmental path of contemporary society and its relationship with risks.

“As our technology expands, as our wars multiply, and as we invade more of nature, we create systems — organisations, and the organisation of organisations — that increase the risks for the operator, passengers, innocent bystanders, and for future generations.”

(Perrow, 1984:p3)

This seminal work presents an analysis of the social aspects of what he terms high-risk technologies (Perrow, 1984). Perrow’s theory provides useful concepts to aid the analysis of dangers inherent in systems within contemporary, post-industrial societies. The framework that he develops is based on the dimensions of tight versus loose coupling, and complex versus linear interactions. Briefly, Perrow summarises his Normal Accident Theory as follows:

“Nothing is perfect, neither designs, equipment, procedures, operators, suppliers, or the equipment. Because we know this, we load our complex systems with safety devices in the form of buffers, redundancies, circuit breakers, alarms, bells, and whistles. Small failures go on continuously in the systems since nothing is perfect, but the safety devices and the cunning of designers, and the wit and experience of the operating personnel, cope with them. Occasionally, however, two or more failures, none of them devastating in themselves in isolation, come together in unexpected ways and defeat the safety devices — the definition of a “normal accident” or system accident. If the system is also tightly coupled, these failures can cascade faster than any safety device or operator can cope with them, or they can even be incomprehensible to those responsible for doing the coping. If the accident brings down a significant part of the system and the system has catastrophic potential, we will have a catastrophe. That in brief is Normal Accident Theory.” (Perrow, 1984:p356)

### 3.6.1 Key Concepts of NAT

One of the major contributions of Perrow's work is the development of a specific set of tools to aid the analysis of hazards in high-risk technologies. Central to Perrow's thesis is the notion of *accidents*. He develops his notion of accident through a distinction with the term *incidents*, based on the levels of the *systems* on which the event occurs. Other concepts, including the terms *component failure accidents* and *systems accidents* are described more clearly in the following subsections along with concepts that remain central to NAT.

#### *Systems*

A system is described as being made up of four levels: parts, units, subsystems and the whole systems itself. Each level is wider and more complex as it encompasses the other, lower levels. The highest level of the system, level four, represents the entire system and all its subsystems, units and parts that combine to form the system. Level three are the subsystems that combine to form the system. These subsystems are broken down into units that make up level two. Each unit is made up of many parts, which represent the smallest component of the system. A part, then, is the first level of a system. Perrow provides the following example of a nuclear plant to explain this definition further.

“Consider a nuclear plant as a system. A *part* will be the first level — say valve. This is the smallest component of the system that is likely to be identified in analysing an accident. A functionally related collection of parts, as for example, those that make up the steam generator, will be called a *unit*, the second level. An array of units, such as the steam generator and the water return system that includes the condensate polishers and associated motors, pumps, and piping, will make up a *subsystem*, in this case the secondary cooling

systems under this rough scheme. They all come together in the forth level, the nuclear plant or system. Beyond this is the environment.” (Perrow, 1984:p65).

### *Incidents*

An *incident* is a minor failure in a system because it does not cause disruption to the operation of the entire system. They involve “damage to or failures of the parts or a unit only, even though the failure may stop the output of the system or affect it to the extent that it must be stopped” (Perrow, 1984:p70). The term *incident* therefore, in Normal Accident Theory (NAT), refers to disruptions to the system whose impact is confined to the first and second levels of the system of study.

### *Accidents*

The term accident is reserved in NAT “for serious matters, that is those affecting the third or forth levels”. An accident is defined as “... unintended damage to people or objects that affected the functioning of the system we choose to analyse” (Perrow, 1984:p65). Perrow takes pains to distinguish it from his use of the term *incident*, which refers to disruptions that occur at lower levels of a system.

“Accidents involve damage to subsystems or the system as a whole, stopping the intended output or affecting it to the extent that it must be halted promptly” (Perrow, 1984:p70).

### *Component Failure Accidents*

This involves one or more component failures (part, unit, or subsystem) that are linked in an anticipated sequence. Any interaction of several failures that has been anticipated by the designers or operator of the systems is distinguished as a component failure accident.

### *System accidents*

The central idea in NAT is expressed by the term “*system accident* or *normal accident*” (Perrow, 1984:p62). Systems accidents involve the unanticipated interaction of multiple failures. According to Perrow (1984), for an accident to constitute a systems accident, it must combine multiple failures in different units that form part of the whole system. Although Perrow accepts that all accidents, including systems accidents, have their origins in some component failure, he asserts:

“It’s not the source of the accident that distinguishes the two types [*component* and *system accidents*], since both start with component failures; it is the presence or not of multiple failures that interact in unanticipated ways.” (Perrow:p71)

### **3.6.2 Complexity, Interactions and Coupling**

Central concepts developed in Perrow’s work to aid the identification of systems that are inclined towards accidents are *complexity*, *interaction* and *coupling*. Complexity refers to the type of interaction within a system, which can be *complex* or *linear*. The term complexity in NAT refers to a form of interaction within a system. Perrow identifies two types of interactions relevant to the analysis of systems accidents. These are *linear interactions* and *complex interactions*.

“*Linear interactions* are those interactions of one component in the DEPOSE system (Design, Equipment, Procedure, Operators, Supplies and materials, and Environment) with one or more component that precede or follow it immediately in the sequence of production. *Complex interactions* are those in which one component can interact with one or more other components outside of the normal production sequence, either by design or not by design.” (Perrow, 1984:p77)

Perrow takes pains to underline his view that neither the terms *complex* nor *linear* interaction adequately capture the notion he is trying to convey (Perrow, 1984:p78). These terms are not meant to depict the type of system, but rather the character of interaction within the system. According to Perrow, complex interactions are very few in number, whilst linear ones are far more common. As Perrow explains: "...linear systems have very few complex interactions, while complex ones have more than linear ones, but complex interactions are still few in number" (*ibid*). Linear interactions follow the expected sequence of production and maintenance procedure. Complex interaction however, "are those of unfamiliar sequences, or unplanned and unexpected sequences, and either not visible or not immediately comprehensible" (Perrow, 1984:p78).

Perrow also warns the reader against associating the terms linear and complex with the physical architecture that forms the system. The term complex system does not refer to "highly sophisticated technology, numerous components, or many stages of production". Neither does it follow that an assembly line should be classified as linear, although they generally tend to be so (Perrow, 1984:p78).

Linear interactions represent the sequence of interactions that have been built into the architecture of the system in its planning stages. They represent the way the system was designed to run. Complex interactions on the other hand are never built into the design of the system and therefore represent unintended consequences. Perrow (1984) gives the following example of intended interactions that can still be considered as complex.

"...the nonlinear [complex] interactions may be intended but rarely activated, and thus operators or designers forget about them. It could have been foreseen by a designer that the demineralised water might sometimes be needed in containment, so she could have made it

possible to line up various valves to provide the water. But if it is rarely used or is usually lined up before a crew enters containment, the faucet creates no problems, it is not an expected production sequence but an infrequently used system possibility (in this case for maintenance, not production).” (Perrow, 1984:p77)

Accordingly, nonlinear or complex interactions may fall within one of two categories. The first, and most common form, of complex interaction is systems interactions that are *unintended*. The second, less common, is intended, but *unfamiliar* interactions within a system.

### *Controls, Hidden Interactions and Added Complexity*

Not all systems interactions are visible, even in linear systems. Complex and linear system may use control devices to intervene in non-visible, hidden devices within the system. Examples of control devices include warning lights, switches and dials (Perrow, 1984). Within linear system, hidden interactions tend to reside in clearly defined, separated parts of a production or maintenance sequence. However, in complex systems:

“...well-defined and segregated segments do not necessarily exist. Instead, jiggling unit D may well affect not only the next unit, E, but also A and H. [Hence, complex systems require more controls] ...because so many components are linked in branching paths and feedback loops [...] Attempts are continually made to reduce the number controls by automating the subsidiary interactions and leaving only the main parameters for the operators to worry about. But this decreases the system’s flexibility; the operator loses the ability to correct a minor failure in a part rather than shutting down the whole unit or subsystem. The operator cannot exit from the high-level, summary controls to the low-level specific one required to deal with a single part.” (Perrow, 1984:p79).

From this basis, Perrow develops an important analysis in which he argues that the more controls are added to a system, often with the aim of simplifying its operation, the more complex the system is made. This added complexity further contributes to the development of a high-risk system with the catastrophic potential of a *normal accident* (Perrow, 1984).

### *Default Status Controls*

The dilemma of growing complexity is further complicated by the use of “Default” status controls in systems.

“Default status is the normal status of a control; for example, you must choose to change a switch to ‘on’; by default it is ‘off’ [...] But modes and switches are not always clearly linked [...] Operators sometimes disconnect these sophisticated indicators (or much more commonly, ignore them) because of such complications.” (Perrow, 1984:p82).

Although these problems are common in all industrial systems, Perrow argues that they become amplified in systems that feature a large host of nonlinear interactions because:

“...interactions caused by proximity, common mode connections, or unfamiliar or unintended feedback loops, require many more probes of system conditions, and many more alterations of the conditions. Much more is simply invisible to the controller.” (Perrow, 1984:p82).



### *Transformation Processes*

Transformation processes are those that escape understanding even though they may be described. Such processes are common in systems that appear complex beyond retrieval. Transformation processes are “often discovered through trial and error, and what passes for understanding is really only a description of something that works” (Perrow, 1984:p85). Systems that perform transformation processes tend not to assemble or fabricate, instead they generally transform raw material (Perrow, 1984). These systems are typified by unknown interactions, because of the lack of knowledge over the exact nature of the system.

### *Comparison of Complex and Linear System*

Linear systems are said to possess “spatial segregation” of the different segments of production. This means the first and second levels in a linear system, which are not linked directly through the production process, are often spatially separated (Perrow, 1984:p86). Furthermore, there exist only a limited number of connections within production sequences. This allows “damaged components to be pulled out with minimal disturbance to the rest of the system” (Perrow, 1984:p86). However, the opposite is true for complex systems, as Perrow explains:

“In complex systems, removing a component or shutting it down means temporarily severing numerous ties with consequent readjustments, capping, product storage, removal to get access, and reconfigurations because parts and units tend to be multiply linked.”  
(Perrow, 1984:p86)

Further to this, linear systems mostly support “serial production — a series of linked but semi-independent production steps — rather than what organisational theorist James Thompson (1967) calls ‘pooled interdependence,’ where all components (including operators) must coordinate their

input if the system is to function at all” (Perrow, 1984:p86). Failure within the first or second levels of complex systems often reveals “unanticipated interdependencies” (Perrow, 1984:p87).

There is also a difference between the types of labour we find in complex and linear systems. Unlike linear systems, complex systems are characterised by specialisation of labour. In linear systems, the workforce tend to generalise and occupy roles that are more readily interchangeable. Perrow extends this observation to other areas:

“What is true of labour is also true of materials and suppliers. If material and suppliers are substitutable, more latitude of response is available, limiting failures to incidents and preventing failures in the first place. But complex systems appear to have more exacting requirements for materials and supplies; the fuel cannot be off-standard, nor one fuel substituted for another, whether we are dealing with nuclear plants, aircraft, spacecraft, or chemical production. Substitutions are more likely in linear systems.” (Perrow, 1984:p87)

A final distinction between complex and linear systems can be found in the existence of feedback loops. Complex systems generally possess a greater number of feedback loops, compared to linear systems. This is explained by the centralised character of controls in complex systems and the many interactions of control parameters, which they support. Whereas the information received in complex systems is ambiguous, information used in the running of linear systems tend to be more accurate in their representation of the systems state. The following table presents a useful summary comparison of complex and linear system.

Fig 3.2 Summary Comparison of Complex and Linear Systems - Adapted from Perrow (1984).

## Complex vs. Linear Systems

### *Summary Terms*

| <i>Complex Systems</i>  | <i>Linear Systems</i>   |
|---|---|
| <i>Proximity:</i> tight spacing of equipment; proximate production steps.   | <i>Special segregation:</i> Equipment spread out; Segregated production steps.  |
| <i>Common-mode Connections:</i> many common mode connections of components not in production sequence.                                    | <i>Dedicated Connections:</i> Common-mode connections limited to power supply and environment.                          |
| <i>Interconnected Subsystems:</i> Limited isolation of failed components; personnel specialization limits awareness of interdependencies. | <i>Segregated Subsystems:</i> Easy isolation of failed components; less personnel specialization.                       |
| <i>Limited Substitutions:</i> limited substitution of supplies and materials.   | <i>Easy Substitution:</i> Extensive substitution of supplies and materials.   |
| <i>Feedback Loops:</i> unfamiliar or unintended feedback loops.   | <i>Few Feedback Loops:</i> Few unfamiliar or unintended feedback loops.   |
| <i>Multiple and Interconnecting Controls:</i> many control parameters with potential interactions.  | <i>Single Purpose, Segregated Controls:</i> Control parameters few, direct, and segregated.                             |
| <i>Indirect Information:</i> indirect or inferential sources of information.  | <i>Direct Information:</i> Direct, on-line information sources.   |
| <i>Limited Understanding:</i> limited understanding of some processes (associated with transformation processes).                         | <i>Extensive Understanding:</i> Extensive understanding of all processes (typically fabrication or assembly processes). |

### 3.6.3 Tight and Loose Coupling

Other than complex and linear interactions, the two other major dimensions expressed in NAT are tight and loose coupling. Understanding of these terms is based on their use in engineering where they originate.

“Tight coupling is a mechanical term meaning there is no slack or buffer or give between two items. What happens in one directly affects what happens in the other.” (Perrow, 1984:p92)

Tightly coupled systems are typified by a lack of slack between the parts of the system. Loose coupling, however, enables the different parts that form the system to function more independently of each other. Systems that are loosely coupled are better able to accommodate disasters and respond to changes than those that are tightly coupled.

“Loosely coupled systems, whether for good or ill, can incorporate shocks and failures and pressures for change without destabilization. Tightly coupled systems will respond more quickly to these perturbations, but the response may be disastrous. Both types of systems have their virtues and their vices.” (Perrow, 1984:p92)

Perrow argues that tightly coupled systems appear to represent an optimum mode of organisations for linear systems. Loose coupling, on the other hand, captures a more suitable means of organisation for complexly interactive systems.

### *Disaster Recovery*

NAT stresses the importance of recovery from systems accidents by asserting that disaster is common to all systems, although more (or less) frequent in others.

“Since failures occur in all systems, means to recovery are critical. One should be able to prevent an incident, a failure of a part or unit, from spreading. All systems design-in safety devices to this end. But in tightly coupled systems, the recovery aids are largely limited to

deliberate, designed-in aids, such as engineered safety devices [ESD]... In loosely coupled systems, in addition to ESDs ... fortuitous recovery aids are often possible [...] Tightly coupled systems offer few such opportunities. Whether the interactions are complex or linear, they cannot be temporarily altered.” (Perrow, 1984:p95)

Coupling is especially relevant to the recovery of the system in the event of a disaster. A distinction between tight and loosely coupled systems identified by Perrow (1984), which is especially relevant to the issue of disaster recovery is that tightly coupled systems are less flexible than loosely coupled systems. The former requires that cushioning or buffers and substitutions be planned for and accommodated within the system during the design stage. In the latter however, there is more opportunity for imaginative jury-rigging, substitutions and spur-of-the-moment buffers and redundancies without the need for prior planning in the design stage.

The following table summarises the key characteristics of tight and loosely coupled systems.

Fig. 3.3 Tight and Loose Coupling Tendencies – Adapted from Perrow (1984)

| <b>Tight and Loose Coupling Tendencies</b>                             |   |
|--|---|
| <i>Tight Coupling</i>  | <i>Loose Coupling</i>                           |
| Delays in processing not possible                                      | Processing delays possible                      |
| Invariant sequences  | Order of sequences can be changed               |
| Little slack possible in supplies, equipment, personnel                | Slack in resources possible                     |
| Buffers and redundancies are designed-in, deliberate                   | Buffers and redundancies fortuitously available |
| Substitution of supplies, equipment, personnel limited and designed-in | Substitutions fortuitously available            |

### 3.6.4 CII as Complex Systems

Perrow makes several important contributions through NAT. Firstly, the distinction between complex and linear systems based on the type of disasters that they generally demonstrate. One of Perrow's most important contributions, however, may be less obvious. This contribution lies in the identification of the increasing development of complex systems, as systems that are more prone to catastrophic dangers. In this section we argue that the development of CII constitutes the development of highly complex systems, as described in NAT. In so doing, we aim to justify our choice of NAT as a supplementary theory for the examination of danger that occur through the development of CII.

#### *Computers as Complex Systems*

The strongest argument supporting the identification of CII as complex systems comes from Perrow, who identifies the microcomputer as a complex system. The computer system can be regarded as the smallest component of most corporate information infrastructures. This argument is given further weight when we consider the advances in computer technology since 1984, when Perrow first identified them as complex systems. The argument that computer technologies are far more complex today than they were in the mid 1980s is compounded by their integration over computer networks. By combining all the different components that combine to form modern ICTs, the notion of II can be said to capture the most complex features of computer technology (Hanseth, 2000). The two characteristics used in NAT to determine the complexity of systems are interactiveness and coupling. A comparison of these two aspects with the features of CII further supports the argument of CII as complex systems.

*Interactiveness of CII*

As is the case for all other complex systems, CII consist of linear interactions, which combine to form the complex interactions uncommon in systems dominated by linear interactions. CII, like complex systems, support interactions that work in ways not determined in the designed stages of the technologies that combine to form the infrastructure. This is because a CII is made up of many technical components developed by different manufactures, and configured by different technical teams to meet different business objectives such that the developed infrastructures will always be unique in some way from other CII. This uniqueness is further reflected in the interaction that occurs within the system.

A key feature of complex systems is the existence of hidden interactions. Hidden interactions in CII arise from the extensive dependence on high-level controls. For instance the screen display on any personal computer serves as a control panel. CII like email and NOS (network operating system) technologies work on a further, higher level of control to that identified in Perrow's original thesis because they require the use of control panels that combine information from specially (local) distributed systems, each of which possesses their own high-level control panel of technologies that form the local system. The highest level control panel of a global II such as an email or NOS of a multinational corporation therefore provides an aggregation of locally and regionally distributed control panels.

The heavy dependence on high-level controls means that much of the internal workings of the CII remains outside the immediate view of the operator. Consequently, operators of CII must rely on high-level control monitors for information on the internal workings of the CII.

Default status controls in computer technologies have multiplied through the increased automation of procedures in computer systems. For instance, when installing a software application, many of

the settings are configured through default status controls. Such controls, often aimed at reducing the chance of human error in the installation process, serve to transfer intelligence from human operators to the technology, hence deflating the skills of the operator, and adding further complexity to the IT.

### **3.6.5 Limitation of NAT**

Without question, Perrow's thesis of Normal Accidents represents a comprehensive investigation contributing to the sociological discourse on risk. However, as with other theories in this area, it is not without its limitations. Many of the systems that Perrow examines (e.g. nuclear plants, petrochemical plants, and "earthbound systems" etc.) all fall within the area of environmental disasters. This focus on environmental dangers may open Perrow's work up to the criticism of bias in favour of the environmental movements, against other interests such as industrial production centres.

This critique can be made more rigorous by drawing on the grid-group typology of Douglas and Wildavsky's cultural theory of risk (CTR). Perrow's thesis is focused on (what is often classified in the conventional risk literature as) low probability, high consequence risks. Viewed from the lenses of CTR, Perrow's thesis can be identified as subscribing to the risk preferences of the egalitarian culture. Hence, Normal Accident Theory can be criticised for all the shortcomings of the sectarian cultural form because of its focus on risks with global consequences.

This critique has been addressed in the present study through the integration of NAT with CTR. As stated earlier, CTR provides the main theoretical concepts for the analysis of risk, whilst NAT is used for analysing danger in the technology of the Corporate II. The following section will present



important ideas from Niklas Luhmann's Sociological Theory of Risk (STR) as the theoretical glue with which to integrate CTR with NAT.

### 3.7 THE SOCIOLOGICAL THEORY OF RISK (STR)

Thus far, our theoretical framework combines the two sociological theories of risk. The first we find in Douglas and Wildavsky's Cultural Theory of Risk (CTR). The second is the toolset for analysing accidents provided by Perrow's Normal Accident Theory (NAT). In this section, we aim to validate the integration of these two theories for the purpose of our study.

The integration of CTR and NAT is validated through the definition of risk that Luhmann develops in STR and the distinction that it maintains between risk and danger. We draw on this distinction as the bridge with which to link CTR and NAT, which allows for the analysis risk as cultural perception, and danger as objective reality.

In very simplistic terms the definition of risk in STR captures the connection between a decision and the possibility of loss in the future. This definition of risk emerges from a critique of the technoscientific paradigm or rationalist tradition, which is accused of "not seeing what it does not see" (Luhmann, 1993:p14). To overcome the limitations inherent in technoscientific approaches Luhmann demands that we must adopt strategies that enable us to understand why the rationalist tradition cannot see its own shortcomings. For this purpose he develops the concept of second-order observation, which he distinguishes from first-order observation.

#### 3.7.1 First-Order and Second-Order Observation

The concepts of first and second-order observer capture the position of an actor in regards to risk, or in CTR terms, the position from which a person (the observer) perceives the debate over risk.

According to Luhmann the person who observes at the level of first-order believes they operate with an accurate view of the real-world, whereas the person observing at the level of the second-order has the benefit of a more holistic view of the first-order observer, which privileges them in seeing the blind spots of the first order observer.

### *Observation as Distinction*

A further point of Luhmann is that each observer draws on a distinction in indicating either first-order or second-order observation. Time is required to shift between these two levels of observation. This negates the possibility for simultaneous observation as both first-order and second-order observer. STR adopts a definition of observation as distinction to clarify the concepts of second-order observation.

“Observation shall thus be understood to mean the use of a distinction to indicate one side (and not the other), regardless of which empirical reality the operation performs, so long as it is capable of drawing distinction (and thus of seeing two sides simultaneously) and of making an indication.” (Luhmann, 1993: p223)

Even when drawing distinctions, the first-order observer treats such distinctions as objects. To undertake second order observation, one must observe an observer. The idea of an observer observing itself means “observing a system that for its part is carrying out operations of observation” (Luhmann, 1993).

“At the level of first-order observation, participants observe one another as objects and draw conclusions about the nature partners or opponents on the basis of prejudices or perceptions, or on the basis of the communication of prejudices and perceptions. [...] In second-order observation the primary question is which distinctions the observed observer uses to make

indications and how he does so. What does he regard as probable and what is improbable?"

(Luhmann, 1993:p226)

### 3.7.2 Risk and Danger

Based on the distinction between first-order and second-order observation, Luhmann develops a definition of risk based on a distinction between risk and danger. To appreciate the concept of risk that Luhmann (1993) develops in STR we must accept the underlying assumption that uncertainty exists in relation to future loss. This leads to the two possibilities of risk and danger with regards to the potential loss.

“The potential loss is either regarded as a consequence of the decision, that is to say, it is attributed to the decision. We then speak of risk – to be more exact of the risk of decision. Or the possible loss is considered to have been caused externally, that is to say, it is attributed to the environment. In this case we speak of danger.” (Luhmann, 1993:p21)

Hence *risk* is a decision to which a future loss can be attributed. *Danger*, on the other hand, refers to the possibility of loss arising from one’s environment, or, we can say loss from factors outside one’s control (Luhmann, 1993). According to this theory the distinction of risk and danger captures the two sides of the same coin. Here, a similarity with other ideas expressed in the risk discourse (see chapter 2) starts to appear.

“The distinction of risk and danger permits a marking of both sides, but not simultaneously. Marking risks then allows dangers to be forgotten, whereas marking dangers allows the profits to be forgotten that could be earned if risky decisions are made”. (Luhmann, 1993:p24)

A parallel with the thesis of Beck's Risk Society and also the work of Peter Bernstein's (1996) is made evident when Luhmann distinguishes between modern and premodern societies on the basis of this distinction.

“In older societies it was thus danger that tended to be marked, whereas modern society has until recently preferred to mark risk, being concerned with optimizing the exploitation of opportunity.” (Luhmann, 1993:p25)

Although the distinction between risk and danger does not feature in CTR, it is evidently assumed by its authors when they argue that dangers are only too real (Douglas and Wildavsky, 1982). The problem however is that although well adapted for the analysis of issues for risk and culture, CTR is less equipped to analyse the development of dangers within the real-world. This is where the need for the integration of CTR with NAT arises.

### 3.8 CHAPTER SUMMARY

The aim of this chapter was to discuss theoretical concepts that combine to form the framework for the analysis of our research data. The chapter has discussed in detail the theoretical ideas of the Cultural Theory of Risk (CTR), Normal Accident Theory (NAT), and some key concepts from the Sociological Theory of Risk, which together form the theoretical framework for our study of risk in the development of corporate II.

CTR has been chosen for this purpose because we believe that more than any other sociological theory of risk, it allows for the adoption of a cultural perspective to the study of risk. We have discussed the philosophical underpinning of CTR and the analytical method of grid group analysis adopted in CTR. In support of our selection of CTR as the primary theory for our analysis, we have

argued that besides its anthropological underpinnings, which lend itself to the analysis of ethnographic data used in the present study, CTR represents the most appropriate sociological theory of risk because it is able to capture the different ways in which groups of different kinds perceive risk.

The chapter also documents concepts from NAT as a supplementary theory. The choice of NAT to supplement CTR was justified by our argument that it allowed for a more thorough examination of dangers in the CII that appeared from the fieldwork. This was accompanied by a discussion of key concepts from STR that supports the integrated use of CTR and NAT. In the next chapter we examine the ethnographic method, techniques and philosophical ideas behind this process of data collection.

# CHAPTER 4: RESEARCH METHODOLOGY

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This chapter presents the justification for the choice of the qualitative ethnographic approach of autoethnography as an appropriate research strategy for the present study. The chapter will commence with a discussion of philosophical issues and debated perspectives in social science research. Some alternative research approaches, available for selection by the IS researcher are discussed. The final sections of this chapter provide a detailed discussion of key considerations in our research design.

## 4.1 PHILOSOPHICAL ISSUES

The selection of a suitable research methodology requires an understanding of theoretical and philosophical assumptions underpinning social science research (Garcia and Quek, 1997). Such considerations lead to questions of ontology and epistemology, and the distinction between qualitative and quantitative studies, upon which the discussion of research approaches within the social sciences are conventionally structured (Hirschheim and Klein, 1989).

### 4.1.1 Ontological and Epistemological Considerations

Ontology refers to the subject of existence, or the nature of reality. The continuum of ontological perspectives ranges from *nominalism* to *realism*. Nominalism holds that ‘reality’ is what we individually think, and that abstract entities do not exist independently of human thought. Realism

refers to the belief in the existence of the world of physical objects, independent of human observation.

Epistemology denotes the nature of knowledge, or more specifically “how we acquire knowledge” (Hirschheim, 1985:p13). A continuum of epistemology can be drawn from positivism to anti-positivism (Burrell and Morgan, 1979). Positivism represents the view of scientific truth embraced by natural science. It concerns the measurement of natural phenomena. Positivists hold the position that sees general explanations based on underlying regularities and causal relationships. Positivism holds that, by use of a systematic method of inquiry, adequate controls within the research design, and valid measures, unbiased and objective facts can result from research. An alternative perspective in the form of anti-positivism emerged through a critique of positivism. This philosophy privileges the view of individuals involved in a given activity. The social world is to be studied from the viewpoint of these individuals. Anti-positivists reject the notion of the researcher as an unbiased observer, capable of seeing the world as it is. Instead, they emphasise understanding and interpretation of human activity.

#### **4.1.2 Quantitative vs. Qualitative Research**

The division between quantitative and qualitative research represents a common distinction between approaches to social science research. As the name suggests, quantitative research draws on numbers to describe social phenomena. The term qualitative refers to a focus on the qualities of entities, the process and meanings, which are not examined experimentally or measured (if at all) by the quantity, intensity, frequency or amount (Denzin and Lincoln, 2000). Quantitative studies, which remain the orthodoxy of natural science research, are based around measuring and analysing causal relationships amongst variables. Qualitative research emphasises the socially constructed nature of reality, the influence of the researcher on the research subject, and the contextual

constraints of social research. Qualitative research stresses the “value-laden nature of inquiry” (Denzin and Lincoln, 2000:p8). The quantitative researcher employs numbers to describe social objects and relationships. Qualitative research, in contrast, represents:

“...a situated activity that locates the observer in the world. ...They turn the world into a series of representations, including fieldnotes, interviews, conversations, photographs, recordings, and memos to the self...This means that qualitative researchers study things in their natural settings attempting to make sense of, or to interpret phenomena in terms of the meaning people bring to them.” (Denzin and Lincoln, 2000:p3).

Consequently, questions posed by qualitative researchers’ emphasise *how* social phenomena are produced and given meaning. Becker (1986) identifies several significant ways in which qualitative and quantitative research perspectives differ. These distinctions, discussed in the following subsections, reflect the different epistemologies, research techniques, and forms of representation.

### *Influence of Positivism and Post/Anti-positivism*

Similar to quantitative research, qualitative research is rooted in the positivist research tradition. Moreover, qualitative research was born out of postpositivism, based on multiple methods to gather empirical evidence. Initially, qualitative researchers “...attempted to do good positivist research with less rigorous methods and procedures” (Denzin and Lincoln, 2000:p9). Such attempts have continued through to the 20<sup>th</sup> century, as illustrated by the work of Strauss and Corbin (1994) on the grounded theory approach to qualitative research, which combines key elements of both the positivist and postpositivist framework.



### *Capturing the Individuals Point of View*

Although both quantitative and qualitative research methods aim to capture the viewpoint of the individual, qualitative researchers believe they can obtain a closer (and more accurate) perspective of the actor, through the use of qualitative techniques. Proponents of qualitative research argue that the detached, inferential methods of data collection employed in quantitative research fail to capture the perspective of social actors. In retaliation, quantitative researchers contend that the product of qualitative, interpretive research methods lack objectivity; they are impressionistic, and therefore unreliable.

### *Concern for Rich Descriptions*

Quantitative researchers focus on developing generalisations and discard the use of rich description, which is seen to interfere with this process. On the other hand qualitative researchers place value on the rich descriptions of the social phenomenon.

### *Studying the Constraints of Everyday Life*

Whereas qualitative researchers deliberately seek out the constraints that often characterise everyday life, quantitative researchers tend to avoid direct contact with this context of study, preferring instead to abstract from this messy context. Qualitative researchers on the other hand engage directly with the everyday world, in which they aim to embed their findings.

## **4.1.3 Social Science Research Paradigms**

The above discussion of qualitative and quantitative research draws on various philosophical aspects of social science research captured by the term paradigm (Kuhn, 1962). In their *Handbook of Qualitative Research* (2000:p157), Denzin and Lincoln argue, “paradigms deal with first

principles, or ultimates. They are human constructions [that] define the worldview of the researcher-as-interpretive *bricoleur*".

As with most other distinctions within social science research, there is a lack of clarity and overlap in debates over paradigms. For instance Guba and Lincoln (1994) provide a taxonomy of four paradigms for qualitative research, which include positivism, postpositivism, critical theory, and constructivism. Furthermore, the term paradigm is often used interchangeably with epistemology. According to Guba and Lincoln (1994) the key features of a paradigm include ontology, epistemology, method, and ethics/axiology, as illustrated in the following table.

Fig 4.1 Alternative Social Research Paradigms. Adapted from Guba and Lincoln (2000)

| <i>Item</i>             | <i>Positivism</i>                                      | <i>Postpositivism</i>   | <i>Critical Theory</i>                  | <i>Constructivism</i>                                       |
|-------------------------|--|---|---|---|
| <b>Ontology</b>         | Naïve realism  | Critical realism  | Historical realism                      | Relativism  |
| <b>Epistemology</b>     | Dualist/ objectivist                                   | Modified dualist/objectivist  | Transactional/ subjectivist             | Transactional/ subjectivist                                 |
| <b>Method</b>           | Experimental/ manipulative; verification of hypotheses | Modified experimental/ manipulative; critical multiplism; falsification of hypotheses | Dialogic/ dialectical                   | Hermeneutical /dialectical                                  |
| <b>Ethics/ axiology</b> | Extrinsic: tilt toward deception                       |   | Intrinsic: moral tilt toward revelation | Intrinsic: process tilt toward revelation; special problems |

#### 4.1.4 Adopted Methodology and Philosophical Assumption

A more commonly accepted taxonomy of research paradigms within the IS field is that of Orlikowski and Baroudi (1991), who identify the three categories of positivist, interpretive, critical paradigms.

For the purpose of this study, the interpretive paradigm of Orlikowski and Baroundi (1991) appears to provide the most synergy with the chosen qualitative research methodology of ethnography. Interpretivist research supports the ontology of nominalism and the epistemology of anti-positivism. By following the interpretive tradition the aim is to understand the relationship between risk, culture and danger in the development of corporate II, rather than the measurement of causal factors in the relationship between risk, culture and danger. The interpretive philosophy supports IS research “aimed at producing an understanding of the context of the information system, and the processes whereby the information system influences and is influenced by the context” (Walsham, 1993:p4). The understanding of risk as a derivative of cultural perceptions, combined with the concept of culture as heuristic guidelines, or an institutional rationale shared by the members of a group, requires a philosophical perspective that allows for the examination of the complexity concerning human sense-making as a context situated cultural phenomenon. Therefore, the philosophical assumptions of the interpretive paradigm provide a useful basis from which to undertake this study.

## 4.2 ETHNOGRAPHIC RESEARCH

This section provides a detailed discussion of the ethnographic research approach used to conduct this study. The term ethnography combines the words *ethno* and *graphy*. The former denotes a culture, race or people, whilst the latter indicates a form of writing. A review of literature presents variations in the use of the term ethnography. For instance, some authors adopt the following broad definition:

“We see the term [ethnography] as referring primarily to a particular method or set of methods. In its most characteristic form it involves the ethnographer participating, overtly or covertly, in people’s daily lives for an extended period of time, watching what happens,

listening to what is said, asking questions – in fact, collecting whatever data are available to throw light on the issues that are the focus of the research.” (Hammersley and Atkinson, 1995:p1)

Others opt for a narrow definition of ethnography, focusing on the study of culture. For instance, Van Maanen (1988:p1) provides a definition of ethnography as:

“...a written representation of a culture (or selected aspects of a culture)...ethnography ties together – fieldwork and culture – as well as the knot itself.”

### **4.2.1 History of Ethnography**

Although widely adopted in many disciplines, ethnography remains central to cultural anthropology, where it is widely acknowledged to have originated (Hammersley and Atkinson, 1995; Schwartzman, 1993). The development of ethnography in anthropology is associated with Alfred Cort Haddon’s call to anthropologists to seek a deeper understanding of their research subjects by taking more time to “coax the native by patient sympathy” (Tedlock, 2000:p456). The answer to this call was provided through the work of the Polish born, British anthropologist Bronislaw Malinowski at the London School of Economics, who is more generally acknowledged as the founder of the ethnographic approach (Schwartzman, 1993; Tedlock, 2000). Malinowski’s main contribution is said to be the establishment of fieldwork as a central feature of ethnography by suggesting the purpose of ethnography should be to grasp the “native’s point of view” through extensive periods of participant observation (Tedlock, 2000:p457).

## 4.2.2 Philosophical Influence of Ethnography

Developments in the philosophical assumptions underlying ethnographic research have corresponded to trends in social research. Traditionally, social science research has been dominated by positivist and realist philosophies inherited from the natural sciences.

### *Dominance of Positivism*

Positivism is strongly rooted in the history of philosophy, and as such has had a major impact on social science research. Until after the climax of logical positivism in the 1940s, positivism remained unchallenged in both natural and social science (Kalakowski, 1972). Prior to this period, both qualitative and quantitative techniques were applied equally, in a complementary manner, by social scientists (Hammersley and Atkinson, 1995). Examples of this diversity in research techniques are provided by the work of sociologists at the Chicago School of Sociology who employed statistical techniques and participant observation in their research during the early 20<sup>th</sup> century (Handbook of Ethnography). Hammersley and Atkinson (1995) argue “it was only later, with the rapid development of statistical methods and the growing influence of positivist philosophy that [quantitative techniques such as] survey came to be regarded by some practitioners as a self-sufficient methodological tradition”. The rise of positivism led to increasing attacks on qualitative techniques, which were often dismissed as unsuitable for social scientific research on the basis that they can only produce subjective, rather than objective results.

### *Rise of Naturalism*

Ethnographers created the alternative to rival the positivist philosophy of social research (Hammersley and Atkinson, 1995). Naturalists defined social phenomena as totally separate to physical phenomena. Principles that formed naturalism were drawn from various sociological and philosophical ideas, including phenomenology, hermeneutics, and symbolic interactionism. All

these different social and philosophical ideas reject key aspects of positivism. They reject the idea that knowledge of the social world can be obtained from findings of identified relationships among quantitatively measured variables, manipulated through experiments (Hammersley and Atkinson, 1995). In one form or other, they all argue that actions are rooted in social meaning. Naturalist aim to capture this meaning by studying the social world in its natural state. They try to remain true to the nature of the phenomenon under study (Hammersley and Atkinson, 1995:p6). In the study of human behaviour, naturalists argue for the use of techniques that provide access to the meaning that governs social actors.

Despite the tensions between positivism and naturalism, they both share their roots in natural science. Moreover, both positivists and naturalists remain loyal to a worldview of social phenomena as being independent of human observation. Additionally, both positivism and naturalism regard “practical and political commitments of the researcher as...extraneous to the research process”, and therefore attempt to eliminate any such commitments as a source of distortion that serves to undermine objectivity (Hammersley and Atkinson, 1995:p11).

### *Turn Against Naturalism and Positivism*

From within ethnography and developments in the field of philosophy, doubts have been raised about the realist ontology shared by naturalism and positivism. Consequently, more traditional forms of ethnography have come under increasing attack by ethnographers opposed to the idea of value free research embedded in naturalist approaches. Hammersley and Atkinson attribute the recent turn against naturalism and the realist philosophy in ethnography to:

“...The tension within ethnography between the naturalism characteristics of ethnographers’ methodological thinking and the constructivism and cultural relativism that shape their understanding of the perspectives and behaviour of the people they study...Constructivism

and relativism are compatible with naturalism only so long as they are not applied to ethnographic research itself” (Hammersley and Atkinson , 1995:p11).

### *The Structure of scientific Revolutions*

Another source of doubt over the objective claims of positivism and naturalism stems from philosophy, and was captured by the work of Thomas Kuhn (1962). In his book *The Structure of scientific Revolutions*, Kuhn (1962) questions the idea of scientific progress, by arguing that science does not develop through a process of accumulation towards truth. Kuhn (1962), along with others, demonstrated that scientific work and major developments in scientific knowledge had been based on the theoretical suppositions about the world, which were not necessarily rooted in empirical evidence.

Kuhn and colleagues challenged the conventional wisdom, of scientific research as the accumulation of knowledge. Instead, he argues that historically, science has been characterised by revolutionary periods in which theoretical presuppositions, which form '*paradigms*,' shift from one paradigm to another. Kuhn (1962) argues that the succession of paradigms does not occur through the rational assessment of evidence. He further argues that paradigms do not share the same worldviews, and as such are incommensurable. Kuhn's contribution contested the existence of a theory-neutral observational basis, from which theories can be tested, arguing instead that judgements over validity of theories can never be affirmed by evidence of any sort.

### *The Post-structuralist Movement*

A further source of attack on the realist philosophy of ethnographic research has come from the post-structuralist movement. Influential authors in this area include Michel Foucault and Jacques Derrida. Foucault argues that social research works as part of a wider process of surveillance and

control, characteristic of modern society. Foucault identifies 'regimes of truth' as the influencing factor behind the outcome of social research. Similar to Foucault, Derrida's work on deconstruction is also based on the rejection of realism. Deconstruction dismisses the idea that the ethnographer, under the guidance of naturalism, can capture the true meaning of social actions. Deconstruction asserts "...meanings are not stable; nor are they properties of individuals, but rather reflect the constitution of subjectivities through language" (Hammersley and Atkinson, 1995:p13).

### *Genres of Ethnographic Writing and Philosophical Hermeneutics*

Another contribution of deconstruction to the destabilisation of ethnography has been on the genres of ethnographic writing, leading to the growing view that ethnographic writing represents a creative process, involving the type of non-scientific strategies employed by journalists and novelists (see section 4.4). Like deconstruction, philosophical hermeneutics has also undermined the naturalist idea of the ethnographer capturing meaning through a process of value-free observation. Philosophical hermeneutics represents a radical version of the earlier nineteenth century philosophy of hermeneutics and the interpretation of historical text. The original version of hermeneutics concerned the interpretation of text for the intended meaning of the author. The new practice of philosophical hermeneutics, on the other hand, sets out to expose the bias or prejudices of the reader of the text. When applied to ethnography, these ideas serve to undermine the neutrality of the ethnographer. The product of the ethnography is no longer seen to represent the meaning of social action captured by the ethnographer. Instead, ethnographic representations are seen to reflect the social-historical position of the researcher (Hammersley and Atkinson, 1995:p13).

These various attacks against the dominant naturalist paradigm in anthropological research have contributed to a splintering of the ethnographic method and the emergence of various subgroups under the banners of ethnographic research. One of the emerging strands of this division, which is considered in the following section, is autoethnography.



### 4.3 AUTOETHNOGRAPHY

The style of ethnographic research adopted for this study falls within the area now commonly referred to within anthropology as autoethnography. The term Autoethnography is largely attributed to David Hayano (1979). Hayano (1979:p100) used the term to identify cultural studies by an anthropologists of her “own people”, where the research is considered a full member or “native” of the group being studied, therefore developing a close, intimate familiarity with participants as a full insider within the culture under study. So broadly has the term autoethnography been used amongst ethnographers that Ellis and Bochner (2000:p742) remark:

“[p]erhaps the loose application of the term autoethnography only signifies a greater tolerance now for the diverse goals of ethnography and a better understanding of the fallibility and indeterminacy of language and concepts”.

Those authors identify a range of approaches, which they argue fall under the umbrella of autoethnography as *reflexive ethnographies*, *complete-member researchers*, *personal narratives*, *literary autoethnographies*. The boundaries between these approaches appear extremely blurred, with disagreement over categories and definitions amongst researchers. Ellis and Bochner (2000:p740) observe “many writers move back and forth among terms and meanings even in the same articles”.

#### 4.3.1 Reflexive Ethnographies

The development of reflexive ethnographies is attributed to a shift from the focus on participant observation to the “observation of participation” in the 1970s and a further focus on the process of writing (Tedlock, 1991). In reflexive ethnographies, the focus of the field study is placed on the

personal experiences of the researcher. Reflexive ethnography involves the ethnographer using their senses, feelings and entire being as a primary tool of data collection within a group. Reflexive ethnographers use the “self” to learn about the “other” (Cohen, 1994). Reflexive ethnographies can be classified further into confessional tales or ethnographic memoirs, and narrative ethnography. The former class of reflexive ethnographies focuses on the personal story of the ethnographer and their “backstage” experience of doing fieldwork, whereas the latter, narrative ethnography, incorporates the experiences of the researcher in describing and analysing participants and emphasises the “ethnographic dialogue or encounter” between them (Tedlock, 1991:p78).

### **4.3.2 Complete-Member Researchers**

Alder and Alder (1987) use the term “complete-member” researchers to refer to ethnographers that are fully immersed and committed to the groups under study. During this process, the researcher identifies with the research participants and “becomes the phenomenon” of study in a covert manner (Mehan & Wood, 1975). In complete-member research, the focus is placed on the research process and the group under study.

### **4.3.3 Personal Narratives**

Ellis and Bochner (2000:p743) explain that personal narratives are “to understand a self or some aspect of a life lived in a cultural context. In personal narrative text, authors become “I,” readers become “you,” subjects become “us.” In this form of ethnographic research, research participants and readers are invited to take a more active part in the research. The reader is invited into the world of the researcher, to experience the emotions, feelings and senses about events presented. The goal in personal narratives “is to write meaningfully and evocatively about topics that matter and may make a difference, to include sensory and emotional experience” (Ellis and Bochner (2000:p743).

#### **4.3.4 Literary Autoethnographies**

Literary autoethnographies refer to “autobiographies that self-consciously explore the interplay of the introspective, personally engaged self with cultural descriptions mediated through language, history, and ethnographic explanation” (Ellis and Bochner, 2000:p742). In this form of research, historical details, such as dates that remain central to autobiographical research, are subverted in preference of details that illuminate the “lived experience and humanity” of the ethnographer and research participants (Ellis and Bochner, 2000:p742). Literary autoethnographers mostly confine autoethnographical aspects of the writing to introductions and epilogues. The focus of such works is more on the fieldwork than the personal development of the researcher.

#### **4.3.5 Choice of Autoethnographic Method**

Due to the overlapping nature of these different forms of autoethnographic methods, it is very difficult to situate accurately an ethnographic study into only one of these categories. Consequently, the current study draws on aspects from the different categories of autoethnography. This study can be identified as reflexive in the sense that our case charts the personal experience of the researcher as a member of the research site.

Also because I worked as a paid employee within the research organisation, during and prior to the fieldwork, this study may be categorised as a complete member autoethnography. However, similar to the goal of the writers of personal narratives, the objective of the researcher in constructing this study has been to develop a personally meaningful narrative that invites the reader into the lived experience of the research participants as experienced by the researcher himself.

Furthermore, the biographical nature of this study, in drawing from the lived experiences of the researcher prior to undertaking the fieldwork, would place this work more in line with the latter two forms of ethnographies. Of these two (personal narratives and literary autoethnographies) the category of literary ethnography seems the most appropriate category in which to situate this study. The primary justification for our choice here is the subversion of historical data (such as dates and time) in preference of details that highlight the lived experiences of the researcher and participants, which is favoured by literary autoethnographies (Ellis and Bochner, 2000).

## 4.4 ETHNOGRAPHY IN THE IS FIELD

A review of research publications in the information systems discipline shows only a small number of research based on the ethnographic approach. Some of the earliest studies in IT were conducted by researchers in disciplines other than IS. The two research disciplines that have made early contributions to the study of IT using ethnography were anthropology and organisational behaviour.

### 4.4.1 History of IS Ethnographic Research

In the research field of organisational behaviour, the classic work of Mann (1956) and Williams (1958; 1960) into the automation of office work represents some of the earliest contributions in this field. Although the authors do not identify their approach as ethnographic, they distinguish it from quantitative techniques by highlighting their use of participant observation and the exploratory nature of their research into a single company over several years.

One of the most cited contributions to the study of IT in organisations using ethnography comes from Zuboff (1988). Her seminal work, *The Age of the Smart Machine*, remains one of the most well known studies of IS in modern society. This work is recognised in both IS and management studies as an “insightful and well-researched piece of work” (Walsham, 1995:p379). Zuboff’s

(1988) book is based on her PhD research into organisational change processes associated with the introduction of new IT systems within eight different companies. In this research, she makes heavy use of participant observation to study these organisations over a period of five years. Amongst other findings, Zuboff's (1988) analysis identifies how information technologies produce new information throughout the different levels of the organisation, a characteristic, which she terms as "informaté".

The work of Orlikowski needs little introduction among IS researchers. Similar to Zuboff, Wanda Orlikowski (1988) used ethnography in her PhD thesis, which is said to represent "the first notable doctoral ethnography produced in the United States by an information systems researcher" (Harvey, 1997:p210). The ethnographic research for this thesis was conducted over an eight-month period in one multinational software-consulting firm. The research focussed on the role of IT in organisational processes" (Orlikowski 1988:p1). She utilises a variety of ethnographic techniques, including participant observation, ethnographic interviews, and document analysis. Using this research as a firm foundation, Orlikowski has made several significant publications. One of these publications draws on the work of Foucault (1779) to examine the issue of control and the deployment of IT in work process (Orlikowski 1991). Another publication of Orlikowski (1992) uses the work of Anthony Giddens (1984) on Structuration Theory to interpret the stages involved in the introduction and adoption of new software by users.

Further contributions to ethnographic research in the IS field comes from the work of Star (1989) and Lucy Suchman (1987). The work of these two authors has been identified as important contributions to the establishment of interpretive research in IS (Walsham 1995).

Suchman's research on human action and communication cast major doubts over the conventional assumptions covering human action and communication. This research, published in the book

*Plans and Situated Action*, is based on ethnomethodology. Suchman introduces the term “situated action” to capture “the view that every course of action depends in essential ways upon its material and social circumstances (Suchman 1987:p50).

Suchman’s work in the area of computer supported cooperative work (CSCW) is also based on ethnographic research of IS. Here, she identifies the term artful integration to describe the forms of articulation, which she sees as important to systems design (Suchman 1987). There is much overlap between the work of Suchman and Star.

The work of Star (1989) is especially relevant to this dissertation not only because it applies ethnography to IS, but more importantly, Star and her colleagues (see chapter 2 for a detailed review) use ethnography to study IS as infrastructures (Hanseth, 1996;2002b; Hanseth and Lundberg, 2001).

Another researcher who has contributed to the study of IS as infrastructures using the ethnographic approach is Ole Hanseth (1996). Much of Hanseth’s contribution to this area is based on his PhD dissertation, which draws on empirical data mostly collected from projects on the development and use of the EDI network in the Norwegian health sector. Ole Hanseth’s PhD was conducted in similar circumstances to this dissertation in the way he draws on his previous experience working in the “standardisation activities and product development” projects of the organisation he studied. In this study, Hanseth uses a variety of data collection techniques including participant observation, interviewing and document analysis. From this research Hanseth (1996; 2000) produces a number of interesting findings, including heuristic strategies for the development of information infrastructures.

A common observation amongst the above examples of ethnographic research in IS is that authors who have conducted their PhD dissertation using ethnography have often gone on to make further significant contributions on the basis of this initial work. Contributions to IS research from Orlikowski and Zuboff represent some of the most obvious examples.

#### **4.4.2 Autoethnography and IS Research**

Within the field of IS, autoethnography would fall under the umbrella of interpretive research. There is at present, very little evidence of autoethnographic research in the IS discipline. In the short period in which IS has appeared as an academic discipline it has mostly been dominated by positivist research. Walsham (1995) draws on the work of Latour to analyse “the sociology of IS research”. He argues,

“the massive body of work from a positivist stance can be taken to imply an implicit rejection of interpretive claim.” (Walsham 1995:p380)

Furthermore, Walsham identifies two major difficulties facing the interpretivist IS researcher.

“...Supporters of positivism do not in general need to justify their epistemological position, to journal editors and referees for example, since it is the dominant and accepted approach in the mainstream journals.” (Walsham 1995:p380)

From this evidence, the small group of IS researchers who undertake interpretive research seem often restricted only to mild, conventional forms of interpretivist research, which conform more closely with the tenets of naturalism. Even within the small area of interpretive IS research,

motivation for autoethnographical research remains less than other forms of interpretive IS research.

Despite the obstacles facing autoethnographic research within the interpretive strand of IS research, a small and growing body of IS research, which draws on autoethnographic methods can be identified. Two notable contributions come from the PhD dissertations of Ulrike Schultze (1997) and Erica Wagner (2002).

Schultze's PhD (1997), is worthy of special mention here because she makes a conscious effort to draw on contemporary ethnographic methods of autoethnography to the study of IS issues. Schultze draws on autoethnography to study "the situated practices of knowledge workers engaged in the production of information" (Schultze, 1997:pii). Her dissertation is a very good illustration of an IS autoethnographic research in that she demonstrates many of the key requirements that constitute autoethnographic research. Notably, her work demonstrates the features common to reflexive forms of autoethnography. It is written in the first person throughout and draws extensively from the confessional style of ethnographic writing (Van Maanen, 1988)<sup>1</sup>.

Wagner (2002) adopts a narrative approach to study the introduction of an ERP system, into the administrative infrastructure of a university. Although she draws on autoethnographic techniques, Wagner's research is not conducted as ethnography. Furthermore, she does not write in the first person. Consequently, her dissertation mostly conforms to the realist style of writing (Van Maanen, 1988).

In the research methodology chapter of her dissertation, Wagner comments that she was conscious of her relationships within the research site, as a past employee in the accounts department of the

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<sup>1</sup> The first person singular expresses an immediacy and involvement of the researcher, therefore in what follows, whenever this present research enters the realm of autoethnography the first person singular will also be used.



organisation. However, this prior role of the researcher, and the understanding it provided her, rather than being drawn upon as a valuable source of data, was subverted through the efforts of the researcher to maintain the role of the neutral scientific observer. Consequently, although Wagner's research represents an exemplary dissertation, it is argued here that further insight might have been gained through conscious use of autoethnography (Wagner, 2002).

Despite the existence of only a small body of IS research that falls under the umbrella of autoethnography, its appearance within recent PhD theses indicates a trend towards its wider adoption in coming years, as these former IS PhD candidates go on to establish themselves within academia, thereby spreading the gospel to other members of the IS field. Furthermore, evidence of the increased take-up of interpretive research within the IS discipline (Walsham, 1995) is indicative of a movement leading towards greater use of more novel research methods, such as autoethnography.

## 4.5 JUSTIFICATION OF RESEARCH APPROACH

Researchers come to favour a particular research approach over others for a variety of different reasons. The selection of ethnography and autoethnography as the research approach in this study was motivated by a number of related issues. Firstly, my primary aim was to gain an understanding of IT infrastructure development issues from the perspective of the participants working within the IT infrastructure development team, and whose decisions and actions directly shape the development of the corporation's information infrastructure.

### 4.5.1 Feeling Confined by Ethnography

Secondly, during the design stages of this study, I had planned to undertake a longitudinal case study, with the view of conducting structured and semi-structured interviews amongst members of

the CII development team over several years. However, when I contacted my former employers for permission to conduct this study, they insisted that I sign a contract of employment before permission could be granted for the study. This arrangement was mutually beneficial, so I commenced work for the company in December 2000. Although the areas of the company in which I worked during my research was not directly involved in the email and network operating systems infrastructure, which became the focus of study, being in the organisation on a full-time basis gave me access to information that would otherwise have been difficult to obtain. The predicament of full-time access to the research site and the abundance of data that it supplied led me from a longitudinal case study to ethnography.

#### **4.5.2 The Journey to Autoethnography**

It soon became apparent to me that another research method was needed, other than the longitudinal case study; one that allowed me to draw on the many informal sources of information that I encountered during my working day. Ethnography was suggested by my supervisor as a possible way to incorporate these informal sources of information, and after some initial reading the appropriateness of ethnography became obvious. The switch to ethnography seemed to unlock all my senses for the purpose of information gathering by acknowledging all the different experiences within the research site as valid means of data collection.

Starting with a general introduction to ethnography, I began focussing on the literature on organisational ethnography. Although I gained support from my supervisor in my choice of ethnography as a research method, I felt fairly isolated within the IS community, which I found favoured the case study research method. I was able to temper this feeling of isolation by attending classes in the anthropology department of LSE. These classes were very important, as they allowed me to overcome some of the stereotypes about ethnographic research that I had encountered within

the IS community. The ability to share my experiences with other researchers, particularly those experienced in using the ethnographic methods, was also very helpful.

As the research progressed, and I began contemplating some initial findings with my PhD supervisors, it became clear that my previous experiences and understanding of the research site had a significant bearing on my findings. Having been a member of the organisation under study for several years before undertaking the fieldwork, I found myself faced with two sources of evidence; from my previous experience working in the organisation, and the evidence that I was gathering from the ethnographic fieldwork. Initially, I felt restricted by a need to limit my source of data collection within the boundaries of the ethnographic fieldwork, as is suggested in much of the conventional ethnographic literature (Hammersley and Atkinson, 1995).

Over time, as I considered, connected, and compared findings from the fieldwork with those of my previous experience working in the organisation, I became more convinced of the need to combine these two sources of data within the research. After making a connection with the discourse on autoethnography as an approach to ethnography that welcomes the lived experience and personal narrative of the researcher into the research process, autoethnography appeared as the most obvious research approach to undertake the study.

The only consideration that I could find against the chosen research approach was the increased work and complication generally associated with conducting ethnographic research compared to other, more established approaches especially within the IS field. As I was to discover, these were very significant considerations, which, with the benefit of hindsight, I should have paid greater attention in the early stages of the research.

In my opinion, the ethnographic approach can lead to a very lengthy research process. This is not only because of the long period that the researcher is often required to spend, participating in the field collecting data, but also the time needed to collate data from ethnographic fieldwork. As I found, an extensive and successful fieldwork can often result in lengthy periods of analysing and making sense of this data. Nevertheless, I found this process to be rewarding in achieving more empirically rooted findings. This is possible because the vast amount of empirical data, most of which does not appear in the dissertation, provides the researcher with a rich collection of experiences on which to build the analysis.

The approach of ethnography and autoethnography enabled me, not only to gather evidence on the culture of the research participants, but also to tap into my own personal experiences and life history as a native member of the culture under investigation. This research approach allowed for a richer, more insightful account of the researcher's lived experience. In the following section, a number of the ethnographic techniques used to gather this rich data of lived experiences are discussed.

## 4.6 ETHNOGRAPHIC DATA COLLECTION

The ethnographic method makes a broad range of data collection techniques available to the researcher. In this section, the topics of participant observation, ethnographic interviews, and fieldnotes are presented. These techniques formed the primary means of data collection within this study.

### 4.6.1 Participant Observation

In ethnographic research, data collection is primarily achieved through a process of participant observation. Participant observation involves the establishment of the researcher within a "natural

setting on a relatively long-term basis in order to investigate, experience and represent the social life and social process that occurs in that setting” (Emerson *et al* 2001:p352).

At its most basic level, participant observation is something all human actors do in a social context. We all do make observations of our social surroundings on a daily basis. However, Spradley (1979) identifies several distinctions between participant observation and this ordinary form of observation, which highlight the key features of participant observation.

### *Dual Purpose*

The participant observer has a “dual purpose” in that they strive (i) to maintain the integrity of the social situation under investigation by conducting themselves in a way that conforms to the norms of the situation and (ii) to observe the structures, actors and social interactions that form the situation.

### *Cultivate Awareness*

Unlike the ordinary observer, who remains focused on things concerned with her or his immediate interest, the participant observer is required to cultivate a highly sensitive level of awareness. The participant observer is required to approach the social situation with a “Wide-Angle Lens” in order to capture a broad spectrum of information.

### *Insider/Outsider Experience of Social Situation*

Normal social observers exist as insiders in a social context. In the sense that they experience their own movements, see some of the things happening around them, and engage in their activities as the primary actors. Rather than the simple experience of a social situation as an insider, the

participant observer simultaneously experiences the situation both as an insider and an outsider. The participant observer, as an insider is able to participate in the activities of a social context, carrying out much of the activities of research subjects. This closeness allows the participant observer (in the role of the insider) to generate much of the same feelings as other social actors in the situation. Additionally, at the same time, the participant observer, in the role of researcher, is able to generate the feelings of an outsider through the conscious consideration of the social situation and their role as participant.

### *Introspection*

Introspection is a skill used by all social actors to understand situations, and to develop skills necessary to follow actual roles. It involves ethnographers looking within themselves to understand how they feel about their experiences. An ordinary social observer carries out their routine social activities without any reference to their inner state. They often only become introspective when unexpected events occur. The participant observer, on the other hand aims to maintain a sensitive state of introspection. In so doing, the participant observers draw on their own senses, as the research instrument. Introspection is seen to enrich the data an ethnographer gathers through participant observation.

One of the most important roles of the participant observer involves recording observations. Unlike the ordinary observer, who will have no interest in documenting routine activities and observations, the ethnographer will at some stage (either during or after the observation) take notes of these activities. The detailed records maintained by the participant observers contain both objective observations of the social situation and the subjective feelings, they observe in themselves and other actors.

## 4.6.2 Ethnographic Interviews

Ethnographic interviewing is generally seen to have emerged in the 1920s and 1930s through the work of sociologists at the Chicago School. Recent developments in ideas on ethnographic research have moved away from the positivist epistemology. Barbara Heyl (2001) identifies a strong move towards the inclusion of postmodern and feminist critiques of anthropology and sociology. She points out that this growing body of literature now “stress *how* interviewing involves a complex form of social interaction with interviewees, and that data are co-produced in these interactions...they recognise that what the interviewees in each study choose to share with the researcher reflects conditions in their relation relationship and the interview situation” (Heyl, 2001:p370). An example is the work of Steiner Kvale (1996), who focuses on the concept of interviews as forms of interactions. As such, the knowledge that results from the conversation between the interviewer and the interviewee should be seen as the outcome of “views” (Heyl, 2001:p373).

Kvale (1996) distinguishes between approaches to ethnographic interviews using the metaphors of the *miner* and the *traveller*. The former refers to the interview as a mining exploration in the research field containing the buried treasure of new information. This metaphor depicts the traditional forms of ethnographic interviewing. In this approach, the interviewee is viewed as a source of data, which the researcher must carefully gather. In the second metaphor, the researcher takes on the form of a traveller. Here, the interview process is seen as a journey, which the researcher undertakes. On this journey, the researcher engages in conversations with different people, and returns from the journey with stories from those encountered. Although the direction of the journey may be planned in advance, the interviewer should remain true to the particular interest by adjusting paths in accordance with twists and turns, which result from the information gained from those encountered through the journey.

### 4.6.3 Fieldnotes

Although the making of fieldnotes remained largely ignored until the past decade, for most ethnographers fieldnotes remain a central product of their participant observations. The centrality of developing fieldnotes in the ethnographic process is illustrated by the term “writing up your notes” used by anthropologists to denote the stages of analysis and publication (Burgess, 1984: p161). This section discusses the process of creating ethnographic fieldnotes and how this activity fits into the ethnographic research process.

At a basic level, fieldnotes represent observations. In their simplest form, fieldnotes represent the observations of the ethnographer. As Emerson *et al* (2001) point out: “fieldnotes are a form of *representation*, that is, a way of reducing just-observed events, persons and places to written accounts”. Fieldnotes capture social situations, and preserve them for further reference. Geertz (1973:p19) states that in documenting social situations, the researcher “turns it from a passing event, which exists only in its own moment of occurrence, into an account, which exists in its inscription and can be re-consulted”. Fieldnotes aim to provide descriptive accounts of the ethnographer’s observations, interpretations, conversations, personal experiences, including suggestions and ideas for further gathering of information. Here, description does not simply refer to the recording of ‘*facts*’ or the production of textual accounts reflecting reality (Atkinson, 1992:p17 – in Emerson *et al*). Instead, this process involves an active process of interpretation and sense-making, which embodies purpose and commitments of the research (Emerson *et al*, 2001).

Sanjek (1990) identifies several different terms used by ethnographers to discuss fieldnotes, including headnotes, scratch notes, fieldnotes proper, fieldnote texts, journal and diaries, letters, reports and papers. He describes the process of making fieldnotes as commencing with mental notes through to a full set of fieldnotes. Others describe a similar progression from scratch notes, to fieldnotes proper, and then to fieldnote records (Emerson *et al*, 1995).



Recently attention has turned towards the process involved in developing ethnographic fieldnotes, revealing a number of problems with this process. Many of these problems arise partly from the “relative invisibility of fieldnotes” (Hammersley and Atkinson, 1995:p176). Also it has been found that anthropologists often consider their ethnographic fieldnotes as a very private and personal aspect of their research (Sanjek, 1990). In agreement with this finding, Hammersley and Atkinson comment:

*Although fieldnotes are the basis of public-domain scholarship, their authors have rarely shared them with other scholars... Fieldnotes appear to be granted special – almost magical – potency... The making of fieldnotes has been part of an invisible oral tradition of craft knowledge, and many who embark on their first project have to find their own way of doing things. (Hammersley and Atkinson, 1995:p176) emphasis added.*

### *Problems of Making Fieldnotes*

Problems concerning note taking are often associated with the conduct of covert ethnographies. In such situations, note taking in the presence of participants is a challenge to which anthropologists have sometimes adopted creative solutions.

...an anthropologist who did not want to write in front of his informants would learn something and then run off into the bushes to scribble furiously. No one said anything, but eventually the folk herbalist visited him with a cure for diarrhoea. (Burgess, 1984: p161).

However, even when the research is overt, the activity of scribbling text into a note pad whilst talking with people or observing the interaction can prove disruptive. Hammersley and Atkinson (1995:p176), who stress the importance of making “notes during participant observation”, also

point out that the method of taking fieldnotes needs to be conducted in a manner congruent with the context of study.

### *Limitations of Fieldnotes*

Not all ethnographers are in agreement over the value of fieldnotes. Instead they express the idea that fieldnotes obstruct the ethnographer's efforts to gain deep understanding of the social situation through direct participation and experience of a culture. At the most extreme, some ethnographers who support this view may choose to suspend the making of fieldnotes until after the completion of the fieldwork.

Burgess (1984) who supports the advice to write observations down as soon as they are seen, cautions that even in situations where researchers are free to construct their notes as they wish

“...it takes much longer to record everything you can remember about what just happened than it did for it to happen...So while you're scribbling furiously, other things are going on that represent the continuity between when you left and when you return.” (Burgess, 1984:p161)

Burgess (1984) further warns that upon entering the research site, it is difficult to record useful notes because “you don't know yet what is significant”. Some ethnographers dismiss the relevance of fieldnotes to the whole ethnographic experience, as illustrated by the following comments made by an ethnographer Jackson (1990:p30).

“...what I would call fieldwork...is not taking notes in the field but is the interaction between the researcher and the so-called research subject”.

Van Maanen (1988) further questions the power of fieldnotes in capturing the depth and subtleties of experiences encountered in the process of participant observer.

Fieldwork, at its core, is a long social process of coming to terms with a culture. It is a process that begins before one enters the field and continues long after one leaves it. The working out of understandings may be symbolized by fieldnotes, but the intellectual activities that support such understanding are unlikely to be found in the daily records. The great dependency commonly claimed to exist between fieldnotes and fieldworkers is not and cannot be so very great at all. (Van Maanen, 1988:p117)

These two positions: detailed note making at the time of participant observation; and the postponement of all forms of note making until the completion of fieldworks, represent extreme ideas on the making of fieldnotes. Most ethnographic research falls somewhere on the continuum between these positions, with the ethnographer taking something from both ideas (Emerson *et al*, 1990).

Consequently, during this research I found it useful to use a range of approaches to documenting my observation during fieldwork. These can be matched with four types of fieldnotes found in the literature: Field jottings; diary accounts; expanded notes; and analysis notes.

### *Field Jottings*

Field jottings are the most basic form of written notes. They are sometimes referred to “scratch notes” (Sanjek, 1990) or “condensed accounts” (Spradley, 1980). During the course of the fieldwork, I found it very useful to keep with me a small notepad on which to write short notes about comments I had heard, or things I had seen. I used this notepad not just to record observations, but also to jot down ideas that came to mind during the course of the research. Jotted

notes represent the first form of writing for most ethnographers. They include phrases, single words, or unconnected sentences marking the researcher's observations and experiences in the field. These notes are often taken as close to the moment of observation as possible.

### *Expanded Accounts*

Jotted notes are further developed into expanded accounts at a later time, usually at the end of the day when the researcher is away from the research site (Spradley, 1980). This second form of notes is sometimes referred to as "fieldnotes proper" (Sanjek, 1990:p95). Words and phrases taken from condensed notes are used to trigger recollections from more elaborate descriptions. The aim of *expanded notes* is to describe observations in as much detail as possible (Sanjek, 1990). Speech should be rendered in a manner as close as possible to a verbatim report. Additionally, nonverbal data, which help to paint the context of the observations, should be detailed (Hammersley and Atkinson, 1995)

### *Field Diary*

Field diaries, or "field journals" are a form of diary maintained by the researcher. The purpose of the field diary is to record the personal aspects of the research. The field diary chronicles the feelings of the researcher, and the relationships she has with other members of the field site. The field diary should be used to jot down emotional highs and lows while they are happening (Hammersley and Atkinson, 1995; Spradley, 1990).

### *Analytic Notes*

The fourth type of fieldnotes is identified as analysis and interpretation or simply analytic notes (Spradley, 1990). It is meant to provide a link between the ethnographer's notes, and the published

ethnographic report. Analytic notes are maintained as a means to record ideas, generalisations, interpretations, and insights into the culture under investigation.

#### **4.6.4 My Experience of Collecting Ethnographic Data**

Similarly, for the conduct of the study, I found it useful to draw on the use of fieldnotes. However, my experience of fieldwork suggests that it is more important to capture the feeling or meaning of observations. This was something I found easier to do through careful observation, and a focus on an understanding of meaning rather than note taking. I often found that the taking of fieldnotes disrupted the activities being observed. In the situation of casual conversation, I found that making notes of any sort often obstructed the free flow of the conversation, because I would often lose concentration. But this was not always the case, as some informants would assist me in making notes, at times pausing to allow me time to make notes. However, my experience was that this was the exception and not the rule.

I also made use of a small digital audio recorder to record observations and ideas. I found that by quickly talking into my recorder, which was several times smaller than my notepad, and was often mistaken by participants for a mobile phone, I was able to describe ideas and observations in more detail. The one problem with the recorder is that I would often have to listen to the entire recording for the one note that I wanted.

### **4.7 ETHNOGRAPHIC WRITING**

The construction of text has come to represent a central feature of the ethnographic process (Harvey, 1997; Van Maanen 1988). Although given little attention in the early era when ethnography was largely dominated by naturalist research, ethnographic writing has recently gained the attention of anthropologists. Unlike the simplistic concept of representation portrayed under

naturalism, the process is of a highly political act in which the researcher is seen consciously to pick amongst a selection of events in the writing of the ethnographic text (Harvey, 1997).

“Through writing the ethnographer turns jotted scenes into text, taming and reducing complex, lived experience to more concise, stylized, re-examinable written accounts.”  
(Emerson *et al*, 2001)

Van Maanen (1988) identified seven forms of ethnographic writing as realist, confessional, impressionist, critical, formal, literary and jointly-told tales. Realist tales, confessional tales and impressionist tales are highlighted as the most distinguished of the identified forms of ethnographic text.

Each style captures a particular set of normative and rhetorical conventions, which shape the text of the ethnographer. He points out that styles are historically sensitive. They change over time with some styles being more acceptable in ‘ethnographic circles’ at particular moments in time. The style of ethnographic text is also said to be strongly influenced by the discipline of the researcher. In the case of this research, the style of the research will be strongly influenced by the general style of IS research writings.

#### **4.7.1 Characteristics of Impressionist Tales**

I have chosen to construct this research in the manner that closely resembles the impressionist tale. As such I shall discuss the characteristics common to impressionist tales.

“When impressionist tales dominate a text something notable has been attempted and these texts are often much discussed”. (Van Maanen 1988:p106)

The term impressionist is borrowed from painting. Impressionist paintings are figurative representations of the personalized view of the artist (Van Maanen 1988). The impressionist ethnographer aims to startle the reader through the text. Impressionist ethnographic tales form a subgenera of writing styles in the way they draw on both realist and confessional tales. These tales are made up of various recollected events from the period of participant observation. The reconstruction of these recollected events are done in a way that alters the original state of observations. In this reconstruction, the researcher identifies notable periods of the fieldwork that can be serialised into a drama worthy of presentation. In this form of tale, the fieldworker takes on the role of student, gradually learning the culture under investigation.

Instead of focusing on the interaction of the research subjects (as in the case of realist tales), or the lived-experience of the researcher (confessional tales), impressionist ethnographers aim to capture both views.

Impressionist tales tend to emphasise uncommon characteristics in cultural situations over and above the daily routine and mundane occurrences. These “tales are not about what usually happens, but what rarely happens” (Van Maanen 1988:p102). The conventions that distinguish impressionist tales from other forms of ethnographic styles are identified as textual, fragmented knowledge, and characterisation, and dramatic control.

### *Textual Identity*

The impressionist ethnographer invites the reader to relive a story with the fieldworker, not for the purpose of interpretation for analysis, but to witness the experience of the researcher from beginning to end.

“The form of an impressionist tale is dramatic recall. Events are recounted roughly in the order in which they are said to have occurred and carry with them all the odds and ends that are associated with the remembered events. [...] Such tales seek to imaginatively place the audience in the field situation.” (Van Maanen 1988:p102)

The challenge of constructing an impressionist tale is to maintain the narrative throughout the story, therefore maintaining the interest of the reader. The purpose of story telling in impressionist tales is punctuated with opportunities to make analytic points.

### *Fragmented Knowledge*

Impressionist tales unfold through the recollection of events. The audience of impressionist tales are taken through the narrative event by event, with little guidance as to the course or destination beforehand. In this way they are invited to experience the unfolding of the narrative as experienced by the researcher. This tale captures the learning process in which various “unremarkable features of the beginnings of a tale becomes crucial by its end” or vice versa (Van Maanen 1988:p104).

### *Characterisation*

The individual character of the research forms a central part of the impressionist tale. Like the writers of confessional tales, impressionist ethnographies project the character of the fieldworker for the judgement of the audience. Characterisation also applies to the different actors in the research situation who occupy supporting roles in the drama. The characters must therefore possess “names, faces, motives, and things to do if the story is to be told about them” (Van Maanen 1988:p105). Here it is important to represent speech in a manner as close to verbatim whenever possible. The fieldworker must attempt to give individual voices to the different narratives displayed.



### *Dramatic Control*

Understanding in impressionist tales occurs through the unfolding of events. Unlike the case of realist and confessional tales, the impressionist researcher is not seen to possess a higher level of intelligence, which allows them to be able to understand the culture of subjects in the research situation in ways foreign to themselves.

“Impressionist tales move authors back in time to events that might have later given rise to understanding (or confusion)” (Van Maanen 1988:p105). The story that is presented represents the interpretation of observations made by the researcher during the time of their occurrence.

Van Maanen describes the construction of the impressionist accounts as organising an illusion, which requires skill in order to give the reader the feeling of experiencing the events first hand. Impressionist tales are judged on the basis of their “interest (does it attract?), coherence (does it hang together?), fidelity (does it seem true?)”. The reader of an impressionist tale shouldn’t be concerned with the accuracy of the story, because they did not participate and therefore cannot know for sure if it is true. Van Maanen concludes his description of impressionist tales by emphasising the importance of attracting and maintaining the attention of the audience in the writing of such tales.

“The main obligation of the impressionist is to keep the audience alert and interested. Unusual phrasing, fresh allusions, rich language, cognitive and emotional stimulation, puns, and quick jolts to the imagination are all characteristic of the good tale. Whatever allegory the fieldworker may have in mind for the story will not catch a sleepy audience”. (Van Maanen 1988:p106)

For these reasons Van Maanen (1988) points out that many of the best ethnographic narratives have been achieved by writers adopting the impressionist style.

#### **4.7.2 Other Styles of Ethnographic Writing**

The other six styles of ethnographic writing identified by Van Maanen (1988) include critical tales, literary tales, jointly told tales, realist tales and confessional tales, which are briefly discussed here.

##### *Critical Tales*

Writers of critical tales place more emphasis on the study of groups that may provide insights into the political workings of society. Critical tales represent social structure from the viewpoint of disadvantaged groups within capitalist societies.

##### *Formal Tales*

Formalist writers are less concerned with the political economy of their research situation. The aim of the analysis in formal tales is the development of generalisation through the logic of induction and inference. Included in this group are ethnography, semiotics, symbolic interactionism, conversational analysis, and ethnoscience amongst others.

##### *Literary Tales*

These are ethnographies that draw on techniques of fiction writing to communicate the research findings in the form of a story. They often make heavy use of dialogue to establish character and “scene-by-scene reconstructions of dramatic and mundane events” (Van Maanen 1988:p132).

### *Jointly Told Tales*

Such ethnographic works are produced through joint collaboration between the researcher and the research subjects. Hence the final product is jointly authored by both the "fieldworker and the native" (Van Maanen 1988:p136). Jointly told tales aim to uphold the authority of those in the research situation, preserving for them a space in which to communicate their own story.

### *Realist Tales*

Realist tales are ethnographic accounts that aim to capture the culture under investigation in an objective manner. Realist tales represent the most popular class of ethnographic writing. They aim to capture, in concrete terms, the day-to-day interactions of social actors involved in the cultural situation. Realist accounts are presented as a "no-nonsense report devoid of self-reflection and doubt" (Emerson *et al*, 2001:p357). Harvey (1997:p211) points out that confessional tales place emphasis on the "...reflexive writing of a text ... The challenge [in writing confessional tales] is to write evocatively".

### *Confessional Tales*

Confessional tales are one of the key responses to the discontent amongst ethnographers with the more traditionalist tales. Such accounts often stem from "sensitivity" (Van Maanen 1988:p73). Confessional accounts are seen as a consequence of the growing infiltration of European thinking in the development of ethnography. Examples include influence of semantics and phenomenology (described above). Three key concerns within conventional tales are identified by Van Maanen as *personalized Authority; the Fieldworker's point of view; and Naturalness*. Unlike realist tales, confessional tales endeavour to expose the personal experiences of the fieldworker. They encourage situating these accounts of the research process at the forefront of the research process.

Confessional tales attempt to “demystify fieldwork or participant-observation by showing how the technique is practiced in the field” (Van Maanen 1988:p73).

## 4.8 SELECTION OF ORGANISATION

As presented in the Introduction chapter, this research was conducted in a multinational financial corporation: CIBC WM. The selection of that particular organisation was influenced by several factors. Firstly, the personal background of the researcher contributed to this choice. Prior to undertaking this study, the researcher worked as a member of their IT Infrastructure development team from March 1996 to July 1999. During this period, the researcher was based in their London office, where much of the fieldwork was conducted. Initial research on the IT infrastructure development activities of this organisation was conducted by the researcher from November 1999 to August 2000, as part of an MSc course. That research focussed on the email and e-commerce infrastructure of the organisation. Data for this early research was gathered through semi-structured interviews, using the case study method (Yin, 1994).

Findings from this early study stimulated interest in further, more detailed research on issues of information infrastructure development within the organisation. Although these findings were discarded and not used within this study, empirical data (collected through interviews and company reports) from this initial study was reappraised and used in this study.

Of the various reasons behind the selection of CIBC WM as a suitable organisation in which to conduct this research, the most influential was the access it gave to a diverse selection of IT infrastructure development projects. These cases included the development of a Customer Relationship Management system for the use by the Equities Trading business group, an e-commerce High Yield trading system, the email system and the PC desktop network operating

system (NOS). All these projects were considered as global projects in the sense that they were designed for the use of CIBC staff distributed between the company's offices in Asia, Europe and North America. Furthermore, project development required collaboration between members of a technical team also distributed across these regions. Combined with the detailed level of access afforded to the researcher, on the basis of his employment with the organisation, it was felt the chosen company presented an excellent organisation in which to conduct issues of IT infrastructure development.

#### **4.8.1 Negotiating Access to the Research Site**

Ethnographic fieldwork was conducted mostly within the London office of the organisation. This site formed the primary research location due mostly to pragmatic reasons. The location of the London office (in central London) was within walking distance of the researcher's university and accommodation, which made it easily accessible. Additionally, because of the researcher's prior role within the company staff, all levels of the organisation were extremely helpful and open with information.

A key factor behind the choice of the London office was the requirement made by the company that the researcher should undertake paid employment in the London office as a technical consultant reporting to the IT director. At the time, the researcher assumed this request was motivated by the company's wish to capitalise on the researcher's previous experience working in the company, and the further knowledge that he had acquired on the MSc and PhD program. This arrangement was accepted on the condition that the researcher would be free to choose his hours of work, and work on a project-by-project basis. A contract of employment was completed and the researcher undertook employment as an IT consultant with the company in December 2000 through to August 2002.

A letter of agreement was produced, stipulating the exact terms and condition under which the research study would be conducted. In this contract, the organisation agreed that the researcher was free to use any information that he collected on aspects of the organisation, providing this information was used only for academic purposes. On a more informal level, a senior director within the IT infrastructure development team, who had volunteered as the champion of the research, had agreed to act as a sort of supervisor of this study in the interest of the organisation.

The original research design involved the researcher spending a period of up to one year in the London office followed by four weeks in each of three other offices located in New York, Tokyo and Toronto. However, towards the end of the first year of fieldwork, the organisation decided against this proposal. Consequently, the researcher was only permitted to visit the Toronto office for a two-week period to gather further data through interviews with members of the IT division. This change did not cause any major disruption to this study, since the original research design had originally been made ambitious in order to allow the researcher the option of collecting research data from as many offices as possible involved in key IT infrastructure development projects.

## 4.9 ETHICAL CONSIDERATIONS

Research ethics remain an important consideration for a social researcher. There exist various issues that fall under this title that influenced this study. In this section, the ethical issues taken into consideration as part of this research are examined. As part of the experience of participant observation, ethnographers will encounter various dilemmas over research ethics. The most significant ethical considerations regarding this research included informed consent and privacy

### 4.9.1 Covert vs. Overt Research

This research was conducted using overt participant observation. Researchers conducting ethnographic fieldwork on any group of people may face the ethical choice between using overt or covert participant observation.

A common view is often put forward in social research that research should be conducted with the full knowledge and unconstrained consent of the people being studied (Hammersley and Atkinson, 1995). Ethnographic research that deviates strongly from this view is that of covert participant observation. Covert participant observation involves the ethnographer conducting research “without most or all of the other participants being aware that research is taking place” (Hammersley and Atkinson 1995:p264). Some commentators compare covert research to spying by arguing that it contravenes the rights and dignity of the research subjects (*ibid*). Others maintain a contrary view, suggesting instead that the level of deception involved in covert participant observation is fairly mild in comparison to those of official or business organisations (Fielding 1982:p94). Moreover, “they emphasise the extent to which we all restrict the disclosure of information about ourselves and our concerns in everyday life” (Hammersley and Atkinson, 1995:p246).

Although the ethical implications of informed consent is more pronounced in covert participant observation it remains an important ethical issue in other forms of ethnographic research. For instance, in situations where the research is explicit, it is often common for the research subject, once he has become familiar with the researcher, to forget that the research is taking place. Bell (1977) points out that it can often be disruptive continually to remind participants that data is being collected for research.

Hammersley and Atkinson provide some reasons why the ethnographer may not inform all the people they are studying about everything in their research.

“One is that, at the initial point of negotiating access, the ethnographer her- or himself often does not know the course the work will take, certainly not in any detail. But even later, once the research problem and strategy have been clarified, there are reasons why only limited information may be provided to participants. For one thing, the people being studied may not be very interested in the research, and an insistence on providing information could be very intrusive. Equally important, divulging some sort of information might affect people’s behaviour in ways that will invalidate the research.” (Hammersley and Atkinson 1995:p246)

An effort was made during this fieldwork to keep key informants, and those with whom access was negotiated, updated on the progress of the research. However, these people showed very little interest in the details of the research. To deal with this problem, I decided to withhold information about my research, unless specifically requested, which only ever occurred when conducting ethnographic interviews, and even then very rarely.

I agree with Roth’s (1962) argument that all social research falls on a continuum between two extremes of covert and overt. This is often the case, even in the same fieldwork between the differing levels of openness between the researcher and the different participants (Hammersley and Atkinson). This was clearly the case in this study. Of the different groups of participants, the managers of the projects that I followed, who often showed a keen interest in my research, received a very honest and opened account of my ideas. Often, I would discuss some of the key ideas on infrastructure development, and they would respond with their own experiences learned through their work. I found this to be a very useful way of collecting data, and establishing trust with some research participants. The business users received the least information about the research, largely



because they did not form a significant part of the research focus, which remains the IT infrastructure development team. The senior managers, who were often pressed for time, requested little or no information except when negotiating access for me to a particular business group with whom I had no previous contacts.

The ethical dilemma of informing and obtaining the consent of research participants was inflated by the sheer size of the research organisation. On this issue Punch (1986:p36) notes that “in a large organisation engaged in constant interaction with a considerable number of clients [it is physically difficult to seek the consent of all participants, and doing so] will kill many research projects dead”. Reinforcing this point, Hammersley and Atkinson (1995:p266) argue that ethnographers “simply do not have the power to ensure that all participants are fully informed and freely consent to be involved”, because the requirement of carrying out research in its natural setting limits the ethnographers control over the research process.

#### **4.9.2 Privacy**

Similar to informed consent, the concept of privacy remains complex. As with most social research, many aspects of the fieldwork in this study raised questions of privacy. However, certain parts of data collection in the field study raised more problems than others. As an ethnographer in the field, I soon became sensitive to moments when I may have been infringing on the privacy of research participants when carrying out participant observation in situations where I did not want some or all of the participants to know of my role as a researcher. This was the case when I first observed the infrastructure development team in their global conference meetings. These meetings were held between senior IT technicians located in different divisions of the organisation. The communication and interaction between the technicians was facilitated by a telephone conferencing system.

I would often join the technicians in the London office of the European division and listen in on the conference calls. The technicians in the London office were all aware of my presence as a researcher observing the meetings, and I was very conscious of the agreement between myself and those technicians that I should not be identified as a researcher to the members of the conference call in other regions. Here, the project manager in the London office explained that he did not believe these technicians would object in any way if they were aware of my presence, but that it would be more problematic for the manager to explain. Additionally, the manager felt the medium of telephone conferencing could create some discomfort for the other regional teams if they were to find out that their conversations were being monitored for the purpose of study.

The issue of privacy was also raised in the fieldwork, when I was given permission by one of the IT managers to review his emails for information that may be useful to my study. Initially I requested to see one particular email regarding a certain event of interest. However, the manager suggested that he would give me access to all of his emails for the purpose of my fieldwork. My concern here was for the privacy of people who had communicated with the manager in confidence, and without the knowledge of their emails being reviewed by a researcher. To address that concern, as far as possible, I tried not to review the emails indiscriminately, but instead to focus on selected emails that I had been alerted to through the conference calls and other activities.

As with all ethnographic research, many aspects of this research can be considered as an intrusion into the privacy of certain research subjects. The members of the organisation's management team, which sanctioned this research, clearly felt anonymity would be maintained by not revealing the true identity of any research subject. Moreover, they expressed consent in the discretion of the researcher to ensure that field data should only be used within an academic setting.

### 4.9.3 Consideration of ethics

In consideration of research ethics, efforts have been made to conceal the identity of the organisation under study and all research subjects. Although it may be possible to identify the organisation through the background and details within the case study, research subjects have been identified with different names. Consequently, in the event that the reader was able to identify the company, it would be very difficult to associate the events of the case study with any specific individual in the actual organisation.

## 4.10 DATA ANALYSIS

It has been said that a key obstacle in conducting qualitative research is that the methods of analysis are not well formulated (Miles, 1984). This especially applies in the case of ethnographic data analysis. One obvious difficulty in the process of ethnographic research is identifying the point where data analysis should take place, as it is an ongoing process as the participant observer moves from the periphery to being a full member of the team (Schultze, 1997).

During this study, I consciously began a formal process of analysis whilst conducting fieldwork. This initial analysis involved comparing events that I had observed within the organisation amongst members of the IT infrastructure development team. I recorded detailed notes of events that appeared to me as relevant. I used a method of constant comparison to make sense of events, by contrasting events and activities that occurred between the various IT infrastructure development groups (Strauss, 1987). It was during this stage that I discovered the significance of my previous experiences within the organisation, thereby leading me to incorporate autoethnography into the research process (see section 5.2.5 above).

Through this process of comparison, I began to understand the difference and similarities between the cultural practices of the different IT groups. By drawing on my past experience in the organisation before undertaking the field, and comparing with what I observed through the fieldwork, I was able to identify changes in the working practices of the participants.

#### 4.10.1 Data Analysis Techniques

The process of data analysis used in this study primarily involved organising and reading (listening) to field data to identify points of analysis. These points were then further refined into findings. The technique of data analysis was adapted from Van Maanen (1979; 1977) who describes a method of analysing ethnographic data that involves:

*distinguishing between* an informant's first-order conception of what is going on in the setting and the researcher's conception of what is going on [...] Put simply, first-order concepts are the "facts" of an ethnographic investigation and the second-order concepts are "theories" an analyst uses to organize and explain these facts. (Van Maanen, 1979:p540, emphasis added).

##### *First-Order Concepts*

First-order categories can be further classified into "operational data" and "presentational data". The former refers to field data that is observed directly by the researcher within the natural context on the research site. The latter denotes the conscious descriptions or explanation put forward by a participant observant about the activities in their culture.

[O]perational data ... documents the running stream of spontaneous conversations and activities engaged in and observed by the ethnographer while in the field. These data

surface in known and describable contexts and pertain to the everyday problematics of informants going about their affairs ... [P]resentational data, which concerns those appearances that informant strive to maintain (or enhance) in the eyes of the fieldworker, outsiders and strangers in general, work colleagues, close and intimate associates, and to varying degrees, themselves. Data in this category are often ideological, normative, and abstract, dealing far more with the manufactured image of idealised doing in by members of the studied organization. (Van Maanen, 1979:p542)

The distinction between operational and presentational data is often blurred. This increases the difficulty of separating these two forms of field data. “Verbal depictions are invariably recorded along with the concrete activities observed to be taking place. What the researcher is told cannot always be taking place. What the researcher is told cannot always be observed or assessed with any confidence as to its accuracy. Even when dealing directly with observable behaviour, “it is sometimes quite difficult for an observer to grasp its contextual meaning to those whose behaviour is being described” (Van Maanen, 1979:p542). Nevertheless, Van Maanen (1979) warns against a lack of due diligence in the process of distinguishing between operational and presentational data. “If the researcher somehow loses sight of this distinction there is the possibility that the presentational data will literally swamp the operational data, thus masking the difference between fact and fiction in the findings generated from ethnographic study” (Van Maanen, 1979:p543). For Van Maanen (1979:p543) this process of sifting out presentational or operational data “is an analytic accomplishment that must be attended to continually by the fieldworker”.

### *Second-Order Concepts*

Second-order concepts are used by the researcher to explain first-order ethnographic data. Second-order concepts often describe relationships between entities within the research field. Consequently, some second-order concepts can often converge with first-order concepts.

However, it is often when they do not converge with first-order concepts that second-order concepts bear the most interesting and novel insights. Van Maanen draws on the following example from his own research on police work to illustrate what he refers to as “theoretically engaging second-order concepts”:

“Consider everyday police talk. Here the ethnographer is often handling first-order conceptions that reveal an informant’s formulation of social structure (i.e., the informant’s version of the ordered set of social relationships). If a patrolman claims, for example, “I don’t want nothing to do with Horton, he’s a fucking call jumper,” that patrolman is displaying his sense of social structure. Implicit in the statement are at least three second-order conceptions bearing upon: (1) the role relations existing among patrolmen; (2) the competitive structure of policing; and (3) the centrality of a patrolman’s assigned territory or “turf” to the practice of policing. To the ethnographer, these matters are seen as deeply embedded in the commonsensical though unarticulated understandings carried by virtually all members of the police culture.” (Van Maanen, 1979:p541)

Extracting this form of second-order analysis from research data is seen as possibly the most challenging, and yet, “interesting goal” of the ethnographic process (Van Maanen, 1979:p541). The initial conception of second-order notions will often be more relevant to the native culture of the ethnographer than to the culture of the research participants. The researcher is advised to consciously employ selected strategies to develop these concepts.

#### **4.10.2 Adapted method of Analysis**

Drawing on Van Maanen’s suggested method of analysis, a system of organising field data for the purpose of analysis was devised, based on the simple technique of ‘coding the record’ (Hammersley

and Atkinson, 1995:p195). Most of this work involved the storage and organisation of ethnographic data captured via a digital voice recorder. This data was organised into a computerised filing system. As the fieldwork progressed and the research gained focus, this data was later organised into folders, according to the title of the IT infrastructure development projects that the data was associated with. This sometimes involved copying one recording of a meeting into the folders of several projects if it was deemed relevant to more than project.

As part of the analysis process, selected field data was organised into a table, based around the categories put forward by Van Maanen (1979). The categories used to organise this data included: Empirical research data (first-order classification); and Theoretical Concepts (second-order analysis). In addition to these basic categories, which allowed me to ground key theoretical concepts into the empirical data, I added the category of Notes/comments. The diagram bellow illustrates these categories used for data analysis in tabulated form with some sample data.

Fig. 4.2 Sample Table of Initial Data Analysis Approach

| Title<br>Date                | Empirical Data   | First-order<br>Operational/<br>Presentational | Second-order  | Theoretical Concept  | Notes/comment  |
|------------------------------|--|---|---|--|--|
| glb_w2k_<br>16-10-<br>01.wav | ...Oh it does, it does solve it, but it is a.. a large, or reasonably large overhead.<br><br>Yes it works .. amm.. But it's a big overhead. It's an administrative overhead.<br><br>It's a cost, and that's going to be the hard sell... | Operational                                   | There seems to be a change in Colin's rationale from his original stance of supporting a multiple Forest solution to supporting a Single Forest solution. | Individualisation in the sense that Colin may be acting within his own self interest rather than the interest of the other UK Technicians.<br><br>Also <i>Bureaucracy</i> from CTR in the sense that his argument supports that form of institutional rationale. | Colin's argument seems somewhat weak, but what is more interesting is that he is trying to justify the findings of the MS-G favouring the Big Bank and ICA model. What could be the reason for this? |
|                              |  |   |   |  |  |

A process of reading and re-reading fieldnotes and listening to digital recordings of project meetings and interviews was undertaken in addition to a study of theoretical concepts. These enabled initial findings from the empirical data to be further refined and corroborated. Furthermore, it allowed for the emerging second-order concepts to be grounded in the empirical data without sacrificing the integrity of the original theoretical concept.

### 4.10.3 Use of Computer software

Where once the ethnographer relied on the scribbled note and the typescript, he or she is now likely to regard the microcomputer as a natural tool. (Hammersley and Atkinson, 1995:p196)

More specifically, the above table of ethnographic data analysis was organised using a computerised spreadsheet application. The different categories of data was organised by columns.



Alternative fonts and colours were also used as a means to highlight particular categories of data. This computerised system did not form the sole method of ethnographic data analysis. However, this system represented a key portion of data analysis. The spreadsheet system was preferred to other specialist data analysis software due to its perceived flexibility. The tabulated or grid format of the spreadsheet allowed the recorded data to be organised and reorganised in different ways. New categories for analysis could be inserted by adding new columns, and new ethnographic data could be inserted into rows by using the basic functions of the spreadsheet application.

#### **4.10.4 The Role of Theory**

As a researcher, I felt that (as far as possible) the research data should guide my choice of theory. Although this seemed largely to be the case, there was some dialectic between theory and research data in the process of analysis.

The first stage of formal data analysis began during the early stages of the fieldwork and possibly earlier, in a very limited way during the literature review (on ethnographic fieldnotes). This initial analysis (see previous section) was useful in identifying emerging topics. Key issues that I observed during this initial analysis led me to favour certain theoretical concepts over others. Following the literature review, the search for a suitable theoretical framework revolved around social and cultural theories of risk, which were identified as a useful area for further research.

As I reviewed different theories of risk, I attempted to focus on those theories that appeared to provide the richest vocabulary with which to discuss issues identified in the data. In Van Maanen's terms, these were theoretical concepts that allowed me to express second-order concepts from the first-order data.

Initially, I was drawn to the rubric of concepts in Ulrich Beck's thesis of Risk Society. However, further investigation brought me to Douglas and Wildavski's (1982) Cultural Theory of Risk, which appeared more suited to the subject of risk and culture. I found this theory illuminating in that it enabled insights into parts of the empirical data that could not be addressed with the Risk Society thesis.

My enthusiasm for CTR caused me to abandon the theory of Risk Society altogether. It was during the latter, formal, stages of analysis, after completing the fieldwork, that it became apparent to me that the relationship between some operational data could be better explained with concepts from Beck's thesis of Risk Society. Efforts to address the tension or ambiguity over the appropriateness of the Risk Society thesis lead to Niklas Luhmann's Sociological Theory of Risk (STR) and Charles Perrow's (1984) Normal Accident Theory. Together, I found the combination of CTR, NAT and STR allowed for the effective analysis of issues of risk and danger in the development of IIs.

## 4.11 CHAPTER SUMMARY

This chapter has presented the research approach of ethnography and autoethnography from the field of anthropology as a useful research strategy to conduct this study into the cultural perceptions of risk in the development of corporate II. The chapter has examined the philosophical approaches, data collection, analysis techniques, and styles of ethnographic writing used in this study. Furthermore, this chapter has identified the benefits that can be gained by the IS field from the adoption of ethnographic and autoethnographic research strategies in IS research.

# CHAPTER 5: AN “IMPRESSIONIST” TALE OF CORPORATE II DEVELOPMENT

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## 5.1 ORGANISATIONAL BACKGROUND

The Canadian Imperial Bank of Commerce (CIBC) has been in existence as a bank for over 135 years. The Bank has over 42,000 employees distributed throughout its global offices. Most of these employees are based in North America where the bank remains one of the key players in the financial sector. Following the subsequent development of the global financial market and the evolution of financial services, CIBC's primary business of retail banking has grown to incorporate a variety of financial service businesses. The annual report (2001) identified the four key business lines that form CIBC as: Electronic Commerce, Retails and Small Business Banking, Wealth Management, and CIBC World Markets. The combination of these business lines were described by an IT director, based in the Toronto office of Canada, as follows:

*“CIBC can be best described as a coalition of business units. This applies equally to the World Markets investment banking group as well as the other groups like the retail bank.”*

### 5.1.1 CIBC World Markets

CIBC World Markets (WM) is an investment-banking corporation that specialises in securities, brokerage, and asset management services. The World Markets investment-banking group was formed in the late 1980s under the name of CIBC Wood Gundy when CIBC acquired the investment trading business of Wood Gundy (a trading house founded by two English immigrants to Canada). In 1999 CIBC abandoned the Wood Gundy name and adopted the name of CIBC World Markets for its worldwide investment banking businesses.

About 13,000 of CIBC's total workforce work within the World Markets group, which has offices in over 63 cities in 14 countries, including all the major financial centres: New York, London, Tokyo, Toronto, and Singapore. Most of the World Markets employees are based in North America, located in either of the two central offices in New York (about 6,000) and Toronto (about 3,000). In the London office, from where much of our research was conducted, the company has around 600 employees.

#### *Growth through Acquisition & the Formation of New business Units*

Over the past decade, the company has grown through a series of acquisitions. In 1997 CIBC continued the growth of the investment-banking group through the acquisition of Oppenheimer & Company, a US based underwriter. More recently the company expanded through the acquisition of Merrill Lynch Canada as a strategy to "...dramatically expand ... overall retail investment broker network" (CIBC Annual Report, 2001:p8). This has been accompanied by acquisition of the credit derivatives trading division, and software development team, which formed part of the former Enron group.

The establishment of new business groups has been another strategy of growth. This process often reflects the state of the financial markets, and whichever products happen to be in vogue. Over the past decade, stimulated by major changes in the global financial environment, CIBC has created a number of new business units in the investment banking business to respond to the emergence of new financial products and services in the securities business.

One of the largest business groups to be introduced into World Markets was the Financial Products (FP) business unit, created in the mid 1990s as a response to the boom in derivatives products.

*“FP was created by recruiting some of senior traders from [a leading investment bank] and some of the top people in derivatives in the industry. They were given a clean sheet and the authority to build a global business from scratch.”*

The employees in the investment banking business have often commanded significantly higher salaries than their counterparts in the retail bank. Of the various groups in the World Markets investment bank, the FP division was amongst the highest paid, especially those specialising in options trading. At the zenith of the FP era, the CEO of the FP business was often rumoured to dictate the strategy of the bank to the then CEO of World Markets, who technically was his immediate manager.

### **5.1.2 WM IT Departments: GT and the Formation of FP Tech**

Prior to the formation of FP, one technology division called Global Tech (GT) supported all the business units of World Markets. As the title suggests, the Global Tech division was responsible for providing technology services throughout all World Markets investment banking business. Consequently, the entire IT infrastructure in all the global divisions of the World Markets group

was fully operated and owned by GT. Much of World Markets financial services were structured around the Fixed Income trading group. The IT infrastructure provided by GT at the time was fairly basic in investment banking term, as explained here, by Ross, a former technician in FP.

*“The existing IT support group [GT] here could [could not in anyway] support derivatives traders ... Because the demands of fixed income traders are a spreadsheet, Bloomberg and ‘I’m happy’... Reboot their PC three times a day and you know they’re happy. But the complexity of what they’re trying to do in Financial Products [FP], you need development support, you need applications to be built, for you cannot get off-the-shelf applications. Where as you can get away with a spreadsheet and a Bloomberg terminal for fixed income. To trade and risk manage complex derivatives; you pretty much need to grow your own software to do that ... to give you the edge. ... To risk manage these products requires intense computer power...”*

The business managers of FP chose not to use the bank’s standard of GT for its IT services. Instead FP formed its own IT services group named FP Tech. The strategy and structure of FP Tech was very different from the GT division. Whereas FP Tech was closely aligned to the FP business unit and quick to respond to its needs, GT was highly structured and slow to respond to the needs of its many business units. A former network administrator in FP Tech contrasts the two divisions as follows:

*“FP Tech worked very differently from GT ... Most of the technical staff [FP Tech] were located in the same area as the traders. This gave the traders and IT staff in FP easy access to each other, unlike GT, which was very much more structured, with the technical team located on a different floor to users. This was purely a case of different management styles. FP Tech was more aligned to the FP user base and was seen as part of the business.*

*Whereas the other part of the bank had always viewed the services of GT as a totally separate function to their business.”*

Other differences between GT and FP Tech are the management structure and technology architecture. GT (Global Technology) maintained a global reporting structure, with its headquarters in Toronto. All regional GT directors reported directly to the Toronto head office where senior GT executives are based. In the GT PC Desktop Support team there were usually three levels of management between the PC support technicians and the senior IT director of GT UK.

In FP Tech, on the other hand, within the London office there was very little hierarchy in that all employees were all encouraged to report directly to Ricky, the UK FP Tech director. Hence, although some of the FP Tech staff had different titles (e.g. Associate, Director, Executive Director etc.) they were not encouraged to adhere to these titles in terms of reporting structure or working relations.

Regional directors in FP Tech reported directly to the managing director of FP business in the local region. Although there was an equivalent CIO for FP Tech (based in the New York office), the regional heads of FP Tech reported to the CEO of the FP business for their respective region.

### *Funding/Budget of IT Departments*

This difference in management structure was reflected in the source of funding for the two departments. Of the two IT divisions, FP was commonly acknowledged to be highly funded compared to GT. The budget of FP technology was provided directly from the budget of the local FP business in each region. Hence the head of FP UK would approve the budget for the London FP Tech team. This method of funding contrasted with the way GT was funded. Unlike FP, the budget

for GT was mostly approved not by local business manager, but by GT's senior management team, based in the Toronto Head quarters.

The different strategies of funding were also reflected in the remunerations of the two departments as explained by a former director of FP Tech.

*“Technology in FP was accountable to that business, which basically motivated that group from day one. With the GT technology here, you know if the bank had a good year, you might get... one or two thousand pounds at year end, or... you know, enough to buy a leather case for your mobile phone or something. ...Financial Products viewed technology as an asset. GT would view it as just another service or cost centre and they always complained about it.”*

### *Technology Architecture*

The distinct funding strategies also had important consequences on the profile of technologies in the two IT groups, with FP often sporting the very latest advanced technologies, whilst GT would often maintain older, legacy computers. GT, having been in existence for many years maintained an assortment of technologies consisting of many legacy systems. At the time many of these systems employed mainframe architecture on a token ring network and a Novell PC network. On the new FP side, however, the IT infrastructure utilised the latest client server technology using Microsoft Windows NT and Sun Microsystems servers on a Fast Ethernet cabling system. GT supported a wide variety of network protocols on their segment of the network, whereas the FP group standardised around TCP/IP from the outset.

The formation of FP Tech led to the creation of two very different IT departments providing IT support within CIBC World Markets: GT, with generic services and ailing technologies; versus FP, offering customised solutions on the latest technology platform. FP supported only 600 people



globally (mostly based in the New York, London, and Singapore offices), whereas GT supported over 13,000 users globally. The two departments shared some parts of the IT infrastructure, such as the WAN (Wide Area Network) infrastructure, which was maintained by GT. FP Tech staff was generally perceived as highly competent, proactive and efficient. In contrast, GT staff was seen as reactionary and inefficient.

## 5.2 JOINING FP TECH FROM MDS

I was approaching my second year of employment as a Market Data Services (MDS) technician in CIBC when I was asked if I would like to join the FP Tech support team. Although I had been working in the London office of CIBC World Market during this period, my employment contract was with a small telecommunications company who was responsible for maintaining the bank's telecoms network and MDS systems.

The MDS team was a fairly small team of four, three of whom were technicians. Of these I was the only one with a computing background in PC based systems, at a time when PC based client server networks were rapidly replacing mainframe and minicomputers throughout the bank. This caused me to become an important member of the MDS team. Because of my role in the MDS team I did not expect to be accepted for any other position within the bank. Hence I was pleasantly surprised when offered the position in FP.

During my time at CIBC I had been impressed by the reputation of the FP business and FP Tech support team. My role as an MDS technician required me to interact with both the business users in both the GT and FP areas of the trading room. The distinction between FP and GT became apparent to me from the moment I walked into the bank. Everything in FP appeared new and advanced, whilst so many things in GT seemed out of date in comparison. Even the traders in FP

appeared more intelligent, professional, and sophisticated when compared to business users in GT. Whereas many traders on the FP side were 'Oxbridge' graduates, many of the traders in GT were plucked from the market stalls in the East End. The technicians in FP (although few in number compared to GT) were clearly head and shoulders above their counterparts in GT. Most of these technicians were recruited from top investment banks throughout the City. Those few recruited from within CIBC were selected from the best GT could offer. Despite this, GT had many good technicians who would have been very happy to move over to FP, and many of whom had more technical experience and skills than myself. Hence my surprise at the job offer.

Colin, a senior technician in FP Tech specialising in networks, first put this offer to me informally. He explained they wanted to recruit a new member of the team to work directly with him and take on some of his expanding responsibilities. I had worked with Colin on various occasions in the past, and was impressed by his extensive knowledge of various network technologies. I wasted no time in accepting the offer. I began work with FP Tech as an employee of CIBC World Market in the summer of 1997. I was still based in the same office on the Trading floor, in much the same area as I had been located as an MDS technician. The difference now however, was that I had become a full member of the prestigious FP Tech team.

### **5.2.1 Early Experiences in FP Tech**

The London FP Technology group consisted of four network support technicians and five application developers, all reporting directly to Ricky. The members of this team worked very closely together and were located on the trading floor amongst their users. Some of the key technologies within the IT portfolio of FP included: Windows and Unix Network Servers; Leverage Desktop (LD) Application Suite Standard; Sybase and SQL Server, MS Access Databases; Optex, Imagine, Murex and Alice Trading Applications.

The five application developers were mostly responsible for developing the Optex, Imagine, Murex or Alice trading systems. The four network technicians were primarily responsible for the network servers, the Leverage Desktop, and all the hardware within the FP infrastructure. I was placed within the network support group.

### *Network Naming Standards*

Amongst this small team of network technicians, very strict rules regarding standards were adhered to as part of our working practices. One such rule was that all computers on the FP network had to conform to a strict naming policy. An example of a standard computer host name was FPLONNT194. The first part of this network name identified the business group (FP), the location (London office), and the operating system (Windows NT). The three-digit number at the end was unique to every computer on the FP network. Each networked computer required its own unique network name to operate on the LAN (local area network). This strict naming standard was necessary to avoid duplicate network names between computers.

I was surprised to discover one computer on the FP network with the computer name BURNS. I immediately raised the matter with Colin, who with a smile explained that this computer was named after the user, a very powerful but short-tempered trader.

*“We decided to overlook the PC naming convention in this case because we want to be able to identify Burns’s PC on the network from the others. You know, just in case one of the guys accidentally deletes the wrong computer from the network – you don’t want it to be that one [BURNS] or you may have to collect your P45 from HR.”*

### *Interchangeable Roles of FP Tech*

The general rule within FP Tech that I soon came to understand was that our roles were not fixed but interchangeable. They were interchangeable in that applications developers were encouraged by Ricky to attend to technical support calls, especially in situations when the network technicians were unavailable or too busy. This applied also to the four network technicians, who were encouraged to develop various small applications for users and the automation of technical support functions using scripting.

### *Samba*

An important component of the FP computer network infrastructure was Samba. Samba is an Open Source application that facilitates interoperability between Unix and Windows based computers. Samba was used in FP Tech to provide file and print services to Windows computers printing through Unix print servers.

Samba runs on a Unix platform, and communicates with networked computers running Windows based operating systems. It works as an emulator by allowing a Unix computer to appear on the network as a Windows computer to other Windows based computers on the network.

FP depended heavily on the Optex system in all areas of the business. This dependence led to the purchasing of a significant number of Sun Sparc Unix computers. The Sun Sparc computers were considered to be very powerful, with the capacity to handle a large number of processes. Initially, many of them were only used to run Optex. For the purpose of fault tolerance, no more than two Optex clients were connected to each Sparc computer. The explanation given to me at the time was that this configuration limited the impact of technical faults in Optex.

Although these Sun Sparc computers were configured to provide other network services, such as print services and file sharing, other Unix based computers only could access these services. The FP technicians used the Samba application to address this problem. Samba was used to extend the file and print services for the Unix based computers to the many Windows based computers on the FP network.

### **5.2.2 Unattended LD Build**

One of the first major projects I became involved in when I joined FP Tech was the development of the new LD (Leverage Desktop) build. This new LD standard would combine the latest versions of applications in the present LD build into a standardised desktop with the newly released Windows NT network operating system.

The current LD standard was only partially automated. This new LD build was going to improve on this by including an unattended installation component. This component allowed the technician to install an entire operating system and desktop applications onto a new computer from scratch with only the use of a floppy disk.

All the desktop applications that formed the LD standard were stored on a CD. The procedure for building a new PC involved a technician installing Windows NT into the computer. The technician would then copy the contents of the CD onto the new PC. The final stage of the process involved the technician editing the registry keys of the newly installed operating system. The automated part of this process was facilitated by the CD, which contained a preinstalled copy of all the applications in the LD standard. This process was faster than individually installing each application. Furthermore, because the CD contained the preinstalled application, with their general configurations, this procedure helped to maintain the standard of applications in the LD standard.

The major problem with this procedure was the installation of the operating system, which was entirely manual.

The new LD standard overcame this problem by including an unattended installation procedure into the LD build process. This new process involved a technician initiating the automated build procedure with a floppy diskette. The programs on the diskette would connect the computer to the network using the basic MS DOS operating systems. Once connected, the installation of the Windows NT 4 operating system would commence over the network. Following the installation and configuration of NT 4 onto the new PC, the automated unattended installation process would then install and configure all the applications that formed the LD standard the NT 4 operating system. The final stage of this process involved the customisation of the desktop settings to match the specific settings preferences of the user. A support technician completed this last stage manually.

The new unattended installation process took about two hours from start to finish, which was about the same time as the installation process for the previous LD build. The benefit of this new process was that apart from the first and final stages, a significant amount of the process was automated. With this new process, one FP technician could single-handedly initiate the installation process for a large number of computers soon after working hours. When the technician arrived on the next morning, they would only need to spend about five minutes on each computer to carry out the final stage of configuring the desktop.

At the time of developing this unattended installation solution, there were very few applications on the market that facilitated this entire process from start to finish. The few applications that facilitated parts of this process could be described as fairly basic. The members of the FP Tech combined a bespoke application called Systems Service Module (SSM) and a newly released

version of MS Systems Management Server (SMS). The SMS package was part of Microsoft's Back Office suite of server applications. Its main functions included the management of Windows computer networks by allowing the network technicians to perform a range of functions remotely over the network from the SMS server. These functions include, remote administration, deployment of application packages, and network monitoring and reporting.

The deployment of applications function of SMS enabled network technicians to automate the deployment of desktop applications onto Windows based networked computers. Using the package installer component of SMS, the network technician could schedule the installation of various applications onto multiple networked computers in an automated manner. However, in order to enable this task, SMS required the client PC to be connected to the network with the Windows operating system. This was an important part of the unattended installation process that SSM was not able to do. SSM was developed by a small UK based software house to act as a sort of Add-on to SMS, which automated the things SMS did not encompass installation process.

My personal recollection of this new unattended installation process was that SMS required a significant amount of work to set-up. This appeared to be caused by the requirement for various configuration settings and drivers for the many different hardware device drivers, such as the CD ROM, monitor and PC sound card that made up the PC.

### *The Practice of Hacking*

In some cases, in order to automate the installation of a particular device as part of the unattended installation process, we would use a program editor to examine the code for the device's software driver. This allowed us to identify the files and program code that were relevant to the installation operation of a particular device. Colin, who was responsible for the unattended installation and the LD project, referred to this process (of reconfiguring any technology differently from its original

design) as hacking. To me hacking was something that highly experienced technicians could do, because it required configuration of a technology beyond what the producer intended for the user. One of the first technologies that I successfully hacked in the FP team was the device driver for a Compaq VGA monitor, which was required for part of the unattended installation process.

I can recall the sense of joy and pride that I felt from the reaction of the other members of the FP Tech team following the success of my efforts. When Colin informed the other members that I had been able to work out a solution by hacking the installation procedure of the manufacturer, the response I received made me feel my status within the team had been spontaneously elevated from a junior, to a senior member of the FP Tech team.

The project to develop an unattended LD build took about six months to complete and ended around October of 1998, just before the time of the year when we would complete our yearly progress report. I had just completed my first full year in the FP Tech team.

Immediately after the project, we commenced with the upgrade of all user PCs on the FP network. I recall working very hard as part of the FP network support team to complete the deployment of this new LD build, which we achieved within two to three weeks.

The rapid completion of this deployment testified to the effectiveness of the new unattended installation procedure. At the same time, various members of the GT support team were suggesting the possible development of an unattended PC build process, however, GT had not yet been able to agree on a standard set of applications for their desktops, or even the network operating system for that matter. Myself and the other technicians took immense pleasure in using the success of our unattended installation project to highlight the superiority of our group over theirs.



### 5.2.3 Impacting Crisis of Asian Financial Markets

Christmas of 1998 was soon approaching. It was around this time that we began to hear of rumours that the bank had sustained considerable financial losses from its investment trading activities. This had been the case for financial securities firms throughout the City and the global financial market. These losses were mostly attributed to the collapse of the Asian financial markets. Especially affected were the derivatives instruments, which the FP business division was responsible for in CIBC WM. These rumours were followed by announcements of major staff cutbacks in major securities firms across the city. CIBC was amongst those organisations to announce plans to cut back their investment trading activities, through extensive reorganisation of the World Markets business.

#### *The Threat of Redundancy*

I recall my expectation of a sizable payment in the Christmas bonus, being replaced with the expectation of possible redundancy. Ricky, the head of FP Tech tried to assure us that any staff cuts would not affect FP Tech. However, the rumours on the trading floor, which the members of other business trading groups seem to delight in spreading, was that CIBC World Market's losses that year had resulted from the frivolous trading activities of the FP division. We were all too aware that as members of the trading room area, we could cause considerable damage to the banks trading activities, especially with our understanding of the banks IT set-up. These risks had caused many investment banks to institute strict measures for the dismissal of staff. One of these was that a member of staff on the trading floor would be informed about their dismissal at their desks, by a member of the human resources team, accompanied by a security guard. After briefly informing the employee of their dismissal, the two would then watch the former employee empty their desk of their personal belongings before escorting them out of the premises. In many cases, the managers of those being made redundant were not informed of which members of their team would be sacked until the moment of the sacking. In one case, a director was called into a meeting by human

resources to assist with the dismissal of a manager within his team. Immediately after dismissing the manager, this director was surprised to be informed by the human resources staff of his own dismissal in the very same meeting room.

### *The 1998 Staff Cull*

As expected, the Christmas of 1998 brought with it a large number of redundancies. It was not unusual to see one or two traders being marched out of the trading room area, accompanied by a member of the security staff and the head of personnel, who always, somehow, appeared invigorated as she paraded the victim across the trading floor towards the exit. For her, the satisfaction of presenting to these financial “high flyers” their pink dismissal sheet informing them of the termination of their employment contract, after years of handing them sums of money, which she may only ever encounter through a chance lottery, brought too much satisfaction to contain, or so it would seem. But “the 1998 staff cull”, as it was named by London staff, was significant in the sense that it not only affected trading groups that was familiar with this annual event. In 1998, mostly every part of the organisation was affected by redundancy, and mostly every part of the business lost a substantial number of its staff. Many members of the technology divisions (in both FP Tech and GT) felt assured in the belief that the companies push for Y2K compliance of all technical systems would at least secure them in their positions until the millennium. For these people, at least, the dismissal of IT staff came as a shock to their system. Redundancies in the IT groups in the 1998 staff cull mostly impacted on the middle tier of management, those with no technical skills other than sending and receiving emails, manipulating budgets in spreadsheets, and creating documents with the latest management buzzwords along with the occasional PowerPoint presentation. Yet for the few fledgling managers with technical competency, those who had been effective enough in their choice of alliances, this period also brought new opportunities. This was the opportunity to establish themselves in the managerial roles that had been left vacant by the casualties from the 1998 staff cull.

That year, the FP Tech team suffered only one casualty. This was not the case for the FP traders, who lost a number of traders along with some very senior, high profile directors from both the business and IT areas. Many of these directors had been based in the New York office, which was seen by many as the headquarters of the company's investment trading business. During this time, the rumour within the London trading floor was that the FP era, as the jewel in the crown of the CIBC's investment banking business, had drawn to an end following the losses of the 1998 global financial crisis (Saigol and Silverman, 2002).

At the end of it all, in January 1999, I felt relieved at having escaped the immediate danger of redundancy, however the experience of seeing many people being dismissed from their posts in such a ruthless manner made a lasting impression. This recent activity served to create a certain anxiety within me. This feeling made me very aware of the precarious nature of work in the investment-banking sector.

#### **5.2.4 Cost Cutting through Restructuring**

Over the New Year period, news was received from CIBC's headquarters in Toronto that the 1998 restructuring of CIBC World Market would be extended into an ongoing restructuring program. This program was driven by a new strategy from the senior management team to reduce spending within the group, and cut the overall costs of the bank's operations. The CEO in the following statement, taken from his 1999 annual report, explained the cost cutting strategy as follows:

*"CIBC earnings in 1999 were reduced by a restructuring charge that will enable us to substantially reduce our cost base in the coming year."*

### *Formation of New, Globally Accountable Business Groups*

One of the projects to emerge from the now ongoing restructuring program was an effort to reorganise the entire structure within the World Markets group. Prior to this reorganisation project, the structure of CIBC World Markets was decentralised. Business units within the group (such as Equity Trading, Treasury, and Foreign Exchange) were all locally managed. Hence, Equity traders in New York reported to managers in the New York office. Although various centralised services were available throughout the organisation, each of the local business groups controlled their own budget.

The practical implication of the reorganisation project was to merge the local business units into “single globally accountable business groups”. Whereas before the equity traders in London would report to the local management team in London, they now reported to the Global Head of Equities. To support the cost cutting initiatives of the restructuring project, the budgets of each business group was substantially capped.

### *Creation of the Global Enterprise Management (GEM) Team*

Another of the consequences of the restructuring project was the creation of Global Enterprise Management (GEM) team within the retail bank in Canada. The initial aim of the GEM team was to manage the IT services of the traditional retail-banking group, based in Canada (CIBC). This involved the outsourcing of the IT services within the retail bank through several major outsourcing contracts. The GEM group became the division within the retail bank responsible for managing the IT services, mostly through the outsourcing contracts. The main IT outsourcing contractor was a newly created company called Inform Communication Associates (ICA). ICA was part owned by CIBC (55%) and part owned by Hewlett-Packard (45%). ICA took over most of the retail bank’s IT services including the IT staff. The GEM division was established to manage the outsourcing

contract on behalf of the retail bank and also to manage the remaining IT services in the retail bank that could not be outsourced for whatever reason.

### *World Markets IT Services Harmonization*

In the reorganisation the IT service departments within the World Markets investment bank were all assimilated into one department, under the structure of the Global technology (GT) department. Rather than support various different systems, the strategy changed to one global technology division with one standardised profile of technologies. Many infrastructure development projects were terminated because of the cuts in spending. The bank reduced its trading activities in both Europe and Asia to concentrate on the North American markets. The former IT director described this strategy:

*“Before the 1999 restructuring program the strategy of the bank was to build a wide menu of financial services and products for our clients. As a result, a great deal of autonomy was given to local business groups in the European offices to create new financial products. There was a big push into the European and Asian Markets at the time. After the restructuring program, CIBC pulled out of these markets to focus on the US and Canadian clients. ...Within Europe itself our new strategy [in 2000] is to focus on servicing these clients. [...] Generally our aim now is to grow a North American Franchise with a global reach.”*

Additionally, the restructuring program resulted in the initiation of several global projects with the aim of centralising the management of the organisation’s key IT infrastructure components. Amongst these were various outsourcing contracts to manage the company’s key IT infrastructure components, such as the cabling network. In the following sections of this chapter, attention is

focused on two CII development projects that emerged from the global restructuring within World Markets, the first of which is the email infrastructure project.

### 5.2.5 History of Email Infrastructure Development

Traditionally each business group within the bank was responsible for maintaining its own email systems. As CIBC grew and expanded, over time several diverse electronic mail systems emerged, which included Lotus CC Mail, Lotus Notes, Office Vision (DISOSS), and Novell Group Wise. This decentralised approach resulted in major inconsistencies in email parameters (message retention, message size, mailbox size, etc.) across the various email systems. At the turn of the century there were approximately 42,000 internal email users, 10 external gateways, 250 post offices, 100 internal gateways, and multiple Internet access points with multiple DNS (Domain Name Services) domains.

At the time of FP's initiation, email was not recognised as a business critical system within CIBC. In the European division, GT had standardised around Lotus CC Mail. Here again, FP chose a different email system to the CC Mail standard supported by GT. The strategy behind this selection was explained by a former mail administrator in FP.

*"...you've got to understand the time line of all of this, from day one it was CC Mail throughout the whole bank. Now I don't remember exactly why we chose to go to HP Open Mail, but probably because ... HP Open Mail is like a server end replacement and because it's running on a Unix platform it's much.. much more reliable ... because CC Mail was never a client server architecture, for CC Mail to work you had to have a drive mapped from the users pc to the CC Mailserver. It was very unreliable..."*

In keeping with their strategy of client server technology, FP chose HP Open Mail, which supported client server architecture over CC Mail.

### *Email Administration Practices*

The maintenance and support of the two email systems was also very different for the two departments. FP users could contact their email administrator directly for immediate recovery of any emails issues. Most importantly, FP users had unlimited mailbox sizes. Some of the users' mailboxes grew to about 1Gb in size. This was a very important requirement for FP users, who became heavy users of email. As a maintenance procedure, the email administrator would send an email to FP users asking them to help maintain the upkeep of the system by regularly deleting unnecessary emails. Whenever this strategy proved ineffective, the mail administrator would generate a report identifying heavy email users, which he would then visit to help identify and remove unwanted emails.

On the other side of the fence, GT maintained a strict regime on email usage. Mailbox size for all GT users was set to 20MB for all users. Emails would be deleted automatically from user's mailboxes after a set period of time. GT users had no direct access to the email administrator and were required to go through a central help desk system. An interesting observation at the time is that both groups of technologists considered their practices and approach to email administration superior to the other.

### *Enter Y2k*

The most immediate issue on the agenda for the FP Tech network support team, as for many other participants of the IT industry nearing the turn of the century, was their preparations for the projected Y2k bug. A project team was established in the Toronto headquarters of CIBC World

Market for Y2k with representatives in all the regional offices. The primary responsibility of this team was to assure that all technical systems throughout all areas of the bank were Y2k compliant before the end of the year. As part of their responsibilities, this group was responsible for approving and funding all projects throughout CIBC World Market deemed pertinent to achieving Y2k compliance.

The limited number of applications in the FP technology infrastructure and the advanced nature of these technologies reduced the Y2k project in FP mostly to a process of checking the compatibility status of a small number of legacy applications on the Unix platform. The handful of applications that were found to be incompatible with Y2k was simply upgraded to the latest Y2k compatible version, which most manufacturers provided. This was the case for all the applications on the FP network, except email. Unlike other areas of CIBC, FP used the Open Mail email server, which was not certified as Y2k compliant. Furthermore, the manufacturer of Open Mail had announced their intention to discontinue the development of the Open Mail server. This predicament led to the initiation of the FP MS Exchange 5.5 email project in February 1999 within the UK. The original objective was that the London FP Tech team would take the lead in developing a comprehensive email infrastructure based on the newly released MS Exchange email solution, which would then be replicated to other FP divisions throughout the globe.

### *The Option to Join GT CC Mail*

There was another option open to FP Tech, which was to integrate its email system into the GT email infrastructure by migrating all the mailboxes over to CC Mail. This would mean handing over some or all control of the email system to the GT division and adopting the email administration practices of GT. However, as explained by a former member of FP Tech, this was not an option that we in FP Tech were prepared to entertain.



*“The GT standard of CC Mail locks us into the structure of GT support. This would mean we would lose control locally because administration is controlled centrally from GT’s headquarters in Toronto. They would determine the mailbox sizes and everything. Anytime we want to add a new FP user to the email system; a request would have to be sent to Canada. With the OpenMail system, you have to do the administration locally, here. This is much better for our users because we can customise the properties of each mailbox on a user-by-user basis.”*

### **5.2.6 FP Tech MS Exchange 5.5 Email Project**

Rather than hand over control of the email system to GT, FP Tech took the decision to replace the OpenMail system with MS Exchange. This decision was taken in the first few months of 1999, after several weeks of testing MS Exchange.

The decision to replace Open Mail with MS Exchange generated a lot of excitement amongst the FP network technicians. Training courses were organised to facilitate the development of skills on setting up and administering MS Exchange.

#### *MS Exchange Skills Development*

Colin and myself were the only members of FP Tech who attended the five-day external training course on MS Exchange 5.5. When we returned, we proceeded with the setting up a test lab for the proposed MS Exchange solution. I proceeded to study in my own time, outside of work, in preparations for professional examinations that would certify me as a MS email administrator. All these activities occurred alongside the implementation of the global corporate restructuring project, which was to bear significant consequences for the members of FP Tech.

### *End of the FP Era*

In February 1999, the end of the FP era, and of FP Tech in particular, was confirmed with the announcement that the FP business would be dissolved into other divisions in the World Markets investment-banking group. FP Tech was going to be integrated into GT as part of the effort to create a single, globally accountable business groups. Myself and other colleagues in FP Tech did not view this decision at all favourably. We openly rationalised this decision amongst ourselves in FP Tech as superficial, managerial propaganda. Colin, who demonstrated a keen interest in rejecting any practical effort to join the technicians in GT, openly rationalised this decision as superficial. He argued that providing our duties did not change and that we continued to support the same advanced technologies, we could continue to develop the skills that would maintain our value throughout the City, should we choose to leave CIBC World Market. The other members of the team, including myself, were complicit in our acceptance of this argument. The development of the proposed MS Exchange 5.5 solution served to confirm this belief.

### *Continued Development of FP MS Exchange Email*

We continued with the development of the trial MS Exchange server by connecting a small group of email users. These users were those we considered to be fairly advanced, in terms of their understanding and use of new technologies. Some of these users used laptops, Palm Pilots, or other personal information managers, which did not integrate very well with the ailing Open Mail technology. These users were eager to witness the benefits of the MS Exchange 5.5 solution. Developing the trial MS Exchange solution to meet the needs of this small number of demanding users proved to be very challenging. The few weeks in which we conducted these trials extensively developed our understanding of the configuration of MS Exchange and its related applications.

### *Rejection of FP Tech MS Exchange Proposal*

This work on the trial MS Exchange solution formed the basis of a formal project proposal to upgrade the existing Open Mail solution to MS Exchange. The proposal was presented around April 1999 by Ricky, the head of FP Tech UK, as a part of FP's UK's requirements for Y2k compliance. Within a few weeks of its submission, we were surprised to receive the news that our proposal to upgrade Open Mail to MS Exchange had been rejected. This news was shortly followed by the announcement that the FP Open Mail systems would be replaced by CC Mail by transferring all FP users over to GT's CC Mail. This news was seen at the time as a major political victory for GT over FP Tech. To the members of the FP Tech network support team it represented a major blow to our efforts to maintain what we considered to be a privileged position over our counterparts in GT. I can recall at the time how some GT technicians taunted us on this news. The feelings from within FP Tech was that we maintained higher standards in all areas of technical support, and therefore it should be GT that should have to adopted our systems, standards and working practices. However, the view that seemed to come from some members of GT was that FP, and FP Tech in particular, were spoiled with an abundance of resources, and needed to be brought into line in some way.

For myself, the news of the rejection of our MS Exchange proposal and the transfer of FP's email services was a major blow to my plans of developing my skills as a senior technician within the trading room environment of the investment bank. I had invested a significant amount of my personal time to study the MS Exchange 5.5 email solution, which would help to establish my position as a senior network technician within CIBC World Market, and any other investment bank. Without the experience of implementing this technology, which the proposed FP Exchange email project would provide, it would be extremely difficult to achieve this personal goal.

### 5.2.7 Deciding to Leave CIBC World Markets

Following the rejection of the FP MS Exchange project, Ricky, the head of FP Tech Europe resigned from the bank. This resignation was interpreted by members of FP Tech as a protest against changes that had been taken place in the World Markets groups over the past few months as a consequence of the corporate restructuring project. Throughout this period, Ricky had openly voiced his objection to the idea of integrating FP Tech into GT.

By this time, I also had taken the decision to resign from my position within the bank in order to pursue postgraduate studies. Ricky left the bank immediately upon announcing his resignation. However I was asked to stay on. At the time I suspected the IT management in the London office were trying to limit the possibility of losing any more network technicians from the efficiently run FP Tech group following the resignation of its leader. However, after a few months of negotiating, I eventually departed from CIBC World Market to undertake a postgraduate degree. Unbeknown to me at the time, this degree would eventually lead me back to CIBC World Market, in the dual role of technical consultant and researcher at CIBC.

## 5.3 GLOBAL MS EXCHANGE EMAIL INTEGRATION

The transfer of FP email users from Open Mail to CC Mail was not scheduled to commence until several months after my departure. During this period, Colin and the other FP Tech network technicians had been able to develop further the trial MS Exchange solution to support the entire FP user base in the UK office. Two events occurred during that period that made this achievement possible. Firstly, as part of the restructuring project aimed at cutting costs, senior management took the decision to implement a strategy to integrate all of CIBC disparate email systems into one coherent, global messaging infrastructure through an outsource contractor. The aim of this

integrated email strategy was to align the various decentralised email systems in CIBC into a standardised email system with a central point of management and administration.

The integrated email solution was intended to bring about many benefits, the first of which would be to fix the burgeoning cost of the email infrastructure and reduce the many technical faults and administrative problems replicated throughout the locally managed email systems in the company. To achieve the objective of a globally integrated email infrastructure, senior management signed a contract with an outsource company called Integra Consulting Associates (ICA). The following statement, by a senior IT director of the European division, points to the problem of duplication and a drive to achieve efficiency as a key factor behind the integrated email strategy.

*“The outsourcing of our email system represents a crucial opportunity for us to resolve problems of duplication of efforts caused by the many email systems that we maintain. It helps us to bring costs under control. You’ll be surprised, just how much it costs maintaining these different messaging systems”.*

### *Initial Impact of the Outsourcing Contract*

The project to outsource the email infrastructure to ICA was seen as a threat, not just by local email support team, but also by other IT staff and business users, some of who were receiving very customised email services. The outsource contract became the common enemy of the opposing local technology groups of World Markets. This new enemy enabled the former FP technicians to revive their previously rejected MS Exchange project. A member of the newly integrated FP Tech team explained the impact of the ICA’s outsourcing proposal.

*“The outsourcing contract with HP and ICA threatened a lot of jobs in the technology group. You must understand the structure of MS Exchange. It’s not just a simple email*

*application like CC Mail or Openmail; it's more like an information management system that stores all data, very similar to Lotus Notes with features that integrate well with the Internet. Although Exchange was being proposed as an email solution, we knew it could do more..."*

Aside from the ICA outsourcing contract, the second issue that supported the revival of the proposed development of the MS Exchange solution concerned the purchasing of computer hardware for the MS Exchange server. This problem was, oddly enough, resolved as a consequence of the decision to transfer FP email users over to CC Mail. As part of the preparation for this transfer, hardware for a CC Mail server was made available to the former FP Tech team by GT. Rather than using this hardware to configure a CC Mail system for the transfer of FP users, the FP technicians appropriated it to configure their proposed MS Exchange solution. The specification for the CC Mail server did not meet the exact requirements of the resource intensive MS Exchange solution. MS Exchange 5.5 required a significant amount of RAM and hard disk memory compared to CC Mail. Here the FP technicians made use of spare hardware from wherever possible to meet the minimum requirements for the MS Exchange solution.

The final jigsaw in completing this makeshift MS Exchange solution was a CC Mail connector. This software allowed a MS Exchange server to connect and communicate with CC Mail systems through a CC Mail server. The connector made the MS Exchange server appear to CC Mail systems as a native CC Mailserver. The use of this connector made it appear to the GT technicians that FP had developed a CC Mail solution, onto which they transferred their users.

Following the development of this MS Email solution within the former FP group, the FP technicians proceeded to tweak their solution to meet the customised needs of their user base beyond the capabilities of either the Open Mail or CC Mail email solutions. An example of this

customisation of MS Exchange involved the configuration of users' Personal Information Managers (PIM). Many of the users owned PIM devices, such like the Psion and Palm handheld personal organisers. They mostly used these devices to maintain details of business contacts and diary entries. These pocket computers were designed to integrate fully with the MS Outlook desktop organiser, which was the email client for the MS Exchange system. With MS Outlook on their desktops users could synchronise the information held on the PIM device with the MS Outlook on their PCs. This procedure also served as a useful backup in the event of loss or damage to the users PIM. The benefit of having MS Exchange as the email server connected to the Outlook client is that the two systems integrate to allow clients connected to the same Exchange hierarchy the ability to collaborate and share information from each other's diary and personal organisers.

Another key feature of the MS Exchange solution that found immediate success was the Public Folder. Public Folders provides a directory structure that Outlook clients connected to the MS Exchange server could use to share and access documents, providing they have the appropriate access rights.

### **5.3.1 Opposition to the Global Messaging Infrastructure**

The initial concerns of the local technology groups over the outsourcing contract was soon to develop into open opposition. At the turn of the millennium, ICA commenced with their plans to deploy their outsourced email solution throughout the World Market group. Immediately, ICA encountered a number of challenges. The first major problem appeared when ICA presented details of their outsourced messaging solution to the World Markets group. The manager of the CC Mail team in the Toronto headquarters of GT explains their reaction to this original proposal.

*“When ICA presented their proposal for mailbox standards to our senior managers it seemed like a good deal, but after we looked at the detail, it became clear that it would cost us a lot of money in the long term and we felt we could provide the same thing much cheaper in-house. I mean when we did the maths, the package was going to cost a lot more to give us the sort of service our users in World Markets needed.”*

Although ICA had been awarded the contract to manage the email infrastructure of all the business units in CIBC, they were unable to proceed with the integration of the World Markets email infrastructure due to the refusal of various business units within World Markets to accept the generic, standardised email service that they proposed. In the London office the local IT staff in GT worked hard to point out holes in the ICA proposal.

One of the biggest stumbling blocks was ICA’s agreed response times. Because the local IT support team in GT were situated onsite within the same area as business users, the general response times they could offer was much shorter than ICA’s, who proposed to provide technical support from an offsite data centre.

Another problem encountered by ICA concerned their proposed training plan for the World Market traders. Because the majority of users across World Markets global divisions were not familiar with the new MS Outlook client used to read emails on the new system, ICA proposed to provide the World Markets users with a self training package on CD ROM. Each email user would work through the CD in their own time to familiarise themselves with using the MS Outlook client. A senior member of the email team in GT Europe contemplated the likely outcome of this proposal.

*“Well you can imagine what would happen if you armed those traders with CDs. I could just see them playing Frisbee all day – just chucking the CDs across the trading floor at*



*each other. It became obvious to us that ICA really didn't appreciate the nature of the trading room environment. You really have to customise the service you provide to meet the needs of the users on a per user basis. Sure, you may find one or two users who would go for the CD method, but most of them just haven't got the time. They want someone from technical support to show them through every step of the way. Just look at how Bloomberg and Reuters do it. Whenever a new trader joins they send a personal trainer to sit with them and show them how to use the software. And this is the sort of thing we have to do whenever we want them to take on any new software."*

### **5.3.2 Resurgence of the London MS Exchange Solution**

Realising the difficulties facing ICA's generic solution, members of the local email support team within GT organised themselves into a team consisting of key technicians from the main regional centres of Toronto, New York, London and Singapore. Based mostly on the work of the former FP technicians, now part of the European GT division, this global team of local World Market technicians put together a proposal to counter ICA's email solution. An email technician from the London office described the motivation behind this effort.

*"...we also knew that we had the skills locally within London to run this project [MS Exchange email integration] internally. ICA submitted a very generic proposal to install MS Exchange, which only included the most basic email features in Exchange. Most of the features that we had in our local set-up weren't even mentioned in their report. When we queried this, it became clear that the bank would face more charges in the future to have these features added on. "*

The team of local email technicians used the Exchange email solution in the London office as a working example of how MS Exchange could be configured throughout World Markets. They were able to call on support from the email users on this small MS Exchange system based in the European division, who had been privileged with a highly customised email service.

From the time MS Exchange was first installed in the London office by the former members of FP Tech, these technicians had gained extensive experience customising the system to meet the needs of the former FP traders. When confronted with this system, ICA refused to customise the proposed solution to match this MS Exchange solution in the European division of World Markets. A member of the ICA project team is said to have made the following comment, when presented with the local MS Exchange solution developed in London.

*“Honestly, I don’t think we could replicate this set-up if we wanted to. ...It would take too much time and effort, it’s just not worth it.”*

### **5.3.3 Compromise over Global Email Solution**

After several months of delay, CIBC’s senior management and ICA reached a compromise with the global team of World Market technicians by accepting their proposal to manage the implementation and subsequent administration of MS Exchange within the World Markets business group. As in the case of the original proposed integrated global email solution, there would be one MS Exchange email system structure within CIBC, and all previous email systems would be dissolved and accommodated under this one integrated email structure. The compromise was that rather than one centralised management structure for this integrated solution, the World Market technology group would be allowed to manage its own set of MS Exchange servers within this globally integrated email structure.

This compromise meant that the goal of an integrated global email infrastructure serving all the different business groups of CIBC could be achieved, but not under the single, centralised management control centre of ICA, as originally planned. Instead, management of this integrated compromise would be shared between ICA and technicians in World Markets. The overall control of the global email hierarchy would be owned and maintained by the ICA team of technicians. However, a subunit within the email structure would be created for the World Markets group. This sub-hierarchy would be administered (technically) and controlled by the internal World Markets team. Each of the regional divisions of World Markets would have their own sub-tree, which they would manage to meet the needs of their local email users.

### *Localised Email Management Standards*

The globally organised team of local email technicians from the World Markets group proceeded with the rollout of MS Exchange into their business unit. The strategy they chose was to allow each region in World Markets to choose exactly what standard they would use for mailbox sizes and other email administration procedures. This loosely organised email management approach followed the general practice of technology management between the regional divisions of World Markets. This strategy of open standards was necessary to allow the different regional divisions of World Market the freedom to organise in order to meet the needs of their local business users, as they were accustomed to in the old email infrastructure.

In the North American division of New York, with the largest number of World Markets users, the local team of technologists chose to set fixed mailbox sizes for users of the new MS Exchange system, in consistency with their previous CC Mail practices. The Asian offices (Singapore, Tokyo and Sydney) and the Canadian division of GT (in Toronto) followed similar procedures, with fixed mailbox sizes for users of the new MS Exchange system. This practice of fixed mailbox sizes was fixed throughout mostly all the World Markets regions as was originally proposed by ICA. This

was possible because the local email administrators had maintained similar strict limitations on the size of users mailboxes.

### *Maintaining FP's Email Management Practices*

In the European division of London, however, there were two separate practices; the one of unlimited mailbox sizes inherited from the former past email administration procedures of the former FP email technicians; the other being the fixed mailbox sizes offered to majority of London users on the CC Mailsystem. Rather than following the practices of the majority (600 CC Mail) email users in London and email users of all other divisions of the bank, the email technicians in London chose to extend the practice of unlimited mail box sizes to all their 800 users.

The limitation on users' mailbox sizes is a generally accepted email administration procedure. It serves as protection against inflation of the email *message store* (the aggregate of all user mail boxes on a mail server or post-office) beyond the limit of the maximum capacity of the email system. By setting a maximum limit for all mailboxes, the email administrator is assured that the email systems will not permit this limit to be breached. This procedure therefore, protects against possible damage that may occur to the email systems should the (manufacturers recommended) maximum size for the message store be exceeded. The decision by the London technicians to maintain unlimited mailboxes was a continuation of the email administration policy of not imposing any limitations over users mailbox size.

Before restructuring, only FP users in the London division had unlimited mailbox sizes. When the FP division was dismantled, the CEO of FP in the European World Markets division was appointed as head of the entire European business group. As the former head of the FP division, the CEO of the European group was accustomed to unlimited size restrictions on email. In fact, this CEO was one of the heaviest users of email, possessing the largest mailbox. With this powerful actor

supporting them, the former technicians of FP, who were firmly committed to customising technology to meet the needs of their business users, became influential actors, not only within the European Email infrastructure, but also within the greater IT infrastructure of World Markets. Remember, it was these technicians who had pioneered the initial local MS Exchange 5.5 system in the European division.

Now these influential technicians were insisting that, in order to maintain one standard email service for all email users within the European division, unlimited mailbox sizes be extended to every European email user on MS Exchange. This requirement won the overwhelming support of all business users of email within Europe, many of whom had been frustrated by strict mail box size restrictions imposed historically through the GT CC Mailsystem. A member of the email team explained that it was easy to maintain unlimited email box sizes within London because of the small user base of less than 1000 users.

### *The Outcome of MS Exchange Implementation*

The first region of GT to deploy MS Exchange within the technical hierarchy of ICA proposed structure was the European division. They successfully completed the rollout within six weeks of initiation, with a team of four IT staff within the London office. This was shortly followed by the rollout of the integrated MS Exchange solution throughout all other divisions of the World Markets business group. Much of the knowledge and expertise gained in the London division was shared with other divisions. For instance, the person who provided the training for the traders in the London office was transferred over to the New York office to train users in that office. During this period of implementation there was close cooperation, not just between the regional IT support teams of World Markets, but also between the regional support teams and the ICA email design support team.

The outcome of the implementation of the integrated email strategy following the completion of the rollout within the World Markets group was a single, globally integrated email hierarchy, under the management structure of ICA's offsite data centre. Additionally, the integrated email hierarchy included subsections for each regional division of World Markets, to accommodate the decentralised email structure of the World Markets business.

## 5.4 THE EASTER BANK HOLIDAY EMAIL DISASTER

Within the London office of the European division, the new integrated email solution operated in a fairly stable manner, following the period of implementation. This was until the Easter bank holiday period of 2001, when the London office experienced its first major breakdown with the new MS Exchange messaging infrastructure.

Every Easter bank holiday the building managers in the London office carry out a test on the power generator by turning off power to the building. During this weekend, all computer systems are turned off until the completion of the test. Following the power down the email technicians proceeded to initiate the server on the Monday of the bank holiday. The server failed to start on this occasion, following several attempts. The next day, when the London and New York markets opened for business, this fault remained unresolved as Colin, aided by other members of the local email support team, struggled to resurrect the dead server.

The initial atmosphere of calm on the trading floor, which often follows the long weekend of a bank holiday, was soon replaced by panic, frustration and anger amongst the business users as they began to realise the full extent of the disaster. A member of the email support team described the situation as follows.

*“Well I’ve never been in a situation where people have been using their Hotmail accounts. People that didn’t appreciate the importance of email were basically dragged firmly into the 21<sup>st</sup> century... without a shadow of doubt! People [business users] were screaming. We set a temporary server up and we created new accounts for people temporarily, because there were certain people who couldn’t do without it....”*

### **5.4.1 Causes of the Email Disaster**

As was explained to me later, the email server failed to reboot (start-up) properly because of a fault with the Information Store. The Information Store is a database in the MS Exchange application that stores email messages. Further investigation revealed that this database had grown to about 70gb in size. This size exceeded the manufacturers’ recommended maximum size of around 35gb. Apparently, the manufacturers’ documentation warned of unpredictable consequences should the size of the MS Exchange Information Store grow beyond 50gb. For the European email server, the consequence was that, following the shutdown, when trying to start-up the MS Exchange server could not read the overgrown Information Store database file. Not being able to access this file, which remains pivotal to the operation of MS Exchange, the server was therefore unable to complete start-up process, resulting in the subsequent breakdown of the London email server.

Neil Brewster, a member of the London email team, who was also responsible for maintaining the UK CC Mail for GT before the MS Exchange email integration project, identified what he believed to be some of the reasons behind the email server crash.

*“We [the local email team in London] had done the MS Exchange rollout incredibly cheaply. We used existing servers, we bought a bigger hard disk and some memory for it, and that was it. We had taken an existing box with absolute minimal spend we got the*

*Exchange system in London, and we weren't allowed to spend any money on it. So it had grown from being this 5½gb system, and it had grown and grown and grown.*

*The other thing is [that] on the CC Mail we used to run very strict maintenance, which is the other thing Colin and me still argue about... on Exchange we don't run it. [With] CC Mail we used to have maintenance so that would run ... if there was a message over 100k, it would delete it after five days... Any message in the entire system over 180 days was automatically deleted. Anything in the Inbox was deleted after 90 days...we were very strict. On Exchange we don't have anything. In London we have no restrictions: we have no restrictions administration procedures on the size of the mail you can send and we have no restrictions on the size of the mail you can receive, even via the Internet. Although you can't send anything beyond 4m internally outside London, because of the mail restrictions [imposed by the email team in the other global regions CIBC World Markets]. The problems was that our system just grew [...until the Easter bank holiday when] we had the power down and the systems wouldn't come back up."*

According to this explanation, the unusually large size of the Information Store database resulted from the practice of providing unlimited mailbox storage capacity to all email clients in the London MS Exchange server of the European division.

#### **5.4.2 Automated Disaster Recovery**

When the MS Exchange server detected some form of corruption to the Information Store database file, it automatically initiated an automated process to recover this file. Colin and the other members of the London email support team observed the progress of this automated process for a number of hours before losing patience and opting for a different course of action. They found that the manufacturer (Microsoft) could not confirm how long it would take to complete the automated



recovery process. Because of the large size of the Information Store database file, there was no way to determine when the automatic recovery process would end. Furthermore, Microsoft's representatives could not guarantee that the automated recovery programme would be successful in restoring the corrupted database file once completed.

After several hours of monitoring the progress of the automated recovery process, the members of the London email team agreed the process was taking too long. Without any guarantee of success from Microsoft, they decided to abandon the automatic recovery process in favour of the alternative DS/IS recovery process that they believed to be faster.

### **5.4.3 Alternative (DS/IS) Recovery Process**

The DS/IS recovery process involves replacing the failed server with a new MS Exchange server. The DS/IS recovery application could then be used to alter the identification and access rights of the new server in such a way as to reflect the old (failed) server within the global MS Exchange infrastructure. Once the DS/IS application was executed on the new MS Exchange server, this server would then function as the failed server (prior to the disaster). The drawback with this solution is that users' email messages would only be restored as far as the last full backup of the old email server.

Three weeks before this disaster, the London email technicians had made a full backup of the failed email server onto a backup email server located in their offsite business recovery centre (BRC) and then run the DS/IS application on the backup server to replace to failed server. They decided to swap the failed email server with this backup email server from their offsite BRC. Because the backup email server at the BRC site was updated only three weeks before the crash the email service could be recovered fully, except for emails generated within the three weeks between the

last full backup and the bank holiday disaster. The plan was that once this temporary backup solution was put in place, the local email team could then turn their attention to recovering the missing emails from the failed email server.

### *Rejecting Manufacturers Recommendations*

This idea was agreed with Global Enterprise Management (GEM) email team (based in Toronto). However, this was not the recommendation of the manufacturer Microsoft, and their team of experts, whose advice was to wait for restoration of the Information Store database to be completed. The London technicians chose to ignore this recommendation, because they felt it did not support their priorities, which was to recover email services to the London office as soon as possible. However, because of the large size of the corrupted Information Store, there was no way to determine when the restore process would be completed. And even if this were possible, there was a strong possibility that the database would be inoperable after the completion of the automated recovery process. Based on this reasoning, the local email technicians decided to take matters into their own hands proceed with alternative DS/IS recovery process.

Having decided on this solution, the technicians informed email users of the implications of the problems and the proposed solution. They then transferred the backup email server from the BRC site to the main office, and proceeded to configure it in preparation for the switch with the failed server.

Until this point of the recovery efforts the impact of the disaster and the activities of the London email technicians had been limited to the London MS Exchange site. Other CIBC divisions were only affected in that they could not communicate with London through email. This was until the London technicians initiated the DS/IS recovery process.

#### 5.4.4 Disaster Escalation: The Consequence of Recovery

When the local London email team ran the DS/IS recovery software, it resulted in the replacement server being registered into the global MS Exchange infrastructure with the ID of the failed, decommissioned London server, which was what they had intended. This meant that email users in the European division could now send and receive emails.

The London email disaster was partially recovered, with the exception of email delivered three weeks prior to the disaster. Locally, within the London office the DS/IS was seen as a successful, major step towards full recovery. Globally, however, this action of the London email support team was viewed less positively because of the unintended, negative consequence of the DS/IS recovery procedure, which had implication on the operations of other parts of the global MS Exchange infrastructure.

##### *Public Folders Corruption*

The negative consequences of the DS/IS recovery process appeared through problems in the email transmission and public folders. The public folder is a component of MS Exchange that enables email users to share files and collaborate over the email system. The public folders feature of MS Exchange works in a similar way as the Inbox folder of an email user's mailbox. The fundamental difference is that a public folder is shared between two or more email users, whereas the folders in a user's mailbox is normally only accessed by an individual user. In the London office, the public folder feature of MS Exchange was not considered an important feature. No practical use had yet been found for the public folders feature amongst the email users in London. This neglect of the public folders feature reflected the approach of the other global divisions of the World Market investment bank who also made very little use of. This situation, however, was very different from

that of CIBC, the retail bank, where a number of business groups were heavily dependent on business process designed around the MS Exchange public folders.

The DS/IS utility used by the London technicians to configure the backup server to take on the role of the old London email server came with the following warning, buried deep, within the manufacturer's technical support documentation:

*“The DS/IS consistency adjuster is run to re-create the directory objects for the mailboxes and for the public folders that are in the store and not in the directory. This process also resets the **Home-MDB** attribute on all public folders in the hierarchy that are homed on unknown sites or servers. In addition, the process also strips the public folder Access Control Lists (ACLs) of any invalid entries (that is, users who do not exist in the current directory). Servers and sites are ‘unknown’ and invalid entries when replication has not completed to the server that the DS/IS consistency adjuster was run on or when a replication connection connector to another site has been removed.”*

(Microsoft documentation in email from Toronto GEM member to Colin in London, 2001).

### *Implication of Public Folder Corruption*

When the London email technicians ran the DS/IS consistency checker, this software corrupted the public folders by transferring ownership of all public folders with the access rights set to the default installation option. The access rights on most public folders within the global Exchange infrastructure were set to the default option. Consequently, most of the public folders in the global email infrastructure were assigned to the new London email server. The consequence of this was that the original owners and users of the public folders in the global email infrastructure were no longer able to access their public folders. The implication of the public folders corruption and other

negative consequences of the DS/IS recovery process were described to me by the manager for World Markets on my visit to Toronto.

*“I can’t recall exactly what the incidence was but what happened was that, lets say for instance you are in Telephone Banking [which is one of the non trading groups within CIBC] and you own a public folder called My Phones [... the software utility used to restore the email server] changed the ownership of that public folder to EU01 [the ID of the European email server]. So it’s telling Telephone Banking, ‘you have no rights to this, you can’t get in this folder’. So [to get over this problem], you have to wait and let every message inside that folder replicate, and then change the permission on your side’s access to a public folder [EU01] to say ‘hey, it’s not my folder’ and allow somebody else to take ownership. ...And that’s what the thing was that replication had to happen over the WAN ... it had to go over, comeback fully (and there is 8,000 items) so that they could be reassigned. There was a utility I think that he [the London email administrator] ran..., and he actually ran it on the full [global MS Exchange] database including the public folders and that’s what changed the permissions.”*

The problem with the public folder resulted in the London email site owning all the public folders throughout the global MS Exchange infrastructure, which impacted on all separated business organisations within CIBC, now sharing the integrated global messaging platform.

### *Further Consequences: Message Replication and Network Problems*

As suggested in the above explanation, the DS/IS recovery process caused further problems, not only to the public folders, but also to the Wide Area Network (WAN) over which the global MS Exchange email infrastructure operates. The use of the DS/IS recovery application generated a very large amount of network traffic through the MS Exchange replication service. The replication

service is used by MS Exchange to transmit systems related messages between the regional MS Exchange servers. This service is needed to synchronise the global MS Exchange email service. The additional activity in the replication service resulting from the introduction of a replacement server into the MS Exchange infrastructure was explained to me thus, by Sparky, a member of the London email support team.

Sparky: *“Because of the way Exchange works you... you have global replication going on. And when we lost our box... There are loads of different parts of it because you’ve got the routing table, which tells it where to send the emails. So basically it calculates all the routing tables, so that, if there’s a CIBC.CO.UK address, it knows to send it straight across to the London ‘bridgehead’ server, and that’s it, dealt with! But when you sort of start changing the infrastructure, those routing tables have to start being recalculated.*

Daniel: *And when you say “start changing the infrastructure”, what do you mean?*

Sparky: *Like bringing server boxes down, renaming them and all the rest of it. Recreating connectors is what sends the email across the WAN and...*

Daniel: *So does it give the connector a new ID or?*

Sparky: *I think it does. I think once you delete a connector and recreate it, it has to do a whole recalculation.*

Daniel: *So it’s not like the older email systems...*

Sparky: *No. It’s a lot more intelligent. You know, it’s all sort of automated stuff. [Sparky returns to his description of the replication activities] And then, obviously you have the situation with the directory replication.... Because we were putting like, six hundred entries back into the directory (with about 600 user mailboxes on the London server), having to replicate all of that as well around the world... I think the email just got totally screwed and just didn’t know where to send anything ...*

### *Resolution of Global Email Problems*

The problems arising from the replication service following the initiation of the DS/IS recovery procedure increased email traffic over the WAN to the point where the global email infrastructure was no longer able to transmit message between email sites across the WAN. When the London email technicians learned of the problems that their chosen recovery procedure had caused, they immediately turned their attention to resolve them. The problem with excess email traffic over the WAN was addressed by switching replication from automatic to manual, which allowed them to manually control when replication messages were transmitted over the WAN. This process halted the automatic generation of replication traffic, which was causing a slow down in the transmission of email messages across the WAN. In the following statement, Sparky explained the process used by the London email team to resolve the problem with the corrupted public folders.

*“Me and another email technician looked through a whole lot of TechNet papers and sussed out a way to re-home the folders... By this time Guernsey had Exchange as well. We had been out to Guernsey and put Exchange in, and the problem affected them as well... And we tested it with them, and it went back perfectly and there were no errors. And the next day we had a conference call with ICA and the [World Markets] Canada mail administrators and the New York mail administrators.”*

Following the agreement between all the main global email teams on the conference call, the London email team proceeded to re-home correctly all the public folders that they had incorrectly taken control over. However, this procedure also had a further negative side-effect, which was to slow down the speed of message transmission between email sites of the global messaging infrastructure. The manger of the Toronto email team continues her description of these negative consequences.

*“...The [email] system was dying a slow death because it was replicating so much information and... It’s basically snail’s pace message flow... It slowed down all of London and our communication to London, so when we were trying to get to London, to send messages, it was taking forever.”*

Eventually, after methodically reassigning the correct permissions to the public folders and patiently waiting for replication to occur throughout all the sites in the global messaging infrastructure, operation of the email system settled back to normal.

The final procedure in the resolution of the European email failure involved the restoration of all users’ emails created three weeks before the server crashed. These emails were still held in the Information Store database of the main email server based in the London office, which originally failed. The local email team did this by recovering the failed email server. Then, by using personal Information Store (PST) files, they exported the missing emails from the failed server and imported them into the Information Store of the replacement server.

#### **5.4.5 New Email Maintenance Practices**

One week after the original crash, the email system was restored to full working order within all regions. The members of the local European email team turned their attention towards developing their site into a far more robust email system. The outcome of these efforts are that in the event of a failure, similar to that of the Easter bank holiday, they can recover to the fully functioning backup solution with only the loss of few hours worth of email.



## *Exchange Archiving Solution*

One of the major problems facing the London email team that contributed mostly to the bank holiday email disaster was the support for unlimited mailbox storage capacity for all users. This solution still allows them to support unlimited mailbox size for all their email clients, a service which none of the other regional email teams are yet able to provide. To achieve this the London email technicians implemented a software application called Exchange Archiving Solution (EAS). This software application works by compressing and archiving old emails and file attachments. The EAS application is able to retrieve the archived information rapidly and seamlessly when activated by the user. A member of the European email team involved in the development of this solution made the following comments on this work and the motivation behind this effort.

*“Me and Jackie had to work very hard to put in the Exchange Archive Solution. Even the company we bought it from was surprised how fast we managed to roll it out. We were working to about ten, eleven PM every weekday for about two months. Then going home and logging in through terminal server at around one or two am to check the every thing was running ok, only to be back in the office at 10am the next day... The thing that kept us going is... we new that after the Easter crash, we couldn't risk another problem like that. As long as we had users on unlimited mailbox sizes, there was always a risk of that happening again. That is until we fully rolled out EAS to all our users, which cut down the size of the Exchange Information Store by more than half to just over 30Gb.”*

## 5.5 GLOBAL WINDOWS 2000 INFRASTRUCTURE

This next case tells the story of the network operating systems (NOS) and the development of the Global Win2k project. From the perspective of our study, this project was very much a continuation of the Global MS Exchange Project. In terms of time, it overlaps with the Global Exchange project because its roots can be traced back to the restructuring program.

The outcome of the 1999 restructuring program was to bring the two technology groups in the London office together, by dissolving the smaller FP team into the bigger and more established department of GT. Despite the fact the two groups were now organised as one IT department, the duties and responsibilities remained unchanged for most members of the IT team on either side.

### 5.5.1 Hidden Agendas and the GT Desktop Project

One of the first projects on which the former members of FP Tech collaborated, with the support technicians of GT, involved the development of a desktop standard, similar to the LD build that had been in use in FP for many years.

The new IT director of the restructured London IT groups claimed openly that apart from other benefits, this project would help to get the members of the former FP Tech IT support team working closely with their counterparts in GT as members of one IT support group. Colin and other members that formed the new IT infrastructure support team appeared fairly interested in this opportunity at the time. However, I recall at the time, a software developer who was soon to leave the bank, commenting that this project had a hidden aim. He claimed that the GT Desktop Standards project was deliberately sanctioned by the senior management in the European division, as a way of keeping key members of the IT infrastructure support team from being distracted by the

consequence of the ongoing restructuring project and (what he saw as) the likelihood of redundancy.

Again, as with the MS Exchange email project, Colin became a central figure in the global Windows 2000 (Win2k) project. He worked closely with a senior member of the GT PC support team to develop a standard desktop and automated installation process for all business areas in the London office. The standard desktop build that they developed was based on the newly released Windows 2000 network operating system, which was Microsoft's replacement for the Windows NT network operating system (NOS).

The advantages of this project was that it would introduce a standardised PC build throughout all areas of the London office, therefore enabling the benefits of reduced support costs amongst other things, to be achieved by GT. The focus of this project was not to upgrade all or any of the PCs in the London office by any particular period, but to develop a standardised desktop build for all PCs in the London office. This PC build, although similar to that of the former FP Tech group, would be based on the suite of applications used by business user groups formally supported by GT prior to restructuring. The build would be gradually phased in by installing it onto any new PCs being replaced following the completion of the project.

Despite the fact that the proposed GT desktop build was based on the newly released Windows 2000 NOS, it did not use any of the key features of Windows 2000; namely the Active Directory (AD) component. Nevertheless, this project introduced the members of the now restructured PC IT infrastructure team in the London office to Windows 2000 and also to the capabilities of AD. Windows 2000 Active Directory (AD) represented Microsoft's entry into the directory services market. The following quote provides a useful overview:

Windows 2000 Active Directory [...] provides administrators with the ability to manage enterprise-wide network objects efficiently from a central location. Information about users and groups, computers and printers, applications and files – once specified in Active Directory – is available for use throughout the network. The structure of the information matches the structure of your organisation, and your users can query Active Directory to find the location of a printer or the email address of a colleague. (Lowe-Norris, 2000:p3)

Active Directory followed the same structured, hierarchical naming principles as the Internet's DNS (Domain Naming Service). This meant that Win2k integrated fully with the established Internet naming service.

### **5.5.2 London Active Directory Desktop Standards Project**

This initial project to develop a standardised desktop build for the GT IT group based in London was completed in November 2000. After its completion, there existed two main desktop standards in the London office: the old LD builds used by FP, and the new GT build used by GT. Immediately after the completion of this project, the members of the London PC IT infrastructure support team that worked on this project began work on the next version of the standard PC desktop build. The new standard PC build would cover about six hundred users based in the London office. This new standard PC build, however, would be the first to unite different applications from all areas of the bank's PC user groups based in the London office. Furthermore, it would make use of the Active Directory component of the Windows 2000 NOS.

#### *Selection of Active Directory: Single Forest vs. Multiple Forest*

The primary object in any Windows 2000 AD architecture is the forest, from which all other objects are created. Therefore, each forest in a Windows 2000 infrastructure represents a hierarchy of equal

status to all other forests. Any corruption to a single forest is restricted to that forest only, and to all the resources within that forest. Each Windows 2000 forest is independent from all other forests. Although two separate forests can be integrated for the purpose of sharing resources, this can only be achieved on a collaborative basis in which the technical administration groups of each forest decide to connect and share their resources. However, in a single forest scenario, all the Windows 2000 based resources are organised under the hierarchy of one forest. The highest authority in the Windows 2000 forest is the team with ownership over the forest.

### *Colin the Linchpin and the Friction with the Novell Support Team*

Colin, who had worked very closely with the PC desktop support team of GT on the standard desktop build had by this time began to emerge as the leader of the London PC support, or WINTEL (Windows and Intel platform computers) team. So much so, at one point of my fieldwork, he jokingly described himself to me as “the linchpin” in the European infrastructure support team in the presence of the European WM IT Director shortly after the completion of the global MS Exchange project. I noted that Colin’s joke was very well received by the IT director who appeared very supportive of the work being carried out by the team of senior technicians that seemed to be forming around Colin, following the integration of FP into GT. Consequently, Colin’s team was given the go-ahead to start working on a more formal proposal for the UK IT infrastructure support group.

The structured design of the AD architecture, based on the Internet DNS architecture, required that some form of organisation-wide AD hierarchy be put in place similar to, and based around the existing DNS namespace scheme.

The GT division already had in place a fully implemented AD architecture based on the Novell Netware network operating system (NOS). In the process of developing this proposal, Colin began

communicating with members of the Novell Netware support team based in Toronto on behalf of the London technology team, about the proposal to develop a global Windows 2000 AD architecture. From these discussions, a dispute occurred between the Novell support and the UK WINTEL technicians led by Colin. This dispute escalated to involving some IT directors in the London and Toronto offices. The dispute centred on the necessity for a Windows 2000 Active Directory architecture. The members of the Novell support team argued that there was no need to establish a Windows 2000 AD architecture since it would only duplicate the existing Novell AD architecture. They argued instead that the infrastructure of the proposed Windows 2000 should be based on, and connected to the existing Novell AD architecture that they supported. However, Colin and the other members of the PC network support team, who opposed this view, argued that Windows was such an extensive system that it should have its own independent AD architecture within the World Market group.

In a series of emails between Colin and various senior technicians in the Novell network support team, Colin argued that MS Windows based systems represented the largest installed base of client computers in the World Markets network. Furthermore, for the World Markets group to achieve the greatest benefit from the installed base of Windows clients, they would need to have in place a fully developed Windows-based AD architecture. These discussions over email continued for about one month.

### **5.5.3 Emergence of the Global CIBC WM AD Project**

The case for a separate Windows based AD architecture rapidly gained momentum, with senior technician from other division of the World Market group joining in the discussions on the side of the London WINTEL team. Eventually, senior IT directors in World Markets agreed to establish a team of technicians to evaluate the value of developing a Windows based AD architecture within

CIBC WM. The team consisted mostly of the senior infrastructure technicians from across the different global divisions of the World Markets group, which became known as the Win2k AD project team.

Initially the Win2k AD team was made up of Angelo from New York, Terry Alstrom in Toronto, and Paul Lee in Asia and Colin in London. These were the same group of senior technicians that formed the World Markets representatives in the MS Exchange 5.5 project. These senior members of the newly restructured World Markets IT infrastructure development team would go on to emerge as the project leaders in their respective local regions. The exception was Terry Alstrom, who emerged as the overall project leader for the global group. The regional leaders each took the responsibility of organising technicians in their local regions that would participate in the project.

The team of senior WINTEL (Windows and Intel platform computers) technicians began to communicate irregularly over email and telephone at first. This led to the establishment of weekly conference calls in which the different members would telephone into a conference system at a set time. In January 2001 this weekly meeting became fixed, along with the members and the main topics of discussion. The meetings became known as the Global Windows 2000 AD meeting or Win2k AD.

#### **5.5.4 Multiple vs. Single Forest AD Models**

One of the first issues to which this project team turned their attention was the design of the Active Directory infrastructure. The most important consideration here was the choice between a multiple and single forest Active Directory architecture. The official Microsoft literature on Windows 2000 provides the following recommendations on choosing between these two Active Directory forest models.

When you begin to plan your forest model, start with a single forest. A single forest is sufficient in many situations; however, if you decide to create additional forest, ensure that you have valid, technical justification [...] A single forest environment is simple to create and maintain. All users see a single directory through the global catalogue, and do not need to be aware of any directory structure. When adding a new domain to the forest, no additional trust configuration is required. Configuration changes only need to be applied once to affect all domains. [...] If administration of your network is distributed among many autonomous divisions, it might be necessary to create more than one forest. Because forests have shared elements, such as schema, it is necessary for all the participants in a forest to agree on the content and administration of those shared elements. Organizations such as partnerships and conglomerates might not have a central body that can drive this process. In short-lived organisations like joint ventures, it might not be realistic to expect administrators from each organization to collaborate on forest administration. (Microsoft, 2000: p263)

### *CIBC World Markets' Preference for Multiple Forest AD Model*

All the members of the new global Win2k AD project team at this early stage of the project were unanimous in the belief that the World Markets group should maintain full administrative and management rights over its own independent Active Directory forest. Because of the different business groups that formed CIBC, some of which were larger than the World Markets, the only Active Directory model that would allow the World Market group to maintain control over its own Windows 2000 Active Directory forest was the multiple forest model. This option would allow the different business groups CIBC control over their own Windows Active Directory forest, all of which would combine together to form the multiple forest of the model within the CIBC group.



### *GEM Windows 2000 Single Forest*

It was during this period, when considering the Active Directory architecture for the World Markets business group, that members of the Win2k AD team learned of an existing project to develop a Windows 2000 Active Directory infrastructure within the retail banking (Big Bank) business of CIBC. The IT group within the retail bank responsible for this existing AD project was the Global Enterprise Management (GEM) group. This department was established by the bank's senior management within the retail bank to manage corporate-wide IT services throughout CIBC. The GEM team drew on the services of ICA (the outsourcing contractor) for much of the technology services they managed. ICA was the outsource contractor responsible for the development of the global MS Exchange 5.5 email infrastructure.

The GEM group were in the process of developing a Windows Active Directory infrastructure. Their AD model, which was intended to cover the whole of CIBC, was based on a single forest architecture. GEM was, at this point, midway through the process of implementing this single forest model throughout all the bank's retail branches in Canada. This single forest AD model clearly conflicted with the multiple forest model of the World Market team. The problem that arose was that the bank could either support a single forest or a multiple forest AD model, but not both, which could not be accommodated under Windows 2000. When the World Market team learned of the proposal by GEM to impose a single forest model throughout the entire CIBC group, they objected to the idea that the World Market group should join as a small part of the overall single forest.

#### **5.5.5 Canada Roundtable Meeting**

The conflict between the World Market proposal and GEM soon reached senior IT executives from both the retail bank and World Market investment banking businesses. To overcome the impasse the senior executives proposed a global meeting between the representatives of the GT and GEM in

order for them to come to some agreed strategy over the Windows AD. This meeting became known as the Canada Roundtable meeting.

This meeting was mostly viewed by the World Markets GT Win2k AD team as an effort to persuade them to join the single forest AD infrastructure of the retail bank as a subordinate division. The implication of this option was that the IT technicians in the World Markets group would have to relinquish administrative responsibility of the highest level of the Windows 2000 Active Directory forest, and pass it over to the GEM email support team of the retail bank.

The Canada roundtable meeting was held in June 2001. By the time of this meeting, the members of the World Market's Win2k AD team had developed a considerable case for the development of an independent Windows 2000 Active Directory infrastructure. GEM, on the other hand, had made considerable inroads in their implementation of their Windows 2000 Active Directory (AD) infrastructure based on the single forest model.

The Canada roundtable meeting took place over two days. Representatives from the outsource provider (ICA) presented the case for the retail banking group. The meeting was conducted in the presence of technical consultants from Microsoft, who had been brought in by the outsourcing contractor. The atmosphere of these meeting appeared very tense. Each team gave presentations of their IT infrastructure, their plans for the proposed use of Windows 2000 Active Directory and their details of their progress. The objective was that, following these meetings, agreement would be reached between the two groups over some form of coordinated Windows AD strategy going forward.

The discrepancy between the choices of the Active Directory model of the two technology groups became the primary focus of this meeting. The World Markets team was based on a multiple forest

design. In this design, the World Markets team would develop and maintain full management authority over an independent Active Directory forest, which they would own. The design of the retail bank team was based on a single forest model, which GEM owned and managed on behalf of all other groups in CIBC. The World Markets business would occupy a subsection within this single forest model. According to this design, all management and administrative authority over the forest would be placed under the control of the GEM, in the retail bank. Other CIBC businesses such as the World Markets group would be given full administrative privileges over their subsection of this Active Directory forest. However, these privileges would be subject to the control of GEM, on behalf of the retail bank, who would own ownership over entire Windows 2000 AD single forest.

As was to be expected, a significant part of the Canada roundtable meeting, was taken up by arguments between representatives of the two technology teams over which AD model was appropriate for CIBC, between the single forest and multiple forest. The following dialogue from the meeting depicts a heated exchange in which the World Market team challenged the Enterprise Management team on their risk management strategy for their proposed single forest AD model. The following excerpt from the meeting shows the members of the World Market team focus their query on the floors in the single forest AD model and the risk of dangers propagating throughout the single forest.

Colin (WM) *Well, I thought... are you going to touch on things like risks because for example, within our labs, there are just a few things we've come across, like for example an authoritative restore – and there is a lot of warnings about how it could potentially – depending on how it's done, if a server is brought offline and how it is plugged in etc... it could end up polluting your whole forest. In my Financial Products [FP] days under NIS+, when we first implemented that, we saw something where emm... a knock on effect rippled through and took all of us out. So of course we would be concerned that something could ripple through and that could affect the whole forest. Now here we have one of our other major concerns.*

Rep1 (GEM) *Yes, and it's a legitimate concern and we talked about that actually. And we really want to actually limit that through the security and access groups and all that... emm... The only people in our environment that will really be able to, in our environment, be able to create domain controllers and do restores and stuff like that will be the ICA ...*

Mike (WM) *.. Hugh, do you honestly think that there will not be any domain corruptions.. I mean like, World Markets is not (quote on quote) the only black sheep in the town right. You see, Colin's question, is not so much a World Markets question as a design philosophy [{"Right, yep"}]. You know there's some strings to ... the homogeneous right. But then diversity gives you some other benefits: like you don't take everyone out right...*

### *References to the Easter Bank Holiday Email Disaster*

Convinced of the validity of their argument, and what in their view represents an obvious design flaw, the members of the World Market team focus their attack on the dangerous consequences of a single forest model for the entire organisation in the event of a global disaster. In the following dialogue Colin refers to recent experience with the London MS Exchange Bank Holiday email disaster.

Colin (WM) *I think it's more em... unpredictable things happening, like em... described, AD, as the [MS] Exchange on steroids, how under disaster recovery situations – I've already, you know, had a really bad experience of unpredictable behaviour [with MS Exchange] so, if you multiply that by 100 with AD and Microsoft say look, you know, we're aware thing could go wrong under these conditions etc – there's a lot of unknowns there, and if it's the entire enterprise then ... Well think about authoritative restores etc...*

Rep2 (ICA) *If you have the ability to do authoritative restore on objects that exist outside your tree and you do it without understanding the implication then yes you will get yourself into trouble ... Ja.. just ...IF YOU DO WRONG THINGS BAD THINGS*

*HAPPEN so... The design is to make sure that one you have a thing to stop you to do the really bad things. Some of the really bad things you can't do [{"right"}] ermm.. so that you have a single point that you can finger at and some one is responsible, and that they are going to do it in controlled time, erm... you have that issue regardless of your own forest or whether it's a single forest or not.*

### **5.5.6 Outcome of Canada Round Table Meeting**

Despite the best arguments of the World Market (WM) team against the single forest, representatives from the Global Enterprise Management (GEM) team and ICA maintained that the benefits of the single forest outweighed the multiple forest. At the end of the two-day meeting representatives of the two technology groups remained firmly entrenched in the belief that their choice of Active Directory design was the best model for the bank.

The agreement was reached that the World Markets Win2k AD project team should undertake a detailed evaluation of both the single forest and multiple forest Active Directory models and submit their findings to the senior IT executives of the World Markets group. The senior executives would then make the decision to either join the GEM single forest AD architecture of the retail bank, or develop a separate AD forest for the World Markets investment banking business, which would result in a multiple forest model. It was also agreed that a technical representative of the retail bank would join in the Win2k AD project team, who could represent the interests of the retail bank. Finally, a budget would be made available for a senior technical consultant from Microsoft who would support the Win2k AD team and guide them through the evaluation process. Following the selection of a suitable Active Directory (AD) design model, this consultant would continue to support the project team through with its development within World Market, up to the implementation stage.

Following the Canada round table meeting, the Win2k AD project team commenced with their weekly meeting, this time with the addition of Hugh Clark. Hugh was the senior technician with the Enterprise Management team of the retail bank, which the members of the global meeting had agreed would join the Win2k AD project team to help facilitate corporation between the two technology groups. A few weeks after, Simon Gladstone, a senior technical consultant from Microsoft, who specialised in Windows 2000 Active Directory deployment, also joined the project team. Prior to joining the Win2k AD project, Gladstone was working with the retail banking division of CIBC. There, he coordinated the design development of the Windows Active Directory infrastructure based on the single forest model. This project was now well into the implementation stage, which was the point when Gladstone completed his work.

#### *World Market Evaluation of AD Forest Models*

Once Gladstone joined the Win2k AD project, the team began work on evaluating the benefits and downside of adopting a single forest or multiple forest scenarios. Prior to Gladstone's arrival, each of the regional leaders in the Win2k AD project (for Europe, New York, Canada and Asia), had produced various documents on their local PC and NOS infrastructure. Gladstone collated this information, along with arguments from each regional representative on the implications of a single forest or multiple forest architecture for each region. He then compiled a form of feasibility report laying out the pros and cons of both the single forest and multiple forest scenarios for the World Markets business group. Gladstone completed the evaluation report within one month and presented his initial findings to the World Markets Win2k AD project members for their comments before finalising for submission to senior World Market IT executives.

### **5.5.7 Findings of World Market AD Forest Evaluation**

Gladstone's report stopped short of recommending which of the two Windows 2000 AD models would best suit the World Market business. Instead Gladstone concluded that both the single and multiple forest scenarios would provide the same benefits and limitations for the World Market team.

The apparent impartiality of Gladstone's finding clearly favoured the Global Enterprise Management (GEM) team, who wanted CIBC to adopt a single forest model. The Enterprise Management team had argued that because there were no additional benefits to be gained from adopting the multiple forest model over the single forest model, the bank should adopt the single forest. In so doing, CIBC as an organisation could then gain from the benefits of sharing one single forest. These benefits would include lower overall management costs for Windows Active Directory throughout the bank, and the reduction in the duplication of work that would be necessary if different local groups were to develop and maintain their own local Windows 2000 AD forests, in a multiple forest scenario .

When Gladstone presented the draft of this report to the members of Win2k AD project, he received a fairly negative response from the World Market team to his findings. From my vantage point as a participant researcher amongst the London technicians, I felt very disappointed for the World Market technicians, who I knew were vehemently opposed to the single forest model. Terry was the most vocal in his objection to these findings, at one point claiming that the report was biased in favour of the single forest model of GEM. The dialogue presented in appendix 2 depicts key excerpts of this Win2k AD project meeting in which this meeting took place.

*Reaction of Win2k Project Team to Gladstone's Report*

What was interesting to note from this dialogue (see appendix 2), was the reaction of Colin, which I observed directly within the meeting room of the London office, namely a support for Gladstone and the findings of his report. The various World Market technicians in the global conference call seem to disapprove of Gladstone's findings. Some, like Terry, openly labelled the findings biased in favour of GEM's single forest model. Colin, however, responded very differently from other senior World Market technicians. On several occasions during the meeting, Colin intervened to defend Gladstone from challenges put to him over his findings by other World Market technicians.

From my own recollection, Colin had been amongst the most vocal in his opposition to the single forest model when the World Market technicians first learned about the plans of the Global Enterprise Management (GEM) team. But now, some months later, Colin appeared resigned (almost supportive) of recommendations favouring the single forest Active Directory (AD) model.

The meeting was concluded, with Gladstone agreeing to make further amendments to the document. He agreed to expand the section on the benefits of the multiple forest solution for the World Market group.

For me, this meeting was one of the defining moments in the Win2k Project. I recall the walk back to our desks from the meeting room of the London office after the conference call as one of the longest walks I have had to share with the London technicians. I felt like a soldier in a platoon returning home from a lost battle, with a strong feeling that in the battle we had lost our home, and independence. As I followed the London technicians down the long corridor back towards their desks, I couldn't ignore the sense of discord between Colin and the other UK technicians, who were present in the meeting, as he tried to assure them of the validity of Gladstone's findings. The other



technicians however, appeared slightly surprised and angered, as I myself felt at the time, by these findings despite Colin best efforts to draw some positive points.

After making the requested amendments to his original draft, the general findings of the report clearly favoured the single forest AD model over the multiple forest. The findings suggested any significant benefits that the World Markets group would gain from developing their own active directory (in a multiple forest scenario) could be achieved through the single forest model, but not the converse. Hence the benefits of a single forest AD model (for CIBC as a whole) could not be achieved with the multiple forest model. Examples given in the report included: the duplication of resources and support efforts required to develop a separate Active Directory in a multiple forest scenario, would be avoided in the single forest.

#### *Decision to Adopt a Single or Multiple Forest AD*

After considering the findings in Gladstone's report, the senior IT executives of the World Markets group instructed the Win2k AD team to continue with the project to develop an Active Directory infrastructure based on the single forest model. According to this chosen model, the World Market Active Directory infrastructure would form a subset (or domain) within the larger single forest AD under the ownership and control of GEM, the IT division of the retail banking business.

This decision appeared to hinder the aspirations of the members of the Win2k AD project. The disappointment of the Win2k AD project team could be easily read from the mood of the conference calls immediately proceeding the announcement of this decision. In the meeting room of the London office, I observed Colin struggle to find something positive to say about the decision in his effort to console the other members of the London team, as he had attempted whilst walking back to their desks from the meeting a few weeks earlier.

During this period I felt that the World Market team were being bullied by GEM division of the retail bank, but couldn't see exactly how. I also felt a very strong sense of betrayal felt by the World Market team towards Gladstone (the MS consultant) and his findings. What I could not fathom at the time however, was why the World Market team were not contesting these findings, when only a few months earlier they appeared adamant that the multiple forest was the only viable AD model for the bank. It wasn't until one year later, in the autumn of 2002 that I would learn of other factors behind the decision of senior World Markets IT executives to join the single forest AD model of GEM.

### **5.5.8 Management Approval of Business Case**

Following the decision by the GT management team to join the single forest Active Directory model of GEM, the World Market Win2k AD team was given permission to develop a business case for the Windows 2000 Active Directory project within World Market. Terry Alstrom, the project leader for the Win2k AD project, presented this business case to senior World Market IT executives in Toronto. The business case was approved in December 2001 and the budget for the development of a global Active Directory infrastructure to cover all regions of the World Market business was provided.

#### *Test Lab*

Following the approval of the business case, Gladstone continued working with the Win2k AD team to develop a global test lab based on the single forest model. This involved installing Windows 2000 servers in each of the major global offices. These servers were connected globally through a wide area network (WAN) in the same way that they would be connected in a real (live) production environment. The test lab replicated the planned AD infrastructure in all but naming convention and replication traffic. The naming convention was the standard for identifying host

systems within the test environment. These followed a similar standard to the live computers on the World Market network, except that the machines in the test lab were proceeded with the characters “T” followed by “\_” to identify them as test computers, which distinguished them from other computers on the World Market’s computer network.

### *Restructuring of the World Market Win2k AD Project Team*

During the development of the test lab the activities of the Win2k AD project team grew extensively as the members found themselves with more issues to discuss than they were able to address in the designated ninety minutes of the weekly conference meeting. This was accompanied by a growth in the number of participants on the conference calls. On several occasions the teams of participants on the call exceeded the maximum (of thirteen lines) on the call. This was more than three times the initial number of four callers from the different regional division when the project first started.

In response, senior members of the project team took the decision to divide the project into three weekly meetings, each held on a different day of the week, and on a different aspect of the Win2k AD project. The original Win2k AD meetings remained the main project meeting in which senior representatives from all the different regions would meet to discuss key project issues. It was also agreed that this main meeting would be reserved for matters concerning Active Directory, which they regarded as the central topic of the project. Another global conference meeting was organised on Mondays (the Server Standards meeting) to address all issues concerning the development of computer servers for the proposed Windows 2000 NOS infrastructure. The other meeting was held on Wednesdays. This meeting (entitled the Desktop Standards meeting) covered issues on the development of a standard desktop application suite between the different regional divisions of the World Market business.

### 5.5.9 Hidden Agendas and the Decision to Adopt the Single Forest Model

One year after the senior World Market IT executives had chosen the single forest over the multiple forest by joining GEM's single forest AD model, I attended a Win2k AD project meeting in which Colin was absent. At the end of this meeting the London technicians were engrossed in a conversation on one of the topics briefly discussed in the conference call. This topic was the recent promotion of the Chief Information Officer (CIO) of the retail bank. This CIO had been responsible for the Global Enterprise Management (GEM) team in the retail bank at the time when World Market was considering, which AD model to adopt. As part of this promotion, his remit was extended to include managing all IT services within the World Market investment bank and some other divisions within the CIBC business.

After the conference call, as the London technicians talked amongst themselves, Al (a senior UK technician) remarked that the decision by the top World Market IT directors to adopt GEM's single forest model the previous year was motivated by their anticipation of this pending appointment of the CIO over all CIBC's technology groups including the World Market GT department.

Al joked that the decision was motivated by "politics" amongst the senior management of GT. He remarked that at the time, the members of the Win2k AD project team weren't prepared to admit openly that this was the reason why World Market chose to joined single forest AD of the retail bank. However, because the senior GT executives were aware of the bank's strategy to bring them under the control of the retail bank and the Global Enterprise Management team, the decision by the senior managers of GT to join the retail bank's single forest AD was really a forgone conclusion. Al, in a humorous tone, remarked:

*"Could you imagine what it would have been like if our bosses had refused to join the single forest model of the retail bank [GEM], only to find one year later that their new boss was*

*the guy we pissed off by refusing to join. It wouldn't go down too well would it? We all new the multiple forest was a better solution for World Market, but at the end of the day, it all came down to politics."*

### **5.5.10 Progress of the Win2k AD Project**

Throughout 2002 the project progressed with the Win2k AD team addressing a variety of issues concerning the transfer of functionalities in the present World Market infrastructure over to the new global Windows 2000 infrastructure. Much of this activity involved setting up and testing various applications within the test lab environment in which to test the operation of the organisations large portfolio of application.

During this period, the format of these meetings often commenced with a short ten to fifteen minutes section used by Terry to update the project team on progress and any other issues concerning the project. He would then hand over to Gladstone, who often requested an update from each of the representatives of the regional divisions on their Win2k project related work over the past week. The different regional representatives would then respond with information on their work in the test labs and other relevant issues.

The regional representatives and the members of their local team would also comment on problems they encountered with a particular applications or function. All members of the Win2k AD project would put forward their advice and suggestions on how to address these problems, with Gladstone taking the lead in receiving and responding to most questions. The Win2k AD project progressed in this manner until the final quarter of 2002 when the various regional teams began implementing the new Windows 2000 AD desktop standard onto PC and server computers throughout the bank. Up

until this point, the members of the project team addressed a variety of issues in the development of the CII.

By January 2003 most of the regional divisions were well into or near completion of the implementation of the Windows 2000 AD infrastructure. Appendix 3 of this dissertation presents a summarised listing of key issues tackled by the AD project team up to December 2003.

### **5.5.11 Ending Ethnographic Fieldwork**

My consultancy contract with CIBC World Markets officially ended in August of 2002. By this stage I had started to feel very disconnected from the academic community. I was concerned that after so much time in the field I had gathered too much data, and was conscious of the need to end the fieldwork. However, I found I could not bring myself to leave the field. Although I was no longer in the organisation, I still attended some of the weekly meetings. At times I felt like an unwanted presence, not just by technicians in the London office, but also by myself, although still I was not able to bring myself to end the fieldwork. The problem I faced was that there always seemed to be something interesting happening within the Win2k AD project, especially as it neared implementation. But more than this, I had seen the project commence from its very inception and felt an eagerness to witness its completion following the implementation. Between September and December of 2002 I had been attending the AD meeting intermittently. I recall feeling very disconnected from the Win2k project team. Eventually I found the confidence to end the fieldwork and my participation in the Win2k AD meetings. The last meeting I attended was in January 2003, two years after the inception of the global Windows 2000 AD project and almost four years after to global MS Exchange email project. So with the feeling of defeat at not having followed the development of a global network operating systems (NOS) infrastructure from its inception through until after its full implementation, my fieldwork was brought to a reluctant but necessary end.

## 5.6 CHAPTER SUMMARY

This chapter has presented the ethnographic narrative of corporate II development at CIBC in the impressionist style of ethnographic tales. This narrative follows the biography and lived experiences of the ethnographer as a member research of the field site. The chapter describes numerous cases II development focusing on the MS Exchange email infrastructure and the Windows 2000 NOS infrastructure. I have sought to detail the context in which these projects were initiated within CIBC. The narratives of corporate II development arising through the lived experiences of the researcher highlights the struggles between different groups over the development of corporate II and the outcome of this process. This narrative forms the basis of the analysis conducted in the following chapter in which I examine how the cultural perceptions of risk shape the development of the Corporate II.

# CHAPTER 6: ANALYSIS & FINDINGS

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## 6.1 INTRODUCTION

In this chapter we undertake the analysis of the ethnographic narrative of corporate II development that was presented in chapter 5. This chapter consists of two key sections. In the first we apply the integrated framework of sociological theories of risk that were developed in chapter 3 to the ethnographic narratives of chapter 5. The second section presents a discussion of the key findings to emerge from this analysis.

## 6.2 COMPETING CULTURES OF CIBC

The case background given in the previous chapter identified various independent business groups within CIBC. Of these the Canadian retail bank (referred to throughout the company as Big Bank) is the main business group. Other business groups like the World Market investment bank operate as a subsidiary of the retail bank. The narratives of CII development presented in the previous chapter focussed on the Financial Products (FP) and Global Technology (GT) IT groups in the World Market investment bank and their relationship with Global Enterprise Management (GEM) IT group of the retail bank. This analysis draws on the grid group framework to examine the culture of these groups.



### **6.2.1 Culture of CIBC Big Bank**

The view expressed by managers in the World Market groups is that CIBC is a collection of disparate businesses brought together under the umbrella of the CIBC group. The single most influential business is the Canadian retail banking business, where most of CIBC's 42,000 workforce reside.

As with many large organisations, the retail business, which remains the management hub of the CIBC group, operates for the most part, as a hierarchy. This observation will become more evident as we undertake a detailed analysis of empirical data using the theoretical framework of Cultural Theory of Risk (CTR). The focus of our analysis remains the development of CII within the World Market investment banking business. Our analysis of CIBC as a hierarchy is based on our study of the World Market business and its relationship with the bank's senior management.

### **6.2.2 World Market Investment Bank: a history of individualist**

The most obvious cultural form that best describes the World Market investment banking business is that of 'the individualist'. Throughout most areas of the CIBC World Market investment banking business we can identify strong characteristics of the individualist culture. This culture seems also to be reflected as the most dominant within the wider environment of the investment banking industry. History illustrates the significance of the individualist culture to the creation of the investment banking industry. From as far back as the famous coffee houses of the eighteenth century, the risk-taking culture of individualists can be identified amongst the merchant class who remain pivotal to the birth of investment banking (Bernstein, 1996).

The independent organisation of the different business groups within the World Market business, and the strong influence of individual actors in its history, adds further validity to this analysis.

Prior to the corporate restructuring project of the World Market business, in the London office for instance, the FP business operated very differently from other business divisions. This often led to the duplication of roles between the different World Market business units.

The strong influence of individual characters also supports the association of World Markets with the individualist culture. The roles that employees occupied did not always reflect their actual status within the company. Hence two people with the same roles or title in the company could have very different levels of influence in the World Market business. For instance, certain traders had almost equal status to the very senior directors of the World Markets. The same was true for some IT and back office staff, who could command higher salaries and more influence in World Markets than the investment traders. The parameters of individual roles in World Markets were certainly not fixed but very much malleable, reflecting to the prowess of each individual actor.

This individualist rationale is especially the case amongst the FP technicians who demonstrated a willingness to deviate from their strict network naming standards by naming one of the PCs on their network BURNS instead of the FPLONNT, followed by a unique three digit number.

### **6.2.3 World Markets IT Departments: FP Tech Individualist vs. GT**

#### **Hierarchists**

Following a functionalist logic, it is reasonable to expect that the individualist culture of the World Markets group be translated into the culture of the GT and FP Tech IT groups. If we recall, the FP business sought to develop its own technology support team from that of the main GT division, in order to meet its specialist needs better. In the London office, where much of our fieldwork was conducted, these two groups do share many aspects of the individualist culture of the wider World Market business, however, when compared to each other, it becomes possible to identify obvious

distinctions between the cultures of the FP Tech and the GT technology groups. In the case of FP Tech, we find that this group is dominated by a strong individualist culture, with some weak signs of the sectarian culture. In the case of GT, our analysis suggests this group displays strong features of a hierarchic culture, and some aspects of the fatalist.

The most obvious comparison is the size of the two departments. Prior to the restructuring project the GT staff have always outnumbered FP Tech by more than ten to one. The consequence of this larger size is reflected in the fairly bureaucratic structure of GT as compared to FP. Whereas GT maintained a highly structured hierarchy with many layers, FP maintained a very devolved structure with few levels.

Another distinction between GT and FP Tech was in their funding, with FP receiving their budget directly from the business group, and GT receiving funding through the hierarchy of the central GT headquarters based in Toronto. The ability to determine the budget increased the influence of the local FP business over the activities of the local FP Tech team. This can support the transfer of cultural values from the FP business to FP Tech. Consequently, the culture of FP Tech demonstrated similar individualist values to those found amongst the FP traders. Similarly, in the case of GT, the control which the GT head office in Toronto had over the budget of the UK GT group also gave it significant influence in determining the behaviour of this group. Unlike FP, the local GCM business did not have any direct control over the budgets of the local GT support team. Hence they have had less influence over the work of the people providing technical service. The hierarchical culture of GT, we argue, was more a product of the subordinate role that it had with the Toronto based head office, where it existed as a small part of a larger organisation.

Note that control over the budget of technology support was not as vital an issue for the business groups in GCM as it was for FP. Both appeared eager to control the spending of their IT team. The

distinction, however, lay in the purpose behind their need to control IT, which further highlights differences in the cultural forms of each group. As a former member of FP Tech pointed out: “Financial Products [FP] viewed technology as an asset. GT would view it as just another service or cost centre, and they always complained about it.”

Both FP and GCM tried to influence the technology teams, and as such could not subscribe to the docile approach of the fatalist cultural form. However, FP chose to influence FP Tech to seek new technologies that may have brought benefits to their business by making funds readily available for IT development. GCM on the other hand chose to influence GT by restricting as far as possible the expenditure of the group. Here the approach of FP reflected the opportunity seeking market individualist, whilst the GCM approach to GT reflected the culture of the hierarchy, preferring instead to restrict IT spending. The distinction between the cultures of these two groups could also be identified in the remunerations, technology profile and working practices.

### *Remunerations of FP vs. GT*

Applying the analysis of CTR, the bonus oriented (commission type) way of rewarding staff in FP and FP Tech encouraged individualism amongst staff. This is because the bonus payments in FP were not set according to roles. Instead, each person was expected to receive a bonus based on the profitability of the FP business and the individual's contribution to the work of the team.

### *Technology Profile*

Differences between FP Tech and GT could also be identified in the profile of technologies that they each supported. GT, being the larger by far of the two, supported a much larger number of technologies. Both GT and FP supported similar types of technologies. These included computing technologies on both Windows based PC and Unix platforms. However, a cultural difference

between the two could be derived from the extensive use of open source technology in FP, which was far from the case in GT.

The case narrative informs us that FP Tech made heavy use of Samba to provide file and print-sharing services between Unix and PC based computers. FP Tech also made heavy use of the Pearl scripting to automate file replication and transfer between its different global locations. Both of these systems played important roles in the II maintained by FP. GT maintained a policy of not adopting any technologies that were not supported by a manufacturer's warrant. Although certain members of the Unix support team used Pearl in their work, this was done at the discretion of the individual Unix administrator, and was therefore not a recognised practice within GT.

Here, the cultural distinction can be found, not so much in the diversity of technologies supported by each group, but in the approach to diverse technologies. We argue that GT demonstrated a closed and uniform approach to the development of its II, by not promoting the use of unsupported, Open Source technologies such as Samba. FP Tech, on the other hand, in adopting Open Source technologies as a conscious strategy for the development of the CII, especially at the core of their technology infrastructure, demonstrated a more open approach to diversity in the development of its CII.

So, despite the fact that GT supported a much larger number of technologies in their infrastructure, FP Tech demonstrated a more open approach to the adoption of diverse technologies in its infrastructure. This more open approach to the issue of diversity adds further evidence to the interpretation of the culture of FP Tech as individualist.

### *CII Management Structure*

Further distinctions between the cultures of GT and FP can be elucidated from the different ways in which key infrastructure technologies in the two groups were structured and administered. Let us take the case of the PC network operating systems and the email infrastructure developed by the two groups prior to the integration of FP into GT. FP maintained a Windows NT 4.0 PC network infrastructure and an HP Open Mail email infrastructure. Both these infrastructures were managed in a decentralised manner in that the primary decision making centre for both was always the local London FP Tech team. Each of these infrastructures was connected into a wider infrastructure to form the global email and network OS infrastructure across the global division. However, there was no recognised management hierarchy between the infrastructures of the different regional divisions that formed FP. Each regional FP team was free to determine for themselves exactly how they would manage their portion of the infrastructure locally. This contributed to a fairly decentralised global management structure for the FP infrastructure.

The opposite however was true for GT. Unlike FP, GT's network OS infrastructure was connected globally in a hierarchical structure in which network servers in the Toronto headquarters occupied the highest point of the hierarchy within the Novell based active directory infrastructure. For instance naming standards of PCs on the local GT network, and user password policies, were set in Toronto and communicated down to the London office to enforce. In FP however, the local technology team was free to determine for themselves the management and administrative strategies to use.

The CC Mail email infrastructure was also organized into a similar global hierarchy in GT, in which the highest points in the hierarchy were the CC Mail email servers in the Toronto headquarters. The administrative policy for CC Mail was determined by GT's email team in Toronto, which remained

the management centre for important issues on the development of the CC Mail infrastructure throughout GT.

### *Diverse Working Practices: Technology Hacking*

The working practice of GT and FP Tech, which determined their development of the CII, differed from each other in that the culture of GT appeared to demonstrate a more formal set of working practices, whilst FP Tech displayed more informal working practices towards the development of the CII. By the terms formal and informal, we aim to capture the adherence or deviation of the two groups to procedures.

The more formal working practices in GT are derived from the lack of willingness to deviate from the recommended procedure for the use of a technology. This, however, was not the case for the FP Tech team, which showed great willingness to deviate from the standard procedures of the technology use in developing the CII. One clear example can be found in developing the automated LD Build. Here the technicians would regularly reconfigure the technology in order to use it in some way that deviated from the recommended procedures of the manufacturer: a practice referred to by the technicians as 'hacking'.

The argument here is not that the members of FP Tech were constantly engaged in the practice of hacking, which did not occur in GT. The focus of our analysis is not on the existence, or absence of hacking, but the public policy over the practice of hacking technology displayed in each group. Keeping in mind that CTR maintains an understanding of culture as the justificatory cosmology amongst a group of people, and not their private, personal beliefs. To this end, our interpretation of the empirical evidence suggests that the practice of hacking was openly welcomed and encouraged in FP Tech, to the point of increasing the status of the hacker within the group. The absence of any open policy of hacking in GT, suggest that if hacking did exist, then it remained hidden, because it

did not support the hierarchical culture of GT. The open practice of hacking, because it often supports the violation of the formal procedure of technology use put forward by the manufacturer, deviates from the cultural practices of a hierarchy towards the culture of market individualist or sect.

#### **6.2.4 Hierarchical Intervention of Corporate Restructuring**

In this section we analyse the consequences of the corporate restructuring project for the IT infrastructure development groups within the London division of CIBC World Market. Our analysis finds that the consequence of this restructuring was to impose a hierarchical culture over the individualist FP Tech group.

The project was the brainchild of the senior management team of CIBC, which was responsible for all the businesses in the CIBC group, including World Market. As described by CIBC's managing director, the aim of the restructuring project was to bring CIBC's spiralling costs under control. This objective points to a change in direction from the opportunist, risk seeking individualist towards a more cautious, risk averse approach of a hierarchy. A significant consequence of this restructuring project was its impact on the World Market IT service groups. For the FP business group, the restructuring project marked the end of an era, or as one of the senior GT directors based in the Toronto headquarters remarked: "FP's days in the sun are truly over". The end of FP effectively occurred when the different trading groups that made up FP were dismantled and integrated into other business areas in the World Market group. The restructuring project also introduced a new globally oriented structure, the aim of which was to make local business groups more accountable to the bank's senior management team. The restructuring from a local to a global oriented structure created additional levels of management between the local business traders and the managing director to whom they reported and received authorisation for spending and the



conduct of their trading activities. This strategy marked a change towards a more hierarchical culture within the World Market investment trading group.

FP Tech was required to follow the fate of their business users as part of the restructuring project through its integration into GT. The consequence of this integration is more clearly explored in the narrative of global email and NOS infrastructure development, which we analyse in the following sections.

### **6.2.5 Email Infrastructure Development: FP MS Exchange**

Under the highly individualist culture of the FP business, FP Tech had developed their own independent email infrastructure around the Unix based Open Mail technology. However, the incompatibility of Open Mail with Y2k presented the UK FP Tech team with the problem of finding a replacement. This situation was quickly seized on by the individualist FP Tech team as an opportunity to introduce the new MS Exchange 5.5 email solution into the corporate II.

The importance of the MS Exchange 5.5 solution to the team of technicians is increased further when they learn of the management team's decision to integrate their team into the larger, more structured GT department. The development of Exchange 5.5 for these technicians not only represents an opportunity to learn a new technology, but a physical symbol that their working practices, values, and way of life - their culture - to which they have become accustomed within the organisation, was still valid. Here, the senior management team may be making announcements, and someone in head office may be redrawing organisational charts that no longer include FP or FP Tech, but as long as they remained seated in their privileged positions amongst the traders on the trading floor, working with the latest technologies to develop solutions for the latest, in a vogue business group, they could convince themselves that nothing had really changed.

Rejection of the first proposal to develop MS Exchange 5.5 as a replacement for Open Mail represents one of the first battles between the FP Tech infrastructure development technicians and the encroaching hierarchy of the Global Enterprise Management group (GEM). This confrontation continues when the senior management team of GT takes the decision that all FP user email accounts on the FP Open Mail service should be transferred over to GT's CC Mail service in preparation for Y2k.

### *FP Tech as Sectarian or Individualist*

At this stage the FP Tech team display characteristics of a weak form of sectarianism. Colin emerges as the charismatic leader of this voluntary group of former FP technicians that appears determined to veto the command of the GT hierarchy to transfer FP user email accounts over from Open Mail to the GT CC Mail infrastructure.

Our analysis identifies the character of the FP Tech group at this stage as a weak form of sectarianism because the activities of the group appeared to fit more clearly within the individualist cultural category. As strong individualists, the members of FP Tech hold the hope in the security of the future through the maintenance of their value within the employment market of the City. This value, as they saw it, was dependent on their knowledge and experience working with the latest technologies. As individualists they felt their security lay in them gaining experience with development of the MS Exchange 5.5 email solution, which would enable them to continue developing their skills on cutting edge technology.

This analysis of the organisation of former FP technicians as a group of individualists is given credence when we consider the skilful manoeuvring of Colin in extending the network of the former FP technicians to incorporate business users from FP and CC Mail email technicians from GT. It was this small network of mostly local interest groups that enabled the former FP technicians to

develop and maintain the first Exchange 5.5 email solution, and to configure it such that it appeared as a CC Mail server within GT's CC Mail infrastructure.

Here activities undertaken in replacing FP's Open Mail with MS Exchange 5.5 demonstrate many of the characteristics of the individualist culture.

### *Alliance with GT Fatalist*

Furthermore, the role of the GT email technicians in helping the former FP technicians to connect their MS Exchange solution to the GT CC Mail infrastructure points to a contradiction in their commitment to the hierarchical culture. This contradiction appears because these GT email technicians were part of the hierarchy that instructed the FP Tech team to transfer their Open Mail users over to the GT CC Mail solution. As hierarchists, they should be less likely to deviate from the command of authority. This contradiction and the resulting alliance with the former FP technicians may be better explained if we interpret the actions of GT's collaborating (email) technician as those of fatalists. Their commitment to this passive culture therefore submits them to the manipulation of others, whether it be the hierarchy of the GT management team, or the individualists of FP Tech.

### *Cultural Change*

Culturally, restrictions on local budgets, and the integration of local business groups into globally accountable business divisions brought about by the corporate restructuring project, demonstrates hierarchical values undermining the individualist culture throughout the World Market business. The consequence of these events is the transformation of culture in World Markets towards a hierarchy. Hence, before this restructuring project we find World Market organised around local autonomous business groups with similar, often duplicate trading activities. As a direct outcome

and objective of corporate reorganisation, we find these businesses being structured into global business units. Hence, at the organisational level, we are able to note concrete changes in the transition of CIBC WM from an individualist cultural form, towards the hierarchical. This is not to claim that World Market was changing from an entirely individualist culture towards a hierarchy, but rather that, it was becoming more hierarchical in character.

### **6.2.6 Expanding the Hierarchy through Global Email Integration:**

Initially, the redirection of the World Market culture towards a hierarchy appears to advantage members of GT, especially on the announcement of the integration of FP Tech into GT, and the transfer of FP business user's email service over to the GT email infrastructure. This advantage however, seems to fade along with the strategy of senior management to fix the spiralling costs of the bank's email services through the decision to outsource the email infrastructure of CIBC. This decision, which was taken by the senior management team within CIBC, can be interpreted as the top-down CII development approach of a hierarchy.

The ensuing clash between the senior management outsource alliance, and the network of World Market email technicians illustrates further the cultural distinction between these two groups. The sheer effrontery of the senior World Market email technicians in organising themselves against the strategy of outsourcing put forward by the senior management team rather than submitting to their fate or following the policy of the bureaucracy, demonstrates a strong propensity towards risk taking individualist culture amongst this group.

A comparison of the two proposals (the outsourcing proposal, and the proposal from the World Market technician) further demonstrates distinctions in the value judgements of these two groups. The outsourcing proposal was based on standardised mailbox settings for all email users throughout

all CIBC business groups. This meant that a user in the retail business would have the same mailbox settings for email as users in the World Market business group. In contrast to this generic solution, the team of World Market technicians presented a less detailed proposal, in which they argued that the World Market business, and all the business units that fall within it, should maintain their own sites within the new integrated MS Email infrastructure. In these sites, each region would be free to determine how to manage the email service according to their local preference and requirements. Their counter proposal would enable the World Market groups to develop a more customised email service than that of the outsource provider. This alternative reflects the strategy of a more individualised group, not only for this reason alone, but also for the autonomy it gives the different regional groups in World Market to determine their own approach to the management of their local email infrastructure, within the proposed World Market email site.

Another important observation here is that the technical input for the counterproposal drew extensively from the experience of the former UK FP Technicians acquired through developing their local MS Exchange solution. In many ways, this situation would serve to justify their efforts of developing their unauthorised MS Exchange solution.

### *Triumph of the World Market Alliance*

The Alliance of World Market technicians were successful in convincing the senior management of the merits of their proposal. Agreement was reached that the Alliance would be allowed to proceed with their alternative proposal, providing they could complete the implementation of their proposed solution within a very short period.

The Alliance worked very closely to complete the project within time. One of the first divisions to complete the project was the UK division led by Colin. Upon completion Colin and other members

of the UK World Market email support team visited the New York office to assist the World Market team there with their rollout of Exchange, and share the experience of the London division.

An important criteria imposed on the team of World Market technicians by senior management was that their proposed solution should not incur any costs outside of their local budgets. For the Alliance, this criterion did not pose any significant stumbling block. Most regions were able to accommodate this new hardware within their large IT budgets. Where new hardware could not be purchased, the technicians improvised, by using old hardware from the previous email solution. This was the situation in the London office. The UK technicians used the existing CC Mail hardware, which they enhanced by purchasing additional memory.

### *Maintaining Unlimited Mailbox Storage in the London Division*

The need for additional resources in the London office was compounded by the insistence of the former FP technicians to maintain support for unlimited storage capacity for all email users. Previously in the London office, only former FP users possessed unlimited email accounts, a service to which they had become accustomed by FP Tech in the former FP era. Colin and the former FP technicians insisted on extending the practice of unlimited mailbox storage space to all the users in the London office. For the business users of the former FP groups, this was a service they had grown accustomed to and were reluctant to lose. For other email users, formally on CC Mail, this was their chance to experience the IT support services previously only available to privileged users in FP.

### *Key Analysis: Dominance of FP Approach*

The key point that we wish to make in this analysis is the dominance of the FP Tech approach, through the adoption of FP working practices in the development of the integrated MS Exchange

5.5 email infrastructure within London. The combination of existing and new hardware to develop this new email solution in the London office in many ways reflects the approach of technology hacking maintained in FP Tech. Additionally, the insistence of the former FP technicians on maintaining support for unlimited mailboxes demonstrates the transfer of values from the individualist FP business group through the working practices of the former FP technicians over to the new integrated email infrastructure. These working practices were found embedded in the administration and management procedures of the new global MS Exchange 5.5 email infrastructure in the London office.

### 6.3 DEVELOPMENT OF CII AS HIGH RISK TECHNOLOGY

In this section, we undertake an analysis of the occurrence of danger in the Global MS Exchange Email CII. For this purpose, we draw on Normal Accident Theory (NAT), as a supplement to our primary theoretical framework of CTR.

#### 6.3.1 MS Exchange Email Infrastructure as a Complex System

As discussed in chapter three, the concept of system remains pertinent to any analysis using Normal Accident Theory (NAT). In order to analyse effectively the case of email disaster with NAT, we must first establish exactly what constitutes the system in this particular case. This task remains the focus of the present section.

##### *Fourth Level – System*

For the purpose of this analysis the term system, as defined in NAT, is used mostly to identify the email infrastructure throughout the environment of CIBC. Drawing on NAT, the globally integrated MS Exchange 5.5 email infrastructure represents the highest, *fourth level* the *system*.

### *Third Level – Subsystems*

Jumping to the *third level*, we may consider a group of (MS Exchange) email servers in a single regional office or division as a *subsystem*. These are the servers based in the regional offices of the different global divisions of the organisation. Each MS Exchange server, or group of servers in each region, stores the mailboxes of users connected to MS Exchange within the region. Other subsystems include the message transmission service, which uses various network devices, protocols and applications to transmit email messages throughout the system and to other systems outside, in the environment of CIBC's email system. These third level services work at the global level in the sense that, including local activities (facilitating email services within their local area), they interface between local email clients and email services in other regions of the global MS Exchange infrastructure. The local technology support teams in the local regions can also be identified as third level subsystems of the email system.

### *Second Level – Parts*

*Second level* components of our system, referred to as the *parts*; include the test email server and other non-critical servers, such as the backup server used to backup the Information Store database held on the main email server in the different regions. It can be argued that these services should be considered on the same level as the regional servers identified earlier as subsystems of CIBC's email system. However, we have chosen instead to identify these other servers and email services as level two *parts* of the global email system, because they are mostly dependent on the regional server(s) to provide their backup service. Moreover, the regional servers do not depend on the backup servers or test servers in any such reciprocal manner.



The information store database, which is used to store the mailboxes of email users, is an important part of the MS Exchange email server in each region, because without this service the email server could not function in any way as a server. This is because there would be no place in the email system to store emails. Nevertheless, we have chosen to identify the information store as a level two rather than a level three subsystem because it exists as an application on the main MS Exchange email server(s) in a region, and is not in any way independent of this server. Also, unlike the other components that we have identified as third level subsystems, the information store database is restricted to a specific local region, and therefore does not interact globally with email components based in different regional divisions.

### *First Level Units*

We may consider the client applications and hardware used by users to access the MS Exchange email service (such as the PC, and MS Outlook email client) units to represent the first, lowest level of this system.

### *Complexity and Coupling*

Having established the parameters and subcomponents that form the system for our analysis, we now turn our attention towards the characteristics of the system, in order to develop our analysis of dangers in the email infrastructure. To do this, we draw on the concepts of complexity and coupling from NAT.

In the theory chapter, we argued that CIIs emerge through the integration of complex systems, and therefore constitute highly complex systems in themselves. The MS Exchange infrastructure demonstrates a variety of characteristics that illustrate this argument. Amongst the characteristics of complex systems identified in NAT are: automatic controls; high-level controls; uncertain

default status; invisibility of interactions; specialised roles; and interdependencies. In Perrow's words, we argue that the global MS Exchange email infrastructure is "irretrievably complex" (Perrow, 1984:p85).

### *Automatic Controls*

Automatic controls are automated procedures within the system that function independently of intervention from an operator. The dependence of the MS Exchange email system on automated controls is such that it could not function without such controls. If we consider that the transfer and delivery of emails is totally automated, from the moment the email user selects the send option, it becomes possible to appreciate the significance of automatic controls in MS Exchange, and other email systems.

### *High-level Controls*

An example of a high-level control is the control panel that produces "television screen displays of the state of a number of units or subsystems" (Perrow, 1984:p81). Here again, the MS Exchange email infrastructure not only consists of the component identified as common in complex systems, but also is dependent on the main interface. In the email infrastructure, as with other computerised technologies, the monitor display remains the only means through which users can communicate or interact with the system. Unlike other examples of systems, such as the mining and nuclear processing plants considered by Perrow (1984), MS Exchange could not exist as an email system without such high-level controls. By this, we mean that the invention of such high-level (computerised) controls preceded inventions such as email applications, which are therefore dependent on high level controls in all aspects of their operation.

### *Uncertain Default Status*

Uncertain default status refers to the normal setting of switches and modes used in the operation of the system. The term refers to the ambiguity associated with knowing the normal setting of the many switches often designed into complex systems. When applied to the MS Exchange email system, uncertain default status can be understood to be the default status of the many configuration options and settings built into the MS Exchange application. Hence default status in MS Exchange would refer to the status of configuration options that have been automatically selected within the application prior to the email technician's configuration of the application to meet an alternative requirement. Due to the sheer number of configuration options within the entire MS Exchange application, it becomes difficult for any one person, or even a group of people, to know the criteria for setting each and every configuration option designed into the application. Uncertain default status refers to the fact that operators may not know the normal setting of a particular configuration option. As we shall see later in this analysis, the default status can have significant consequences in the management of large CII.

### *Invisibility of Interactions*

Invisibility of interactions refers to the fact that interactions between the components of complex system often occur outside the view or knowledge of the operator. Again, this is a common and obvious feature of the email system. As with all other computerised applications, the processing of instructions and procedures occurs inside the hardware, beyond the view of operators. The only means by which operators can observe events inside the email system is through the use of high-level tools in the form of computer screen displays.

The personnel trained in the operation of complex system often possess *specialised* skills. "In contrast to complex systems, there is minimal specialization of labour, materials, and pools of

supply in linear [more simple] systems” (Perrow, 1984:p86). The different categories of personnel in complex systems, because of their specialisation, tend to be more isolated from each other. In less complex, linear systems, the operators tend to have more generalist skills. The operators of such systems “are trained on several tasks because they tend to rotate, on various jobs, or fill in for people” (Perrow, 1984:p86). This means that substitutions are more likely in simple, linear systems, than in complex ones.

This characteristic of complex systems is not readily applicable to the MS Exchange email system in our empirical study, because we find that the members of the email support team for the new MS Exchange 5.5 system, although specialised in their respective areas, were also generalists in that they could cover other roles within the systems. A possible explanation of this anomaly could be due to the small size of the London email support team, which formed the focus of our data collection efforts.

Nevertheless, even in a small email support team such as the London World Market division, specialisation of roles still existed, although less visible. For instance, some technicians were skilled in the server hardware, whilst others were skilled in server administration, and others in client applications. With the exception of Colin, who demonstrated generalist knowledge of the different parts of the email system combined with specialist knowledge in its administration, the other members of the London email team possessed specialist knowledge of one or two areas of the system necessary for email support. This need for specialisation of roles in the MS Exchange systems can be attributed to the many different components that make up the system and the difficulty for any one person or group to master all aspects of the system.

## *Interdependencies*

The term *interdependencies* capture the connectedness of complex systems. In our case it refers to the interconnectedness of components in the units, parts and subsystems that make up the MS Exchange email system. Specialisation of roles in complex systems means that the personnel involved in the support of complex systems are less likely “to predict, note, or be able to diagnose the *interdependency* before an incident escalates into an accident. The large selection of services that MS Exchange 5.5 integrates into one email solution means that the components are highly interdependent in ways that are not easily discernable to the teams of technicians.

### **6.3.2 Complexity of CIBC Email Infrastructure: From Loose to Tight Coupling**

The global MS Exchange email infrastructure can be classified as either tightly coupled or loosely coupled, depending on the aspects of its design that we may choose to emphasise. A useful yardstick with which to assess the form of coupling within the new MS Exchange email infrastructure would be the previous, older email infrastructure, prior to the development of the integrated MS Exchange solution.

NAT asserts that a system that is loosely coupled “allows certain parts of the system to express themselves according to their own logic or interest. Tight coupling restricts this” {Perrow, 1984:p92). In both the old and the new email infrastructure, the team of local email technicians are free to determine the management and administrative procedures for the email system within their local region. Hence both systems can be identified as loosely coupled in some way. However, a key difference between these two systems exists in that the new email infrastructure is based on one single technology platform throughout. This is very different from the old email infrastructure, which was made up of multiple technologies. For example, in the London office, email users were

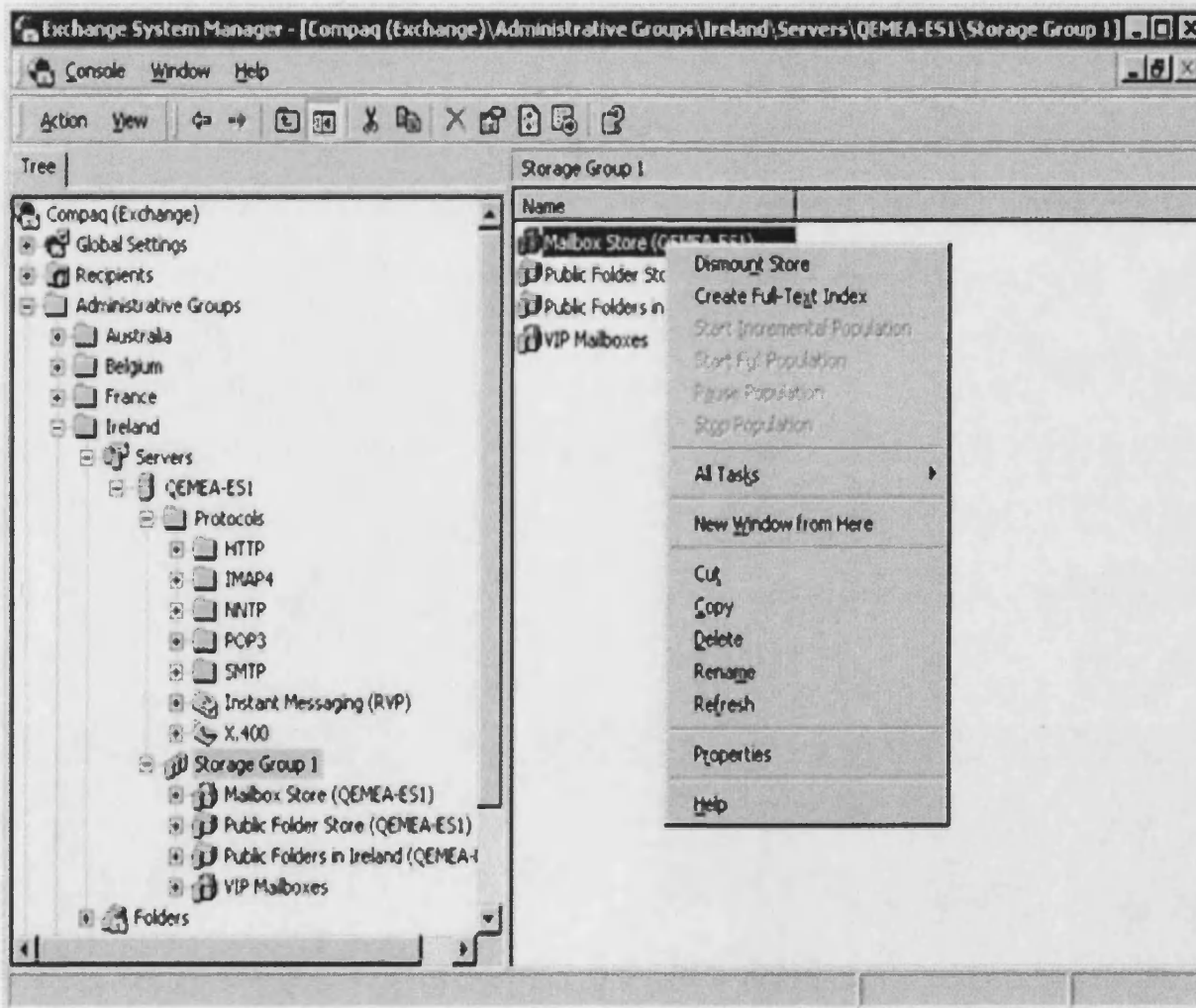
mostly divided between the FP Open Mail system and the GT CC Mail email system. Whilst the GT CC Mail system was more hierarchically structured, the Open Mail system in FP was more decentralised. The different email technologies that formed the old email infrastructure were independent systems in that their operations were not in any way interdependent, unlike the new MS Exchange infrastructure. This meant that technicians responsible for the CC Mail system did not have any direct access to, or influence over, the administration of the Open Mail or other email technologies within the CII. Connectivity between the different email solutions in the old email infrastructure was facilitated by mail gateways, which translated messages from one email technology for transmission over another.

In the new integrated email infrastructure based around MS Exchange, these gateways and the translation service they provided were not required because all the different email services in the different regions were organised around MS Exchange 5.5 as the sole single email technology. In various ways, the old email infrastructure is more heterogeneous than the new integrated email infrastructure. Compared to this older email infrastructure, the new email infrastructure based on MS Exchange 5.5 was clearly a more tightly coupled system.

Other than the consolidation of the different email technologies into one technology architecture, the new email infrastructure can be seen as more integrated for other reasons. The most obvious of which is the hierarchical structure of the new global MS Exchange system. Here, not only had the different email technologies been replaced by a single platform, but also, the email systems of the different regions had been organised into a single global MS Exchange hierarchy. In this hierarchy, the technology team of the outsourcing contractor occupied the highest position, with all the email sites (MS Exchange email services in each regional division) organised under it. A number of the regional divisions may have smaller sites under that in turn. Hence the highest position in this global MS Exchange email hierarchy was occupied by the outsourcing contractor, whose technical

administrators controlled the main (root) site to which all other sites were either directly or indirectly connected. The technical support group in each region had administration permissions over their own site, but not over the root site. The GEM group alone controlled permission over the root MS Exchange email site. Control over the sites in the email infrastructure was managed through the MS Exchange administration console, as illustrated in the following diagram.

Fig. 6.1 MS Exchange Management and Administration Console



### 6.3.3 Bank Holiday Email Disaster

Having examined the character of the email infrastructure with the concepts of NAT in the above section, which identifies the new global email infrastructure as a more complex and tightly coupled system than the previous email infrastructure, we will now examine the Bank Holiday email disaster, and its consequences.

#### *London MS Exchange Email Disaster*

The Bank Holiday email disaster commenced with the corruption of the information store database file. In the above analysis of the MS Exchange email infrastructure as a system, we identified the information store as a *second-level* part. The corruption of this information store prevented the London MS Exchange server (the computer on which it resides) from completing the initiation process, following its shutdown. The information store did not have to reside on the main London MS Exchange server. Due to the importance of the Information store database to the operation of the MS Exchange server, Microsoft even recommends the information store should be distributed between two or more MS Exchange servers. This recommendation was meant to facilitate fault tolerance in the event of a disaster. However, because the London division only possessed one MS Exchange server computer, other than the backup server, the entire information store database was held on this one server. The escalation of the initial damage from the information store, at the second-level of the email system, into a third-level (subsystem) disaster, with the failure of the London Exchange server, can be attributed to tight coupling between the information store database and the email server computer.

For the first day of the Bank Holiday email disaster, the disaster was confined to the London office because failure of the technical components and services were confined to the technical system in



the London office and email service. The other offices in the global World Markets business were affected in that they could not send to, or receive emails from users based in the London office. Hence, with the exception of the London office, the global MS Exchange email service was fully operational in all other areas of the world.

The first major step that the London technicians took to try and resolve the fault was to try and recover the failed database file through the standard recovery process designed into the MS Exchange software. However, for a combination of reasons including the capacity of the computer's random access memory (RAM), the processor speed, and the large size of the corrupted information store database, this recovery procedure progressed at a very slow rate. Consequently, the London technicians decided to abandon this process for the more controversial, but faster, DS/IS disaster recovery procedure.

The complexity associated with these different recovery procedures, which translates to the entire MS Exchange email system, is illustrated by the uncertainty that accompanies their use. In the case of the former standard recovery process, the technicians decided to abandon this procedure, not only because of the slow rate of progress, but also because Microsoft's technical support specialist, who was assisting the London email technicians to resolve the fault, could not determine how long this process would take to complete. The problem here was that within the customised context of the London CII, with its unique portfolio of interconnected technologies, it was not possible to predict the behaviour (and hence outcome) of the standard recovery procedure. In this case, the complexity surrounding the standard recovery procedure (as a component of the overall email system) arose from the lack of knowledge on the part of the London and Microsoft technicians. Consequently, the London email technicians took the decision to abandon the standard recovery procedure in favour of the recovery procedure.

*Disaster Escalation: The Public Folders Crisis*

Similar to the standard information store recovery process, the DS/IS recovery procedure was to unveil further consequences that the London technicians had failed to anticipate. These uncertainties however, when played out in the disaster recovery process of the Bank Holiday email disaster, resulted in the further escalation of the email disaster from the *third-level* subsystem of the London MS Exchange server, to the *forth-level* of disaster, affecting the entire global MS Exchange email system.

In their haste to address the problem of corruption to the information store, the London email technicians did not consider fully the impact that their chosen strategy would have on other divisions in the global email infrastructure. The two main areas of data storage in the MS Exchange email are the information store and the public folders. The information store, being the database that stores the personal mailboxes of all users connected to the MS Exchange site is held locally. This means it is not shared as a global resource within the email infrastructure. Hence, only the London users had access to the information store database on the London Exchange server in order to access their mailboxes. Any corruption to the information store on the London Exchange server therefore only impacted on email users connected to the London email server. This was not the case with the public folders, which serves as the other main data storage components of the MS Exchange email service.<sup>2</sup> The DS/IS recovery process does not only impact on the information store database but it also has repercussions on the public folders component of the entire global MS Exchange email infrastructure.

The team of local technicians failed to anticipate this connection between the DS/IS recovery process and the public folders service and how it might disrupt the work of other business divisions.

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<sup>2</sup> The MS Exchange public folder facilitates group work between users of the email service by enabling them to share resources held within the public folder. For example, users in the Caribbean office of the Retail bank can share documents, files, folders etc. with users in any other office in the CIBC's global MS Exchange infrastructure, providing they have the appropriate access rights.

The corruption of the public folders, following the activation of the DS/IS recovery process, illustrates the complexity of interactions, and the consequence of tight coupling that we find in this new email system. As Perrow points out:

“...in a large [complex] system some parts are so remote from each other that the chances of their interacting in unexpected ways can be disregarded [...] Complex interactions may be unintended ones, or intended, but unfamiliar ones” (Perrow, 1984:p76).

### *Disaster Escalation over WAN*

In addition to the corruption of the global public folders, other problems occurred in the email infrastructure as a result of the DS/IS recovery process. The most serious of these affected the corporations Wide Area Network (WAN) used for transmitting data between the different global divisions of the organisation. The speed of data transmission was reduced to the extent that the email messages were being lost in the system. This problem was triggered by a dramatic increase in replication traffic throughout the global MS Exchange email infrastructure following the initiation of the DS/IS disaster recovery procedure.

The purpose of the replication service is to maintain coherence throughout the global MS Exchange email infrastructure. It guarantees that any changes to any part of the global MS Exchange email service is replicated throughout the entire email infrastructure. Hence, the creation of a new mailbox for a user in the New York office will be replicated throughout all the various regional MS Exchange email servers. This way, email users within the corporation access and share the same global directory of email addresses. The same rule applies with the technology infrastructure. Hence, if a backup server is added to the New York email site, all other email servers in the global exchange infrastructure will have the details of this device and its function within the infrastructure.

Here, we argue that the requirement for coherence throughout the global email infrastructure, which is facilitated by the replication service amongst other things, produces tighter coupling in the new email infrastructure, which did not exist in the older more loosely coupled corporate email infrastructure of CIBC. This tightness of coupling led to the automatic generation of replication traffic throughout the global email infrastructure, which caused the slowing down of data transmission over the WAN.

### *Normal Accident of MS Exchange CII*

The London Bank Holiday email disaster illustrates the occurrence of a danger in a subsystem and its escalation to a forth-level danger affecting the entire system as a consequence of efforts to resolve the initial danger. Following the thesis of NAT, we attribute this *normal accident* (or *system accident*) to the complexity inherent in the MS Exchange email infrastructure. The level of complexity within this new email infrastructure is higher than the complexity in the old email infrastructure prior to the development of the integrated email infrastructure. Moreover, the design of the older email infrastructure was more loosely coupled, which served as a protection against the domino effect of normal accidents occurring across the system of the corporation's email infrastructure. Hence, compared to the new global MS Exchange email system, the old email infrastructure is more linear and simple, but only when compared to the new MS Exchange email system. Because, of this distinction in complexity between the old and new email infrastructure, we argue that the escalation of the initial danger from the London email system to the entire global email system would not have occurred in the older, more linear email infrastructure. Moreover, we find that the tightness of coupling in the new email infrastructure enabled the escalation of the initial email disaster from a regional disaster on the third level of the London email server (as a subsystem) into a forth level, normal accident impacting the entire global email infrastructure. Based on our analysis, using NAT, we attribute this escalation of the initial (local) fault into a

fourth level global disaster to the tightness in coupling that characterised the new globally integrated MS Exchange email infrastructure.

### *Consequences of Bank Holiday Email Disaster*

Immediately after recovering from the Bank Holiday email disaster, the team of email technicians in the London office began working on a solution to address the problem of the large information store. Eventually, they decided on a product called the Exchange Archiving solution. This application, when configured on the MS Exchange server, compresses the size of email messages below their original size. This reduces the overall size of the information store database used by the MS Exchange server to store and retrieve email messages. The use of the Exchange Archiving solution allowed the London email team to continue supporting unlimited mailbox sizes for all the users, whilst maintaining the Exchange information store within Microsoft's recommended limit. In addition to this, the local team also upgraded the BRP server.

What is interesting to note about these efforts to protect against a similar disaster from re-occurring is that the local email team did not change their procedure for supporting unlimited mailboxes. The impact of the fault was extensive. The cause was obviously the overgrown information store database, which was caused by the procedure to support unlimited mailbox sizes. The London office was the only region in the World Market group to practice this policy. Consequently, the most obvious solution for the local UK email technicians would have been to change this policy by limiting the storage capacity of the users mailbox. But rather than concede to this hierarchical procedure, the UK email technicians adopted the Exchange Archiving solution to address the problem of the overgrown information store database. In so doing, they demonstrate their commitment to the justificatory cosmology of the market individualist.

This analysis appears to support the argument expressed in CTR that a group's commitment to a particular cultural form determines the way in which they perceive dangers in the world, or how they choose to apportion blame. In this case, a hierarchist may choose to lay the blame on the lack of strict administration controls over users' mailboxes and the inappropriate management of the technology by allowing users to determine just how much information they should store on email. Instead, the solution opted by the UK email technicians seems to lay the blame on the unsophisticated use of technology by not having in place the Exchange Archiving solution, which they have now implemented. By not choosing the hierarchical procedure of mailbox size restrictions, the UK email support team demonstrated their commitment to the individualist culture inherited from the FP business group and FP Tech.

## 6.4 GLOBAL NOS INFRASTRUCTURE DEVELOPMENT

Having analysed the consequence of danger in the MS Exchange CII using NAT, we return to CTR to analyse the development of this Network Operating System (NOS) CII. The development of a global Windows 2000 (Win2k) Active directory infrastructure was the next major project following the development of the global email infrastructure.

The environment of the UK IT division of World Market following the immediate impact of the restructuring project provided fertile grounds for any individualist aiming to establish themselves within the newly emerging structure. Whether intentionally or otherwise, this appears to be what Colin achieved. The success of the integrated email infrastructure project within World Market had raised the profile of the participating email technicians, of which Colin was a leading member. More and more, Colin appeared as the leader amongst the WINTEL (Windows and Intel) technicians in the European division.

### 6.4.1 Win2k Active Directory Project

The genesis of the Win2k AD (Active Directory) infrastructure project can be traced back to the initial London desktop standard project, which commenced after the successful completion of the MS Exchange email integration project. During this period, the actions of Colin and others involved in these projects can be interpreted as the movements of actors under the guidance of an individualist rationale. The reason for this is that, following the restructuring project, mostly all the London technicians occupied the same roles they previously had prior to restructuring. Therefore, the participation of these technicians in projects like the MS Exchange integration, and the London-wide desktop standard, could only be achieved through their own self-interest. This interest, we believe, is to secure their network and carve out a comfortable position for themselves in the restructured organisation as members of the individualist cultural form.

Drawing on the cultural perspective, an equally valid interpretation would be that the alliance of the team involved in developing the London-wide desktop standard followed the rationale of a hierarchy because their efforts were being undertaken with the benediction of the senior UK IT director. However, we prefer to consider the position of the new IT director as precarious in the sense that he, being new to the post, was also trying to build and establish his network within the organisation. The analysis of the team of UK technicians involved in the London-wide desktop standard as hierarchists would be more appropriate if this project had originated top-down, from the senior management team. Instead the idea for the project originated from Colin and other technicians in the London office following their collaboration on the MS Exchange email integration project.

At this particular stage, the culture of the group appears to combine very strong individualist characteristics, with some partial sectarian features. Several key characteristics of the group of senior World Market technicians point to an underlying individualist culture. First there is no

recognised structure or hierarchy amongst the team members at this initial stage of their formation. Only after several months of discussions do we begin to see some sort of structure begin to emerge around key issues such as the AD architecture design, desktop standards and server standards. Initially however, the members of the Win2k AD project organised as equal members in a network or alliance of independent participants, or individualists in a market.

Secondly, it seems clear that each individual member of the Win2k AD project team stands to gain from their participation in this project. If we consider the scale of the potential Win2k AD project in the World Market group, it becomes possible to appreciate just how each member of the group could benefit through their participation in such a global CII development project, which would clearly improve their value to potential employers outside CIBC. Within World Markets however, the development of a global Win2k AD infrastructure appears to represent an important feature of the organisation's future. Participation in the Win2k AD project at this early stage better positioned these individuals to carve out a role for themselves in the new emerging environment of CIBC WM. Participation in a global Win2k AD project could also enhance the role of each group member within the local constituency, as the key contact, or local interface of the IT group to other global divisions of the organisation.

A key characteristic of sectarian groups is their voluntary-ness. It is this reason that we identify the Win2k AD project group at this early stage as also demonstrating a weak form of sectarianism. Similar to the London-wide desktop standard project, collaboration between the team members of the Win2k AD project commenced bottom-up, before the involvement of the bank's IT management team.



## 6.4.2 Single vs. Multiple Forest Windows 2000 AD Models

At the initial stage of the discussions between the World Market Win2k AD project team members, the focus of the group was on the development of a multiple forest AD infrastructure within CIBC with each business group owning and controlling its own AD forest. This multiple forest AD architecture would allow the World Market business group to develop their own separate AD architecture, without having to collaborate with other businesses in the CIBC group. The alternative to the multiple forest AD model was the single forest model. The single forest solution would require all the business groups in World Market to collaborate in the development of one fully-integrated AD architecture.

The application of grid group analysis to these alternative AD architectures identifies the single forest model as the preferred option of a hierarchy, and the multiple forest as the preferred choice of the individualist. The response of the World Market Win2k AD project team became more characteristic and intense on the introduction of the bank's Global Enterprise Management (GEM) team.

### *Toronto Round Table*

The round-table meeting between the two groups in Canada was meant to provide the forum for representatives of the two groups to debate the merits of their proposed strategy to coordinate better their approach for the development of Windows AD model.

The dialogue between members of the two groups on the risks that CIBC faced, should it have selected either of the two Active Directory models, depicted the risk profiles of the two teams and the contrasting cultures that they each supported. In the dialogue of this meeting, the World Market team made the argument that the single forest model proposed by the Enterprise Management team

exposed CIBC to the risk of a global disaster that could impact on all the business groups organised within the structure of the single forest. Here, the focus of the World Market team on the consequence of global catastrophes depicted a sectarian perception of risk.

In response to the challenge over how they would guard against the likelihood of any global catastrophe that could arise from the single forest model, the Enterprise Management team constantly referred to the use of “security and access groups” and other procedures to limit unauthorised people from damaging the AD forest. To all the questions on the likelihood of incurring a global catastrophe within the single forest, the Enterprise Management team responded by referring to the enforcement of procedures intended to restrict access rights, such that only authorised technicians would be allowed to carry out certain tasks. So for example, when Colin recalled the occurrence of danger with the NIS Plus Unix infrastructure back in FP, and how a local fault had “a knock-on effect [and] rippled through” bringing down the entire global NIS Plus infrastructure, a representative of Global Enterprise Management (GEM) team responded: “...*the only people in our environment that will really be able to, in our environment, be able to create domain controllers and do restores and stuff like that will be the ICA [technical experts from the outsource contractor working with the retail bank]...*”

This response pointed to the assumption amongst the GEM team that the outsource contractor, because they possessed infrastructure development skills, was incapable of instigating any sort of danger within the infrastructure. The logic of this reasoning is in accord with the hierarchical view that tasks within the organisation must be allocated according to speciality in order to protect the organisation against error. Consequently, the focus of risk management in the hierarchy was placed on the allocation of tasks to specialist divisions and the establishment of procedures to prevent other units from participating in tasks outside their recognised area of speciality.

When Colin continued to press the Global Enterprise Management team on how they could protect the organisation against a major catastrophe occurring to the single forest model, by referring to his own experience with MS Exchange (in the Bank Holiday email disaster), he provoked an emotionally charged response from a member of the GEM team who forcefully asserted: *“If you do wrong things bad things will happen”*.

This statement demonstrated a strong, emotional commitment to the values of the hierarchical cultural form, which would attribute the example of the London email crash not to the “unpredictable behaviour” of the technology as suggested by Colin, but to the lack of a procedure to prevent those who do not have adequate expertise from undertaking tasks to which they are not authorised.

Based on grid group analysis, the dialogue between the two groups demonstrated very distinct risk preferences over the single forest AD model held by the World Market technicians and Enterprise Management team. Grid group analysis informs us that the two parties were approaching the debate from opposing cultural forms, or institutional rationales. Consequently, the perceptual lenses with which they undertook the cost benefit analysis of risks for the Win2k AD infrastructure could never produce a matching profile of risks.

After failing to bridge the gap between the two technology teams over the strategy for Active Directory, the decision was taken by the senior IT managers to allow the World Market project team, with the support of Gladstone and Hugh, to undertake a formal evaluation of the single forest and multiple forest model for the World Market group.

### 6.4.3 Cultural Change: from Individualist to Hierarchy

Following the introduction of Hugh and Gladstone into the Win2k AD project team, we witness a movement in the cultural form of the group, towards the hierarchy, instead of the strong individualist and sectarian values demonstrated early on in its formation. The first and most obvious evidence of a turn towards the hierarchy is the approval for the budget and remit of the Win2k AD project team. No longer was the aim of the Win2k AD project team determined bottom-up by the original members of the Win2k AD project team, but by senior World Market IT managers. Here, the voluntary atmosphere of collaboration between the Win2k AD project team members was pushed into the background as the agenda of the group became more determined by the management hierarchy to which the members were now fully answerable. The allocation of funding to carry out the task determined by their management team was interpreted here as a sign of the group adopting the more formal character of a hierarchy.

Within the group, it was the addition of Hugh, a senior infrastructure technician, and Gladstone, a Microsoft consultant that appeared to have the greatest impact. As a representative of the more hierarchical GEM group, Hugh's influence on the project team was to introduce a more hierarchical perspective to the issues considered by the Win2k AD project team.

Gladstone was welcomed by all members of the group in the role of an expert. Following his membership, the group members tended to follow Gladstone's lead. In many situations, the members of the group became heavily dependent on his advice in reaching decisions over which course of action to take regarding the development of the Win2k AD project CII. On many issues, Gladstone's advice was often sought as the final word.

The best illustration of Gladstone's influence and the change in culture of the Win2k AD project team was the decision by World Market's senior IT management team to join the Win2k AD single

forest architecture, instead of developing their own AD forest in a multiple forest scenario. The decision of the World Market IT managers was meant to be based on the unbiased recommendation of Gladstone and the World Market team following their joint evaluation of both the single and multiple Active Directory models for the World Market group.

### *The Mood of Defeat*

The first draft of Gladstone's report received an angry response from the World Market technicians. When Terry, of the World Market team in Toronto, remarked "in my opinion, this whole report is biased..." he was referring to the way in which Gladstone's report (evaluating the pros and cons of the single forest and multiple forest scenarios) appeared to him to favour the single forest model of the GEM team over the multiple forest model put forward by the World Market team.

The mood of the World Market team in the London office at the weekly meeting in which the draft report was discussed was unusually sombre. At the time, I read this mood as an expression of defeat and submission on the part of the World Market team. The GEM team's benediction of Gladstone's findings could be noted by the absence of any comment from their representative Hugh, despite his presence during this meeting.

What was interesting to note about Gladstone's report was the absence of any opinion on the possible devastating consequences of danger in a single forest scenario, and how a multiple forest model would limit the impact of such dangers, especially the type identified by the World Market technicians in the Canada roundtable meeting. Cultural analysis would suggest Gladstone's own cultural commitment, as a member of the hierarchy of Microsoft consultants, and maintained by an opposing cultural form, blinkered his vision of these risks.

I admitted to being surprised over the findings in Gladstone's report. However, more surprising to me at the time was the response from Colin who appeared, almost to sanction the findings of the report. When asked by Terry for his views on the report early on in the meeting, Colin responds that he's happy to accept the single forest model, because it will enable the Win2k AD project team to continue beyond the evaluation of the single and multiple forest models and therefore make progress with the project.

CTR (Cultural Theory of Risk) asserts that individuals are free to choose their cultural form, but once selected, they take on board the whole system of risk preferences of their chosen culture. Following from this, we may argue that Colin's apparent support of Gladstone's findings indicates a change in his choice of cultural forms, from that of individualist to hierarchy. It is possible that Colin may have believed that he had reached as far as he could with the value system of an individualist. Or that the influence of the hierarchy of the bank's IT management now held greater influence over Colin's future within the organisation than the individualist culture of the business trading groups. As an individualist Colin saw how he could better secure his future within the growing hierarchy of the bank's IT management team.

This analysis was given weight when considered against the evidence that, following the corporate restructuring project, the ties between Colin and the former FP technicians to the individualist culture of the FP business trading group had been weakened continually with the dismantling of FP. At the same time, however, the connection of the former FP technicians to the central IT management hierarchy appears to have been strengthened, firstly through the integration of FP Tech into GT, and now through the encroachment of the GEM team and the wider IT hierarchy of the CIBC group. Back in FP Tech, the local FP business managers provided funding for the IT projects undertaken by FP Tech. There was only one level of hierarchy between Colin, as a senior technician, and the FP business leaders. This was Ricky, the head of FP Tech UK. Now however,

following the restructuring project, the levels of hierarchy between the former FP Technicians and the funding for their IT project has increased to include the head of GT in the UK, and the GT management in Toronto, before finally reaching the World Market business groups, who approved funding of all major IT projects within GT. By not adopting the appropriate protocol, as a division of the GT hierarchy, Colin and his team may find themselves in contention with this IT hierarchy, where it now depended on for funding.

Another influencing factor behind Colin's change towards the hierarchy could be rooted in the disastrous consequences of the London Bank Holiday email server crash. The response of the different interest groups involved in the integrated MS Exchange email infrastructure was different from the response Colin had grown accustomed under FP and FP Tech. There, the members of FP Tech would have to respond to the head of FP Tech and the FP business group, whom it could be said, maintained the same, if not similar, individualist cultural values. However, the number of interested parties involved in the integrated MS Exchange email infrastructure was far more extensive. Now the interested parties included the Global Enterprise Management (GEM) team, who owned the global Exchange 5.5 infrastructure, and the GT management team, in addition to the many business groups it served. This was a far larger group than FP, and was more hierarchical in comparison to FP. Moreover, the experience of Colin under this new, more hierarchical group, especially as an outcome of the Bank Holiday email disaster, may have caused Colin to abandon the individualist culture he followed within FP, in favour of the hierarchy. The analysis here is that Colin and the London technicians, having experienced some sort of backlash from the hierarchy of GT and GEM as a consequence of the London MS Exchange email disaster, opted for a new justificatory cosmology and understanding of risks for the development of the CII.

The problem with this analysis however is that, according to CTR, hierarchies do not single out any individual or group for blame. However, we should qualify this claim, by adding that hierarchies

may not single out groups or individuals within the hierarchy for blame, but they can point the finger at those actors that demonstrate a different cultural rationale. In such a case, it would be natural for the GEM team to point the finger of blame at Colin and the UK email team over the Bank Holiday email crash. Furthermore, it would only be logical in this case for Colin and the members of the UK email team to reassess their cultural commitment, in view of the negative feedback resulting from their commitment to the individualist culture.

The claims made by AI and the other UK technicians to the researcher one year after the Gladstone report, provided another explanation for the sudden submission of the World Market team and the decision to abandon the multiple forest and join the retail bank's single forest Active Directory. Our analysis suggested that despite the difference in views over the two Active Directory (AD) models, the risk preferences or cost-benefit weighting of the more powerful GEM group superseded those of the World Market technicians. The claims by AI show that the evaluation process undertaken by the Win2k AD project team, under the guidance of the MS Consultant, was not the actual process through which the decision was made. If the IT directors of World Market were aware at the time that their group was to be brought under control of the then head of the GEM team within the retail bank, then it would have stood to reason that the GEM team would have more influence in World Market's choice of Active Directory models.

In this case, the triumph of the retail bank and GEM team's single forest model, over the multiple forest solution of the World Market group illustrated the triumph of a hierarchy over the individualist rationale. By accepting this decision, albeit reluctantly, the members of the World Market team demonstrated a turn away from the individualist values, which provided the heuristic behind their choice of actions in the past, in favour of a hierarchical rationale, or cultural form. Drawing on cultural analysis, we could also argue here that the role of the MS consultant (as an



expert) in this process was necessary, in order to provide legitimacy to a pre-chosen course of action.

### *Progress of Win2k Project Following Approval of Business Case*

Shortly after the decision to join the single forest AD architecture of the Enterprise Management team, the World Market team presented a business case for the development of a World Market Windows 2000 infrastructure based on a single forest model, which was approved.

The approval of the Win2k AD project business case by the World Market IT management team represented one of the most significant changes from individualist towards a hierarchical culture. The movement of the team's culture towards a hierarchy was reflected in several ways. The most obvious was the provision of funding for the activities of the project team through the approval of the business case. The funding from the World Market IT management team served to demonstrate the role of the Win2k AD project team played as a subunit of the World Market IT hierarchy.

A less obvious, but probably more significant indicator of the sway in the cultural values of the World Market team towards a more hierarchical culture can be identified in the structure of the CII following the decision to join the single forest of the GEM division, on which the business case was based. By adopting the single forest model, the World Market team automatically became a subunit of the (single forest) Windows 2000 hierarchy under the control of the GEM team. This represented a considerable move from the individualist culture towards the hierarchy. Before joining the single forest AD model of GEM's, the locally organised, NOS support teams within World Markets were more individualised because decisions over the development of the NOS and funding for such projects were localised. However, membership of the GEM single forest AD model added a further level of management (namely GEM), which they now require authorisation from to develop their local NOS infrastructure.

The decision to join the single forest AD infrastructure of GEM bound Windows 2000 AD infrastructure of the World Market business into a hierarchical relationship with the Global Enterprise Management (GEM) team, as the owners of the single forest. For this reason our analysis found that the approval of the World Market Windows 2000 business case, based on the single forest model, represented a significant change in the culture of the World Market Win2k project team from an individualist culture towards a hierarchy.

## 6.5 KEY FINDINGS: CIIS AS TECHNOLOGIES OF DANGER

The contents of this section draw on the above analysis of ethnographic data to identify and discuss key findings. The primary finding to emerge from this analysis is that the process of corporate II development constitutes a major transition in the evolution of computer systems from technologies of risk into technologies of danger. As discussed in the theoretical framework developed in chapter 3, our use of the terms risk and danger is based on definitions developed by Douglas (1985) in the Cultural Theory of Risk (CTR) and Luhmann (1993) in his Sociological Theory of Risk (STR): CTR defines risk as a perception rooted in people's cultural commitments. STR defines risk as decisions over potential loss involving uncertainty.

“The distinction presupposes (thus differing from other distinctions) that uncertainty exist in relation to future loss. There are then two possibilities. The potential loss is either regarded as a consequence of the decision, that is to say it is attributed to the decision. We then speak of risk – to be more exact of the risk of decision. Or the possible loss is considered to have been caused externally, that is to say it is attributed to the environment. In this case we speak of danger.” (Luhmann, 1993:p22)

Through a combination of the ideas of risk developed in CTR and STR we arrive at an understanding of risk as decisions over future uncertainty based on a persons cultural commitments.

We agree with Luhmann that a danger is the consequence of externally attributed danger.

Following these ideas we argue that, more than any other technology, information infrastructures (II) posses the distinguishing characteristic of danger. This key finding reveals several important hypotheses discussed in the following sections. These hypotheses address the primary and secondary research questions identified in the literature review chapter of this dissertation. The questions and their corresponding findings are listed below:

1. **How can we understand the relationship between risk, culture, and the occurrence of danger in the development of IT as II?**
  - a. The occurrence of danger in corporate II is influenced by perceptions of risk, that are shaped by the culture of the groups involved in its development.
  
2. **How can we develop strategies to support the management of risk in the development of IT as II?**
  - a. New strategies towards risk management can be achieved by adopting inclusive approaches towards the understanding of risk and danger.

### **6.5.1 Relating Risk, Culture and Danger in CII Development**

In relation to the question how can we understand the relationship between risk, culture, and the occurrence of danger in the development of IT as II, we find that the occurrence of danger in corporate II is influenced by the perceptions of risk, which emerge from the cultural forms of the groups involved in the development of the corporate II.

Our empirical evidence of CII development at CIBC World Market especially demonstrates a tension between the individualist culture of World Market technologists and the hierarchical culture of the retail banking technology team. It is through examination of this tension that we arrived at the above hypothesis. Here, we identify the tension between the opposing cultures of the London World Markets email technicians and the retail bank's technology support team, involved in the development of the MS Exchange email infrastructure, as the source of the danger that occurred through the Bank Holiday email disaster.

### *Individualist Cultural Practices and the Failure of the London Email Server*

In analysing the development of the MS Exchange 5.5 email infrastructure, it was argued that the individualist culture of the FP Tech support team came to dominate the new GT email support team in the London office, following the integration of FP Tech into GT. In terms of risk, the perceptions harboured by the individualist culture came to influence the choices of the new GT London email development team through their decision-making and working practices over the MS Exchange service. The consequence was that the London email team adopted a more lenient approach to the administration of their local email solution, reflective of the market individualist cultural form.

This approach was exemplified by the procedure to allow each individual email user to determine the storage capacity of his/her own mailbox (a practice carried over from FP Tech). Without this email administration practice, which we argue to be the source of an individualist cultural form, the Information Store database file could not have grown beyond the manufacturer's recommended size. Moreover, the London MS Exchange server would not have crashed as a consequence of an overgrown Information Store database file. In which case the Bank Holiday email disaster would have been avoided.

So far this argument describes how the individualist cultural practices of the London email development team led to the failure of the London MS Exchange email server. Based on the concept of risk as perceptions determined by the cultural form of a group, the above argument explicates the relationship between risk, culture and the failure of the London email server through the local email management practices of the London email team. The next section turns attention to the occurrence of danger.

### *Occurrence of Danger*

The aim here is to elucidate the role of danger in the relationship between risk and culture in the development of the corporate II. Following Luhmann's (1993) distinction between risk and danger, the failure of the London email server did not constitute a danger until parties outside the domain of the London email service incurred a loss resulting from the failure. This is not to say that email users in the London office did not incur a loss, but rather, that their loss resulted from the decisions taken by their email support team. Consequently, according to Luhmann's (1993) distinction, this loss represents a risk, and not a danger. This is so because the failure of the London email server represented the risk taken by the London email users in receipt of the benefits of unrestricted mailbox storage. For other users in the global email service outside (but integrated with) the London email service, losses incurred from the failure of the London server represented a danger because they had not been party to the decision-making or risk taking that led to the London server failure. To them, the losses from the failure of the London email server were the consequence of external factors outside their control, factors within their environment (Luhmann, 1993).

To help develop an understanding of the role of danger in the relationship between risk, culture and CII development, we will review how the failure of the Bank Holiday email server escalated into a danger within the corporations global II. Here, we wish to argue that the failure of the London

email server escalated into a danger because of the tightly coupled configuration of the newly integrated global email infrastructure (Luhmann, 1993; Perrow, 1984). When added to the key argument made in the previous section, that the failure of the London email server was caused by the working practices of the individualist cultural perceptions of risk, together they point to a connection between the cultural forms and coupling strategies. This leads to the hypothesis that each cultural form supports a particular approach to coupling. In the case of corporate IIs, the individualist cultural form supports the design strategy of loose coupling, whilst the hierarchical cultural form supports the design strategy of tight coupling.

With this hypothesis in mind, we will examine two scenarios, each supporting alternative cultural configurations from that of the actual Bank Holiday email disaster. In so doing, we aim to show how a mismatch between the culture and coupling resulted in the escalation of the Bank Holiday email disaster into a global danger. To support this endeavour we first recap some key points from the analysis of the Bank Holiday email disaster. An important point to recall is that the Bank Holiday email disaster did not emerge into a danger until after the initiation of the disaster recovery process by the London email technicians. It was the initiation of this recovery process that led to the corruption of the Public Folders component of the global Exchange email infrastructure. From this point on the failure of the London MS Exchange email infrastructure escalated from a local disaster, affecting only the London email service and those trying to communicate to or from the London email server, into a danger impacting various areas of the corporations global II.

### *Thought Experiments of Culture and Coupling in the Development of CIIs*

Here, we will describe a thought experiment of two alternative configurations of culture and coupling to that of our actual case. Our aim in undertaking this thought experiment is to examine how the incident of the Bank Holiday email disaster might have developed with either different cultural forms or coupling strategy. In so doing, we wish to show how the coexistence of opposing

cultural forms within the global email infrastructure shaped the occurrence of danger in the development of the corporate II.

*i) London GT Group and GEM Group as Hierarchies*

In the first scenario, the London email technicians shared the hierarchical cultural form of the GEM (Global Enterprise Management) technology team of the retail bank<sup>3</sup>. In this scenario the London email team would more likely have adopted strict email usage policy and administration procedures for their segment of the new global email infrastructure. In such a scenario the individualist procedure of allowing users to maintain limitless mailboxes, practiced by the London email technicians, would not have been maintained where a hierarchical culture existed throughout the entire global email solution.

*ii) London WM Group and GEM Group as Individualist*

In the second scenario, the individualist cultural form of the London email technicians was shared by the GEM technology team and reflected in their design of the global email infrastructure. In this scenario the resulting global email infrastructure would have been less tightly integrated. In the vocabulary of NAT, it would have been more loosely coupled. This meant more autonomy would have been given to the local regional divisions to determine their own email requirements. The resulting email infrastructure would more than likely have been less standardised and hierarchical, as was the case with the older email infrastructure, which was made up of a variety of different email applications. In this scenario, the potential for opportunistic, maverick individualists to cause disasters still exist. Some might even argue that this potential would increase. However, the loosely coupled configuration of the global email infrastructure, favoured by the dominant

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<sup>3</sup> GEM is the retail banking technology management team appointed by the senior management of CIBC to manage the outsourcing contact with ICA to integrate the global email infrastructure through an outsourcing contract.

individualist culture, would act as a defence against the spread of these local disasters into global dangers.

A useful example of the second scenario can be found in the old email infrastructure, prior to global integration. In this loosely coupled email infrastructure any disaster within the local London email server, would have been largely limited to the email users of either the Open Mail or CC Mail systems in the London office of the investment bank. The individualist practices of groups like the London FP Tech team might have exposed their users to more risk, however other groups in the corporations II were more protected against such risks. This is because the integration of groups within the old email infrastructure was more loosely coupled than the new global MS Exchange infrastructure. Hence, despite the individualists being prone to accidents resulting from their impulsive, opportunistic behaviour, the preference of the individualist culture for loosely coupled relationships serves to protect them from incurring danger through the risky behaviour of others.

In the first of the above scenarios, in which the global email infrastructure is dominated by a hierarchical culture, which we have argued supports tight coupling, each group would be more exposed to disasters resulting from the actions of other groups within the II. This is because of the way in which tight coupling facilitates the faster spread of disasters through the corporate II. However, like the individualists of the second scenario, hierarchists, with their preference for tight coupling are also protected, but in a different way. Hierarchists are protected to some extent against the limitations of tight coupling through their strict adherence to procedure and risk averseness. This cautious approach of the hierarchist reduces their potential for risky behaviour whose negative consequences can quickly spread into dangers for other members of their tightly coupled II.

In the two scenarios of global II development, one dominated by the hierarchical culture and the other by the individualist culture, we find that each cultural form is armed with strategies to protect



them against dangers. These two scenarios are useful in that they demonstrate the validity of the above hypothesis, which asserts that each cultural form supports a particular approach to coupling. However, these scenarios describe thought experiments rather than real cases of II development. Moreover evidence from the actual narrative of II development presented in this study revealed a more discordant match between culture and coupling within IIs. This narrative showed the development of a tightly coupled global CII that was administered (in most part) in accordance with the cultural practices of the hierarchy. Unlike the above thought experiment, this tightly coupled global II was punctuated by at least one segment that was administered in accordance with the risk perceptions of the individualist culture, which favoured the strategy of loose coupling. This discord arose through the development of a hierarchically structured global email infrastructure with its tightly coupled configuration disrupted by at least one group (the London division) that adopted the risk perceptions of the individualist culture in managing their segment of the global email infrastructure.

The existence of the individualist working practices of the London division precipitated the Bank Holiday email disaster. The further escalation of this initial failure into a danger was enabled by its accommodation within the tightly coupled global email infrastructure. The choice of a tightly coupled II, as argued above, is favoured by the risk preferences of the hierarchical culture that was promoted by the GEM retail banking technology group.

Following from this analysis we find that the occurrence of danger in the development of CIBC's global email infrastructure resulted from the tension between the individualist cultural form of London based, investment banking (GT) technology group and the hierarchical cultural form of the GEM Canadian based, retail banking group.

### *Risk Factors and Strategic Alignment Approach*

This tension and the problem of conflict between the working practices, and the coupling strategy that it infers, is not entirely new to the IS field. Established IS researchers have grappled with such issues within areas of factors research and strategic alignment research.

Proponents of the factors-based IS risk approach may surmise from these findings that cultural forms are an important factor in the management of IS risk, and that IS risk analysts should exercise care in addressing the possible risk of a mismatch between the cultural form and coupling strategy in II development (Cavaye, 1995; Levine, 1993; Nandhakumar, 1996). Similarly, proponents of the strategic alignment approach may deduce from these findings that IS risk managers should ensure that the culture of groups involved in the CII are in alignment with the strategy of (Broadbent and Weill, 1993; Weill *et al.*, 1996; Weill *et al.*, 2002). Although risk factors-based and strategic alignment approaches both have their use, the present study supports the findings made by critics of these approaches; namely that they fail to address the complexities involved in development and management of information systems (Ciborra, 1997;2000; Mitev, 2000;2003; Myers, 1994). Hence we find the need for more challenging and less simplistic approaches in addressing issues of risk, culture and danger in the development of corporate IIs.

### **6.5.2 Corporate IIs as Systems of Danger**

In this section we will examine the features that constitute corporate II as dangerous systems, and why such systems are beyond the capabilities of simplistic managerial approaches. The above analysis of the email infrastructure shows how the existence of opposing cultural perceptions of risk can lead to the occurrence of danger. Here we will argue that the development of IT as II must always constitute the tight coupling of systems. We will then combine this principle with key characteristics identified in the installed base notion of IIs (see chapter 2) to argue that the presence of danger can never be removed from the process of II development.

### *CII Development and the Tighter Coupling of Heterogeneous Systems*

An important finding to emerge from this study is that the development of IIs represents a process of tight coupling. In asserting that tight coupling is a fundamental feature of IIs we do not claim that all IIs are coupled in the same way. Instead, we wish only to highlight that each individual process of II development involves the tighter coupling of existing systems through their integration. The consequence of this process of integration is that the II always represents a more tightly coupled configuration of systems than those it replaced. But tight coupling in itself does not constitute danger. For this, there needs to be differences amongst the systems or groups that are integrated in the formation of the II. These differences are captured by the characteristic of heterogeneity identified in the installed base notion of II (Hanseth, 2002a; Hanseth and Lundberg, 2001).

### *The Hierarchical Culture and Risk Preferences of IIs*

For this process of integration to work the different groups in the tightly coupled environment of the II must adopt a more hierarchical cultural form as a justificatory cosmology suited to large organisations (Douglas, 1982). This requirement is determined by the transition of the groups that form the II, from separated (loosely coupled) groups, to integrated (tightly coupled) systems through the development of the II. Post integration, these groups must consider with more care how their actions may impact others in the II. In other words they must adopt perceptions of risk and attitudes towards risk taking that are better suited to large organisations in order to support their new role as a system in the larger system of the II. Hence the risk preferences of the hierarchical culture and the working practices they support form an important feature of the development of the II.

As identified earlier through the thought experiment of different scenarios of culture and coupling, a global email infrastructure dominated entirely by the hierarchical culture and its working practices would have prevented the occurrence of the Bank Holiday email disaster. However, the heterogeneous character of groups that form the corporate II makes the task of developing a CII dominated by one coherent cultural form, very difficult. A further characteristic identified in the installed base notion of IIs that renders this task impossible is that of openness. The openness of the corporate II makes it susceptible to the cultural practices of groups outside the boundaries of the corporation in which it is developed. The consequence is that even in the most unlikely circumstance in which the development of the CII resulted in a homogeneous standard of culture and working practices throughout a corporation's II, this II would still be susceptible to dangers through the actions of groups outside the boundaries of the corporation. The openness of IIs implies that a CII will always be susceptible to the activities of groups outside the corporation's boundaries. It is with these reasons in mind that we argue CIIs constitute technologies of danger.

### **6.5.3 Inclusive Risk Management: First, Second, and Third Order**

#### **Risk Analysis**

This final hypothesis corresponds to the research question: how can we develop strategies to support the management of risk in the development of IT as II? Here, we argue that useful new strategies towards risk management can be achieved by adopting a more inclusive approach towards this process of risk management. This would be a pluralistic approach that draws in the different perceptions of risk maintained by the various cultural forms of groups involved in the development of the corporate II.

#### **6.5.4 Limits of First-Order Observation**

The problems with most existing risk management approaches is that they follow the common policy of the rational technoscientific model, and therefore cannot see what they do not see (Luhmann, 1993:p14). In CTR terms, they are restricted to one of the various cultural forms. Therefore they can only support one way of perceiving risk. Moreover, they remain blinded by cultural bias. The obvious limitation here is that the outcome of cost benefit analysis will be sensitive to threats identified by the favoured cultural form, whilst blind to those visible to other cultural forms.

This presents us with the problem of first-order observation as identified in Luhmann's (1993) Sociological Theory of Risk, for such methods restrict the risk analyst to the first-order level of observation. Rather than suppressing or excluding alternative perceptions of risk by restricting risk analysis to observations of the first-order, the management of risk within the global context of our contemporary society should seek to inscribe and accommodate differing perspectives of risk. Such an inclusive approach is deemed necessary in processes such as the development of corporate II, which encompass the integration of complex technologies and groups of varying institutional rationales.

#### **6.5.5 Grid-group Analysis: From First-order to Second-Order Observation**

What is required in the management of risk within such context are strategies that enable the risk analyst to traverse between first-order and second-order levels of observation in their analysis. We argue that an example of such a method can be found in the grid-group framework of CTR used in the analysis of the present study. By using the grid-group method, the risk analyst is able to

facilitate an inclusive approach through the conscious identification of risks from each of the different cultural forms and their unique perspective on risk.

A useful way to produce a more comprehensive list of risks can be achieved by involving different groups (with different perceptions of risk) into the process of risk identification in the development of the CII. Such an inclusive approach can lead to a richer, more comprehensive list of risks facing the CII.

The case of the Windows 2000 Active Directory (Win2k AD) project serves as a useful example of how inscribing groups of conflicting cultural forms can contribute towards identifying hidden risks in the CII development process. The Canada Round table meeting in which members of the World Market team were invited to table their views and concerns over the single forest Win2k AD model of the Retail banking group is an example. The dialogue of this meeting displayed heated discussions in which conflicting views over the potential for risk and dangers in the proposed Win2k AD model were asserted and defended between the conflicting cultural perspectives of the World Markets and Retail Banking technology groups.

The type of inclusive approach that we advocate, because it includes an alternate perspective into their II development process (although inadvertently), would have made each of the two groups aware of the risks of their proposed strategy as perceived by the other group. In this manner, each group would have been able to benefit from a more comprehensive menu of risks facing their proposed strategy.

This argument is undermined by CTR, which claims that each group in the development of the CII is committed to their chosen cultural form and deflects accusations from other groups with strategies of blame. This claim was evident throughout the disputes between the representatives of

the Retail Bank and the World Markets investment bank over the proposed AD architecture in the Win2k project.

However, although this may be the case, we nevertheless hold that it represents a step forward from the situation where alternate risk perceptions are suppressed in the process of analysis only to surface through working practices in various areas of the corporate II.

### **6.5.6 Analysing Risk Analysts: From Second-order to Third Order**

#### **Observation**

Our final finding with regards to the development of new risk management strategies would be to turn the analysis of grid-group typology towards the direction of the risk analysts. By this, we intend that the group responsible for identifying the cost benefit of risks in the development of the CII should themselves be placed under the scrutiny of the grid group typology. In this way it may be possible to identify the perceptual bias behind the risk management process guiding the development of the CII.

# CHAPTER 7: CONCLUSION

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## 7.1 INTRODUCTION

The aim of this study has been to extend our understanding of the dynamics between risk, culture, and the occurrence of danger in the development of corporate Information Infrastructure (II). For this purpose we adopted a theoretical framework based on seminal contributions to sociological theories of risk. Under the guidance of the ethnographic methodology, specifically autoethnography, we sought to disclose the cultural practices of groups involved in the process of corporate II development in a particular financial organisation. This concluding chapter highlights the achievements and contributions of this dissertation. To assist with these aims the next section presents an overview of the dissertation. The following section addresses the contributions of the dissertation regarding theory, methodology and practice. The final part examines the limitations of the study, and explores potential areas for further research.

## 7.2 OVERVIEW OF THE DISSERTATION

**Chapter 1** introduced the dissertation by discussing IS risk research as the domain of study. The chapter explained how IS risk researchers need to embrace concepts of IT that better capture important changes in IT itself since its development over the past fifty years. The preference for technoscientific ideas of risk over sociological concepts was also identified as a crucial deficiency



in the research literature on IS risk. The banking corporation in which the researcher collected ethnographic data was introduced, and the importance of understanding the place of risk in the workings of investment banks was discussed. Here, we explained how the rapid rise of operational risk from an issue of low to high priority in banking is causing problems for the industry because of its incompatibility with the traditional quantitative risk management methods in the banking sector. We argued that where rational technoscientific methods fail, sociological concepts of risk would fare better. The final section of the chapter reviewed the remaining chapters of the dissertation.

**Chapter 2** reviewed the literature on the subjects of risk, IS risk research, and II. The review of risk research identified a gross imbalance in favour of technoscientific theories of risk. Even in the risk discourse of the social sciences we find the dominant concepts of risk rooted in the mathematics of probability. This is despite the significant contributions to the risk discourse in recent decades by sociology, cultural anthropology, and other social sciences. The review identified limitations in the emerging body of sociological theories of risk resulting from their relative infancy and lack of maturity when compared to rational technoscientific theories of risk. The proposal for the integrated use of sociological theories of risk was put forward as a useful strategy to overcome these limitations.

The second part of chapter 2 identified a similar preference towards technoscientific approaches from a review of IS risk research. Here, we argued for the need of sociologically oriented IS risk research that addressed the often acknowledged, but yet unaddressed, issue of culture in IS risk. The review of II research identified the notion of an installed base of II as a useful concept that captures important characteristics of contemporary ICT. The findings of this literature review chapter were then channelled into research questions in the final section.

**Chapter 3** introduced the theoretical framework used in the analysis of our empirical findings. This framework addressed the request (in the first part of the literature review chapter) for an integrated approach towards the use of sociological theories of risk within IS risk research. This was achieved by combining concepts from the Sociological Theory of Risk (STR), the Cultural Theory of Risk (CTR), and Normal Accident Theory (NAT). Of these CTR emerged as the primary theory of analysis allowing us to examine issues of risk from a cultural perspective. Of the two supplementary theories, NAT facilitated the analysis of danger in the development of the corporate II. STR, though not as extensively utilised in our analysis as the other two theories, served as an important linchpin enabling the effective integration of CTR and NAT. This combination of theoretical concepts was deemed necessary in studying the dynamics of risk, culture, and danger that emerged through the course of ethnographic fieldwork.

**Chapter 4** described the ethnographic research strategy adopted for this study. Our desire to embrace a cultural perspective towards IS risk research was an important factor in the selection of ethnography, a method created by anthropologists for the study of culture. The first part of this chapter examined the philosophical assumptions of the research. This was followed by a detailed discussion of ethnography and the autoethnographic style of research used by researchers studying communities, which they themselves are members. The next section reviewed the state of ethnographic research in the IS field. We charted the history of key contributions within the IS field based on ethnographic studies, before examining the benefits to the IS research community that can be gained from autoethnography. We argued that many IS researchers conduct autoethnography in all but name. Moreover, these researchers can greatly extend the value of their research contributions through conscious use of autoethnography.

Further sections described the data collection techniques of participant observation, ethnographic interviews, and fieldnotes that formed the fieldwork. One of the most important issues in modern

anthropology concerns the debate over ethnographic writing. We examined this debate by discussing different styles of writing, focusing on our preferred style of impressionist tales (Van Maanen, 1988). Ethnographic research, especially autoethnography, presents some of the most challenging matters for ethical consideration. We examined these ethical matters in the latter parts of this chapter. This was followed by a discussion of our data analysis techniques, before concluding the chapter with a summary of its achievements.

The first part of **chapter 5** set the context of our case by detailing the background of the organisation, and key developments in its recent history. This broad perspective was refined to focus on the newly formed FP Technology group through the biographical experiences of the researcher as a full member of this group. This section described the individualist cultural practices of the FP technology team in the London office, and how these practices compared with the hierarchical practices of the more established GT technology group. The main body of the case study focused on the narratives of the MS Exchange Email and MS Windows 2000 network operating system (NOS) infrastructure development projects. The case of email infrastructure development detailed the occurrence of disaster to the global email service. The final part of the ethnographic narrative detailed the development of the global Windows 2000 NOS. This second case charts the conflicting views and decision making over the design of the Active Directory model for the corporation's global Windows 2000 infrastructure.

The analysis undertaken in **chapter 5**, applied the grid-group method of CTR as the central component of our theoretical framework to examine the multiple cultural forms, the dynamics between the different risk perception they support, and the shaping of the corporate II. The first section examined the culture of the organisation through the risk perceptions and cultural practices of the London technology support teams. This section showed how the FP Tech team in the London office came to be dominated by the individualist culture, and how the practices of the

London email support team contrasted with the hierarchical culture influencing the development of the global MS Exchange email infrastructure. The narrative of disaster in the global MS Exchange infrastructure was then analysed with concepts from NAT, which details how the initial localised disaster escalated into a globalised danger as a consequence of tight coupling. The next section analysed the narrative of the global MS Windows NOS using CTR. This analysis focused on the opposing perceptions of risk displayed in the Canada round table meeting between representatives of the investment and retail banking technology groups. This analysis was a continuation of the analysis of the global MS Exchange narrative, which surfaced at various point of this later analysis.

The final part of the analysis chapter presented a discussion of the key findings that emerged from our analysis of empirical findings. This brought us to the near-present, concluding the chapter. As stated in the above introduction, the focus of chapter 6 was to identify the contributions of this study. Following this overview of the dissertation the chapter presented the contribution of the study, followed by the limitations and areas of further research.

## 7.3 CONTRIBUTION

This section represents the main body of the present chapter. Here we identify and discuss contributions derived through this study to the areas of practice, research, and theory.

### 7.3.1 Contribution to the Practice

This study offers contributions to the work of practitioners in the area of risk management, and more specifically IS risk management. The significance of risk management throughout industry has experienced rapid growth in recent years. Michael Power (1999), for instance, in his thesis *The Audit Society*, argues that the pressures of risk management in organisations are becoming more and more stringent with the advancement of contemporary society. This argument is further

supported by sociologists Ulrich Beck and Anthony Giddens through their theses of Reflexive Modernisation, in which they describe issues of risk and risk management as the distinguishing feature between our contemporary society and previous epochs (Beck, 1992;1999; Beck *et al.*, 1994; Giddens, 1999). Within the Banking sector recent developments in the regulation of operational risk provides one of the most useful illustration of their argument (Power, 1999;2005).

The development and use of a framework of sociological theories of risk to examine issues of risk presents the community of risk practitioners (especially those of the IS community) with insights into the value of sociological concepts in the analysis and management of risk. As organisations are placed under more pressure to measure and manage issues of operational risk, issues that do not lend themselves to quantification and technoscientific methods, the value of alternative approaches to risk will gain.

Of the various sociological concepts adopted in this dissertation, the idea of second order observation developed in the Sociological Theory of Risk (STR), and the grid group method of the Cultural Theory of Risk (CTR), will prove especially useful in assisting risk practitioners overcome the limitations inherent in technoscientific techniques dominant amongst contemporary risk management methods. These concepts (discussed in the key findings section of chapter 6) will not lead to a panacea for risk management. However, we argue they can represent a step in the right direction, by encouraging the risk practitioner to grasp the multiplicity of risk; a point often overlooked by technoscientific approaches.

For practitioners in the domain of IS risk, an important contribution is derived from the treatment of culture in this study. Although widely acknowledged as important throughout the literature, the treatment of culture has for many years eluded IS risk researchers. Through the use of CTR to examine the relationship between risk and culture, this study is able to support IS risk practitioners

in understanding how to address issues of culture in the management of risk. Here, the grid-group method was found to be a useful tool to aid risk practitioners in that analysis.

### **7.3.2 Contribution to Research**

#### *The Ethnographic Method of Autoethnography*

The novel use of autoethnography represents an important contribution to research within the IS field. Autoethnography allowed the researcher to connect biographical narratives of his lived experiences within the organisation prior to the fieldwork with the narratives that emerged through participant observation during the actual fieldwork.

IS researchers often struggle with the dual role of researcher and practitioner in many IS studies. Testimony of such struggles is evident throughout the IS field (Bener, 2000; Wagner, 2004). Whilst acknowledging the value of these methodologies, we argue that by enabling the fieldworker to traverse both the paths of researcher and practitioner, the ethnographic method of autoethnography can present a useful strategy with which to address this struggle. Moreover, the adoption of autoethnography will allow IS researchers to contribute to developments in ethnography, which represent a more widely established social science research strategy than either longitudinal case studies or action research.

#### *Ethnographic Writing Style*

In recent years anthropologists have become occupied with debates over ethnographic writing style. Many anthropologists have argued that the adoption of new writing styles create opportunities for new theories (Van Maanen, 1995b; Clifford 1986). Such calls have accompanied appeals for ethnographers to experiment with different approaches in writing up findings from fieldwork. Despite the increasing adoption of ethnography by IS researchers, the IS field has yet to embrace

the debate over writing styles. Instead IS researchers construct text without any conscious consideration for the style of writing, and its importance to communicating their work. One notable exception is the pioneering work of Ulrike Schultz (1997), who adopted the “confessional” style of writing for her PhD thesis on the information practices of knowledge workers. The present study draws on the alternative “impressionist” writing style for the first time within the IS field. In so doing this study is able to contribute to an emerging debate over writing styles within the IS field. We believe that the increasing adoption of ethnography within the IS field can, in time, lead to further contributions in this debate.

### **7.3.3 Theoretical Contribution**

#### *Integration of Sociological Risk Theories*

An important theoretical contribution is derived from our adoption and integration of sociological risk theories. Common strategies for integrating sociological theories often involve supplementing them with technoscientific risk theories (Bener, 2000; Renn, 1998). We contend that the strategy of combining sociological risk theories with technoscientific concepts undermines contributions of the former, by inviting the limitations of the latter. This strategy therefore defeats the purpose of sociological risk theories.

Rather, our alternative strategy of integrating concepts from different sociological theories of risk addresses the limitations arising from the infancy of sociological theories, without incorporating the deficiencies of the technoscientific approach. Furthermore, the integrated framework adopted in this study provides a good indication that the emerging body of sociological risk theories presents a viable alternative to the established technoscientific approach. This insight not only benefits risk researchers within the IS field, but also those within the wider domain of risk research.

### *CTR and IS Risk Research*

A useful contribution to theory within the IS field is derived from the use of Mary Douglas's Cultural Theory of Risk (CTR) as the central component of our theoretical framework for the analysis of risk, which represents one of the few uses of this theory within the IS domain. A rigorous review identified only two other studies within the IS field that have applied CTR. The most recent is the work of Mittleton-Kelly (2004), which does not address the subject of risk, for which CTR was developed. Instead it draws on the grid-group method to examine the cultural forms of IS professionals. The other study, by Bener (2000) is focussed on issues of IS security risks. An important limitation of these two previous studies can be identified in their use of survey methods to gather data from participants. Having emerged from the domain of cultural anthropology, CTR is better suited to the analysis of qualitative data, of the kind obtained through the ethnographic method.

Moreover, whereas the present study adopts all the ideas of CTR as the central component of our theoretical framework, previous studies incorporated only parts of CTR as a supplement to other theoretical ideas. The use of CTR in the present study is therefore more comprehensive, and the insights more detailed than earlier studies in the IS field.

### *NAT and STR in IS Risk Research*

Similar to CTR, there are few examples of Charles Perrow's Normal Accident Theory (NAT) and Niklas Luhmann's Sociological Theory of Risk (STR) within the IS field, consequently, important theoretical contributions arise from their incorporation in the theoretical framework of this dissertation.

The analysis of danger in the global MS Exchange email infrastructure demonstrated the value that can be gained from the adoption of NAT within IS risk research. This value is enhanced by the



distinction between risk and danger made in STR, which has eluded IS risk research and much of the wider risk discourse prior to the work of Luhmann (1993). The distinction between risk and danger facilitates the integration of accident theories like NAT with risk theories like NAT. Without this important distinction, the terms risk and danger are mostly deployed in a synonymous and confusing manner.

A case in point can be found in Ulrich Beck's (1991) Risk Society thesis, which is widely acknowledged as amongst the most important contributions to research into the sociology of risk in recent decades. The key argument in Beck's thesis is that contemporary Western Societies have become dominated by risks due to the development of advanced industrial processes (or globalisation). He argues that these processes produce side-effects, spill-over, and unintended consequences that pose negative implications for groups outside the considerations made in the design of these processes. Beck therefore finds that advanced industrial processes produce new, greater risks than the ones they aimed to address. Unlike Luhmann (1993) and Douglas (1986), in Beck (1991) takes little time to examine the concept of risk beyond its etymology. The consequence is the notion of risk adopted by Beck (1991) remains vague. Moreover, the use of the distinction of risk and danger developed in Luhmann's STR points to a weakness in Beck's argument. Beck's argument states that as an outcome of globalisation (or advanced industrial processes) contemporary societies have become dominated by risks as a distinguishing feature. However, the distinction of risk and danger, developed in STR, shows that processes of globalisation are leading to the proliferation of dangers and not risks.

This finding has important implications for the Theory of Risk Society, which remains the most widely adopted of the sociological theories of risk. Within IS risk research, Beck's ideas have been adopted to challenge orthodox technoscientific concepts. Here, proponents of the Risk Society thesis argue that the development of new ICTs such as Information Infrastructures, which have the

aim of reducing risks, serve to create new and more challenging risks (Ciborra and Hanseth, Forthcoming-2007; Ciborra and Osei-Joehene, 2003; Hanseth *et al.*, 2006). However, the contribution of this insight appears limited if we accept the claim that risks are intangible and a product of perception. For if this is the case, then how can it be possible to determine the validity or magnitude of one risk over another? In following the thesis of Beck, that advanced industrial processes are creating new global risks, these authors have been misled towards the findings that ICT (or in our case II) development lead to the globalisation of risks. In contradiction, we find that processes of advanced industrialisation, such as II development, lead to the globalisation of dangers. Our contemporary world should therefore be characterised as a transition from an industrial society characterised by risks (a society in which the possibility of losses arising from risk taking remain largely bounded to decision takers) towards a global society of dangers. The distinction being that in the global danger society the losses arising from risk taking are no longer bounded to the risk taker, but now become shared amongst others in the environment of the society, and indeed globally.

In concluding this section we must emphasise the significance of this contribution to IS risk research and the wider risk discourse. An understanding of society as one dominated by danger disposes its members towards organisational strategies that differ from those of an understanding of society as being dominated by risk. Whereas the latter appears to favour proactive individualist strategies, with their focus on profit and self-interest, the former appears to favour the more cautious sectarian approach, with their focus on the consequences of their actions on the environment and its subsystems. Is it any wonder then that in the conclusion of his seminal work, Beck identifies sectarian movements, (e.g. environmental and social protest groups), as the way forward in addressing what he sees as risks (but we have identified here as dangers) of our contemporary age?

## 7.4 LIMITATIONS AND FURTHER RESEARCH

### 7.4.1 Ethical Considerations

One of the challenges encountered in this study resulted from the ethical considerations of ethnographic research and specifically autoethnographic methods of data collection. Two notable issues that may be considered as limitations in this study regard (i) the gathering of data through full member participant observation and (ii) electronic media. In both cases, controversies over consent of the research participants arise.

#### *Full Member Participant Observation*

In the case of full member participant observation the researcher is accepted as an employee within the community of study. This can lead to the problem of false identity or deception, when information collected under the identity of an employee is then used under that of a researcher. Such issues of ethical consideration are prevalent in qualitative and ethnographic research. To address such concerns the researcher drew on the recommendations from anthropology, which are documented in the research methodology chapter. The interest of the researcher was presented to the management of the organisation, and wherever possible the field worker identified his interest as researcher to participants in the process of data collection.

#### *Autoethnography*

The most controversial method of data collection adopted in this study was the autoethnographic method of biographical data gathering through life histories. This technique can be considered controversial because it allowed the researcher to draw on his personal experiences as an employee in the company of study, prior to commencing the study. This was possible because the researcher had for several years worked as an employee within the IT infrastructure support team of the

organisation before undertaking his PhD research. The question of ethical consideration surrounding the use of data gathered prior to the commencement of participant observation, and the request of permission to undertake the study, must surely be raised. Here we contend that the acquisition of data through the researcher's life history as a full member of the organisation is equivalent to the narratives of lived experiences often relayed to the ethnographer by research participants during the conduct of fieldwork. The usefulness of autoethnography is that rather than suppressing this useful source of research material, it provides the ethnographer with the tools to mine it usefully.

### *Electronic Data Collection Media*

The use of electronic media to gather research data presents a serious ethical dilemma. The two narratives of the global email infrastructure and the network operating system (NOS) infrastructure both required the use of email records, which were often forwarded on to the researcher by managers in the IT department. In most cases the original sender of the email was not aware that it would be sent to a researcher investigating issues of risk in the development of the IT infrastructure.

This also raises the issue of consent. The clearest breach of consent through the use of electronic media occurred through the participation of the researcher in the weekly conference calls for the global Win2k project. These calls involved teams of technicians from all the global divisions of the World Markets investment bank calling into the conference to discuss the global Win2k project. The technical team in the London office, where the researcher was permanently based, were the only members of the conference call to be aware of the identity of the researcher. Eventually, towards the latter stages of fieldwork, when the researcher visited the Toronto head office, his identity was revealed to this team also.

The ethical considerations of data collection through electronic media can be expected to receive more attention with the widespread diffusion of ICT. More and more social researchers of all disciplines will face this issue, which researchers in the IS field must be in a position to address.

### **7.4.2 Culture of Global Technology Support**

A useful area of further research is that of culture and global technology support/development. Such research can ask: what is the nature of culture that exists between global technology support/management teams? How is the culture between such teams created and sustained? What is the nature of the relationships between a technology (its implemented/supported or configured structure/features) and the culture of the team(s) that work with them. For instance: how was the adopted structure of the MS Exchange and Win2k infrastructures affected by the culture of the technicians/managers and vice-versa.

### **7.4.3 Anxiety Amongst Global Corporate IT Developers**

Various issues of interest surfaced in the analysis of the empirical data and the literature to present themselves as useful areas for further research. One of these was the subject of anxiety amongst the group of CII developers within the study. As an outcome of the integration of previously localised IT infrastructures into global CII, the local infrastructure technicians subsequently had to work closer together in globally organised teams. In the study of the Win2k project, within the investment-banking team alone, we observed the expansion of the original global Win2k meeting into several meetings. These included the desktop standards meeting, and the server standards meeting. All these teams involved the establishment of project teams comprising of technicians located in the various global divisions of the organisation. What this represents is the interaction of previously separated groups. These groups, all committed to the cultural forms of their local

divisions are now being required to negotiate their roles within the newly created global project team.

The interaction with the new groups can often introduce the members to new cultural forms that may clash with the culture within their local divisions. This may put some individuals in a position where they are interacting with multiple cultural forms through their role in one particular project. It is this interaction, and its possible contribution as a cause of anxiety amongst participating individuals, that we wish to focus on as a useful area for further research. Simply put, the study of anxiety as a consequence of the interaction of different cultures, which occurs when technicians who work in a particular culture interact with groups with different culture. The assumption here is that anxiety may arise in people when placed in an environment of a different cultural forms.

The opinion of this author is that the increasing development of global CIIs across previously disconnected businesses has the consequence of introducing the members of the project teams to different cultures of rationality that they then have to exist within. Furthermore, this increased interaction with different cultural forms may lead to an increase in feelings of anxiety amongst those technicians.

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# APPENDICES

## APPENDIX 1: DETAILED EXCERPT OF CANADA ROUNDTABLE MEETING

| Speaker (group) | Quotation   |
|-----------------|---|
| Colin (WM)      | Well, I thought... are you going to touch on things like risks because for example, within our labs, there are just a few things we've come across, like for example an authoritative restore – and there is a lot of warnings about how it could potentially – depending on how it's done, if a server is brought offline and how it is plugged in etc... it could end up polluting your whole forest. In my Financial Products [FP] days under NIS+, when we first implemented that, we saw something where emm... a knock on effect rippled through and took all of us out. So of course we would be concerned that something could ripple through and that could affect the whole forest. Now here we have one of our other major concerns. |
| Spk#?(GEM)      | Yes, and it's a legitimate concern and we talked about that actually. And we really want to actually limit that through the security and access groups and all that... emm... The only people in our environment that will really be able to, in our environment, be able to create domain controllers and do restores and stuff like that will be the ICA ...  |
| Colin (WM)      | Oh, but you said that CIBC World Markets will have their own domain and we can do what we want in that domain...  |
| Spk#?(GEM)      | ...Exactly...   |
| Colin (WM)      | So I could come along and I could know nothing about active directory and think, "Shit! I want to do an authoritative restore." And do it completely the wrong way and end up propagating it into the forest...?  |
| Spk#?(GEM)      | ..No.. not .. errr..!   |
| Colin (WM)      | ..But you just said ICA are gonna be the only people..  |
| Spk#? (GEM1)    | In our environment..  |
| Colin (WM)      | But we're a domain of.. we're a tree of your forest though, World Markets, so..?  |
| Spk#?(GEM1)     | . I.. I'm just talking about this area here, and certainly you have the ability to er..   |
| Colin (WM)      | .. We could corrupt your forest though potentially?   |
| Spk#1 (GEM)     | Yes   |
| Mike L (WM)     | .. Hugh, do you honestly think that there will not be any domain corruptions.. I mean like, World Markets is not (quote on quote) the only black sheep in the town right. [All ☺ ☺ ☺] You see, Colin's question, is not so much a World Markets question as a design philosophy [{"Right, yep"}]. You know there's some strings to ... the homogeneous right. But then diversity gives you some other benefits: like you don't take everyone out right. So really it's a design principle question rather than a World markets question, like <b>how vulnerable is this infrastructure we're building to ..., never mind deliberate malpractice, you can never protect against everything right...</b>  |
| Angelo (WM)     | And the more homogeneous the environment, the faster a mistake will propagate and the more err... the more devastating it will be. It's going to be hard to explain to the brokers, why when we added another teller in an office we lost our trading desk – they're completely unrelated business lines  |
| Spk#? (GEM)     | [Explains that they have been working closely with the different lines of business to address these issue and establish procedures to curb any such dangers and that the structure they have provided, if the different business units stick to it will help to address this issue].  |
| Mike L(WM)      | [makes a funny remark about the definition of cowboy]   |
| Spk#?(GEM)      | [...]   |
| Spk#?(WM)       | [...]   |

| Speaker (group) | Quotation  |
|-----------------|--|
| Spk#?(GEM)      | Well there's security stuff that we're trying to do for just that particular reason right, so that someone doesn't grab a group policy and shuv' it in to restrict some workstation and have it propagate through the organisation and it comes down to how to control ownership and how to control authorisation and where we delegate authority. So at the business unit level under AD.CIBC.COM delegation authority happens only at the OU level. There will be er.. no domain access, no domain admin account at that level. There will be delegated authority to do particular jobs [1]. Ability to change something that er can <i>damage</i> the business unit level or that really has an impact on em the organisation will be taken away. Things like that falls under change control. We have change control so I think that we'll be testing rollout plans ... So we want to protect you form yourself as far as possible by limiting your ability to actually do harm to <i>anyone</i> . |
| Colin (WM)      | I think it's more emm... unpredictable things happening, like em.. described, AD, as the [MS] Exchange on steroids, how under disaster recovery situations – I've already, you know, had a really bad experience of unpredictable behaviour [with MS Exchange] so, if you multiple that by 100 with AD and Microsoft say look, you know, we're aware thing could go wrong under these conditions etc – there's a lot of unknowns there, and if it's the entire enterprise then .. Well think about authoritative restores etc...   |
| Spk#?(GEM)      | If you have the ability to do authoritative restore on objects that exist outside your tree and you do it without understanding the implication then yes you will get yourself into trouble .. Ja.. just .. IF YOU DO WRONG THINGS BAD THINGS HAPPEN SO... The design is to make sure that one you have a thing to stop you to do the really bad things. Some of the really bad things you can't do [{"right"}] ermm.. so that you have a single point that you can finger at and some one is responsible, and that they are going to do it in controlled time, erm.. you have that issue regardless of your own forest or whether it's a single forest or not.  |
| Colin (WM)      | But anybody with a domain will be in that position, any administrator who has a domain is .. is that correct?  |
| Spk#?(GEM)      | Well under AD.CIBCWM.COM ... you know all of the directory is based upon service level agreements that we have with ICA [Inform Communication Associates] and change controls... Emm you ability and our ability, from CIBC's point of view to change back over to CIBC World Markets will likely be limited because ... we will likely take most of the <i>controls</i> of that so that we do have the ability to control ... there are .. the are ... for that that we haven't yet confirmed.  |
| Steve K (WM)    | Colin also made a very good emm point; very subtle but a very good point emm.. we're making an assumption that Active Directory [AD] is floorless in its operation, that it's actual operation is synonymous with it's described behaviour.. and there is no software nirvana like that.   |
| Spk#?(GEM)      | :)... And you have that problem regardless... Emm design is not the issue, there are issues apart if there are...  |
| Steve K (WM)    | Yes, but now, statistically you have more points of failure that you can start that chain reaction.  |

## APPENDIX 2: EXCERPTS OF WIN2K AD MEETING TO DISCUSS GLADSTONE'S REPORT.

| Speaker | Quotation  |
|---------|--|
|         | <b>Start of Conference call</b>  |
| Terry   | <i>Overview of the key issues to be discussed.</i>   |
| Terry   | Paul (P), what do you think of Gladstone's document?   |
| Paul    | I think it's er... An interesting way to look at the criteria of er... which way to go.  |
| Terry   | Sure.  |
| Paul    | ..And I think I like the way that he used the impact (whether it's high low or medium) and then decide the advantage or disadvantage. So I think that it's a good way to do that.  |
| Terry   | Sure.  |
| P       | The next question that we need to ask ourselves is that ermm. ... is, is this the right approach..? to.. Er.. Actually decide whether it's single verses multiple.   |
| Terry   | Well, I've got a different perspective on it er.. It's not a matter of whether it right or wrong, because I don't think that there is any one approach that is completely right (well there could be something that is completely wrong) but er.. I think my perspective is that if we've got a better way to do it, we should add it or incorporate it. If we don't ..em I prefer not to get caught up in trying to find something else.. would be my perspective. Because if you think about it, the majority of the people in this room started this process last February. So while I understand what you're saying, I'm weary about debating too much about whether it's the right or wrong thing. I'm more interested in making sure that it speaks to your needs and your requirements, and that it not be (and this is no disrespect to MS-G) but it not be tainted too much with a pure Microsoft perspective.. that it truly reflects your environment, your requirements and your concerns. |
| P       | I think the ..er the section I've read so far is quite independent. It is not.. Er.. I don't think that it is Microsoft'ish .. That I've read so far.  |
| Terry   | Ok, good.  |
| MS-G    | .... I would like some feedback ... I would like feedback from the team as to what you think the impact should be, if that's consistent with.. Er..???   |
| Terry   | And I think that's what he needs to see from all of you, even if it's just to say I agree. I think he needs to get a feel for your comfort level, em.. Because ultimately, the only other choice he's going to assume that he's got what you need nailed down.. Er.. because I would like to publish this document to our management, and even the bank's people .. to say this is where we stand. Colin, what about you?  |
| Colin   | Yeh.. Er.. The first thing I'd like to do is to congratulate Gladstone, because I think it's an excellent document, and er.. I've found it already er.. cleared some things up in my mind.. Ermm.. There's just some very specific points that I'd like to raise, and I don't know how we do that, whether we discuss them on a conference call or whether we bullet point them as email and then kick them of as a thread, so .. how do we actually dissect this document .. emm.. what's the best way to handle that?  |
| Terry   | Well if it specifically points to something that Gladstone specifically documented, I would respond via email and copy somebody from each region including myself. Now if there is something that is missing all together, like for example I brought up the application issue this morning, I think we should table that here, and in future meeting, if there is something that just has been missed, because.. you know.. Gladstone was just simply not aware.  |



| Speaker | Quotation  |
|---------|--|
| Colin   | Yep, absolutely.   |
| Terry   | So I don't know which one of those your comments fit into. You tell me.  |
| Colin   | Well.. No.. I mean.. Well the first .. This is clearly an early draft, but er.. Gladstone has talked about two administrators within World Markets, Well personally I'd like to see one from each region due to the time differences so that we feel secure that there is somebody with suitable privileges at any time, who can carry out the appropriate actions. Amm, and the other point was, emm.. it's what I always felt, Gladstone raises the point that really you have to look at killer apps like [MS] Exchange within the context of this. I don't think that you can look at these two separately, certainly not with the direction that CIBC is going in. So.. I always said that <b>Exchange</b> was pivotal to the final decision emm.. that we made as far as active directory was concerned. So.. em.. you know I've got a lot out of this document already.   |
| MS-G    | With regards to the first concern about the two administrators that the Enterprise Directory Team (Betty Reed and Darlene ???'s group) ... will have those two accounts. Every em.. World Markets Administrator would have full rights as you see fit within the World Markets Tree in the event of a single forest.   |
| Colin   | Oh right, .. I know we can't come in at the enterprise level, for control, but I thought at the tree level that you were specifying only two within the CIBC World Markets Tree.   |
| MS-G    | At the Tree level it's up to you. You know, everybody that is on this conference call that wants to be there, it's really up to you what you do within.  |
| Colin   | Well yes, I didn't think that you would really have an issue with it anyway, That was just a minor point. And the other thing is that clearly ..err.. As I said the <b>Exchange</b> component, which I think is going to drive the decision on which one we go for.  |
| MS-G    | Right, just to go back to your point about not having rights at the Enterprise level. You know, I don't think it's necessarily a way out thought to approach the Enterprise Directory Group and err... You know, try to get some arrangement, where you would be able to get access to Enterprise Admin particularly. Not necessarily schema admin, but the enterprise admin group. Is there anyway to have the CIO or the senior VP having some way of initiating access to the enterprise administrative group ... were in a scenario where if a domain goes down and you need to add a domain quickly, there is clearly a process phase??? where the senior VP can get password access very quickly and provide it to whoever needs it to do the work and then that password gets expired afterwards? <b>The kind of relationship that they've established with ICA there is no reason why World Markets couldn't proceed to get such an arrangement.</b>   |
| Colin   | I mean you are absolutely right. I've worked on the <b>Exchange project</b> from the very beginning, and how it panned out was that it was kind of the mutual respect built up over time and it was a case of gaining trust in one another, but of course we're all participating in a directory enabled system. Emm.. and now I have an excellent relationship with a few of the guys in HP (like Joie Lee, and Ricky Kong etc.), and I find I can get things done very quickly emm.. when it comes to building redundancy into Exchange etc, because there is a lot of <b>trust</b> there about what the other guy is doing, and I think.. That was my other point about Active directory: it's going to be the same scenario. There's got to be that <b>trust factor there</b> emm.. when you're participating in something like this, because.. er.. I don't know. Things that concern me are like Directory pollution or if somebody with sufficient rights causing a knock-on effect throughout the Directory. |
| Terry   | Which brought up the question for me, because in this document, it talks about the Enterprise Directory Group not wanting World Markets to be able to have certain rights and privileges, but they did not say that, that same limitation would occur to other groups: <i>[Terry then proceeds to quote from the document]</i> '..to provide for segregation and to ensure that the two .. tree and ensure that the cross tree changes may not be made inadvertently on the other side of tree, the enterprise directory services group has made the decision to remove enterprise administration from CORPCIBCWM.COM'. Why haven't they also  |

| Speaker | Quotation  |
|---------|--|
|         | removed it from the other side and made sure that it's only available to FI.INT?...  |
| MS-G    | ...Yeh I..   |
| Terry   | ...I think this seems very one sided to me.. That's actually my point: <b>this whole process is one-sided!</b>   |
| MS-G    | ...I ... this... it was done to accommodate World Markets, because you know you hadn't made it clear that you wanted to maintain as much autonomy as possible. So that was the reason why that was done. I'm sure if some other group comes up with the same concerns they will try to facilitate that. This was actually <b>Paul from Microsoft [MS] working with their group</b> , emm.. you know they came up with that specifically for World Markets, but I'm sure other groups will have that too. |
| Terry   | There is this one other thing that I find at a higher level that I find <b>suspiciously, ... frustrating</b> in terms of they view of this document.. I think it's very now oriented and what I mean by that is, we know from our counterparts in the States and from your counterparts in the State em.. that there are other considerations that would require multi-forest configuration ...  |
| MS-G    | mhm...   |
| Terry   | ... and I'm not clear why there's no discussion about the strategy of MS moving forward and that being a consideration for.. not just World Markets but the Enterprise nest???   |
| MS-G    | ..right  |
| Terry   | ..I would like to see some reference to that, only for food for thought, because this is going to be going to a lot of high level executives who wont have a clue that that's a possibility.   |
| MS-G    | Ok.. ... like talking about the next version of .Net Windows, Sever.Net, which is going to support the transit of trusts between forests, which reduces some of the administrative tasks for moving users and things of that nature. It still doesn't solve the Exchange issue that we all know about now, but it still makes things a bit better. So I'll add some features... .. Any.. and input at all to make this document richer, I appreciate.  |
| Terry   | I also need to get a sense for... Again, if you are totally non technical.. You don't realise the.. The advantages of Active Directory (AD) in terms of <b>centralising your support and your administration</b> , but the only thing that you really need it for is Enterprise Applications, and the only enterprise application that is in the pipe is MS Exchange 2000, and that's two years away; <b>tell me again why I need active directory?</b>  |
| MS-G    | Right.. eh..   |
| Terry   | When I read this document, I said if I didn't know anything about what Active Directory could, and the only thing that's AN Enterprise App that's coming down the pipe is Exchange 2000, and I know that we're not ready for that, why am I doing it?  |
| Colin   | I think to be fair to Gladstone though.. What he's done is...  |
| Terry   | ...I'm not picking on Gladstone Colin. I'm trying to look at it from a non technical management view.  |
| Colin   | oh yes, but I think what he's done is he's basically laid down here exactly what we've been talking about for over a year now. And I think that's important, first of all for us to understand and start making some decisions. I think in terms of why we need Active Directory I think each region can put together some very specific requirements that senior management would be able to recognise immediately.   |
| Terry   | So what I suggest is that we also include that somewhere.  |

| Speaker | Quotation   |
|---------|---|
| Colin   | Yes. Definitely! I mean I think for Gladstone, he can come in with a very vanilla list of what Active Directory gives you, but as we work with each region and close to the business we can come up with some very specific reasons about how we can leverage Active Directory and what advantages it can give us, because, already emm.. in our roll-out of just Windows 2000 Professional to the Desktop, <b>there is a hell of a lot that we could do if only we had an Active Directory behind the seems.</b>   |
| [...]   | [...]   |
| [...]   | [...]   |
| MS-G    | In terms of overall.. From looking at the situation, from looking at the requirements and.. And understanding some of the issues, some of the concerns emm.. e.. <b>it's my personal opinion right now that from er.. Autonomy perspective (if that's a concern) I think that World Markets in this single forests, with their tree, and the configuration that the enterprise directory services is looking at, you really have a lot of autonomy. You really have a lot of control over the environment. I don't think there is a lot of emm.. well you know, ICA's involvement in the whole.. er.. er.. I mean today.. in the whole administration of the environment, it's very limited as far as World Markets is concerned, I think today, because that can obviously that can change. I'm sure everybody here has all heard rumours about ICA and their involvement etc etc. So er..</b> |
| Terry   | So it really boils down to that thing you was talking about earlier, in our executive, is using it as a condition that we'd be able to access the same level of authority as ICA, should the circumstances arise?   |
| MS-G    | Right.. And that would give you, except, of 99.9% control. Right now, even if they didn't do that, you'll still have the autonomy within your environment. You still could manage Exchange the way you want to manage Exchange. You still could deploy whatever domains you want, you just have to... work with the Enterprise Directory Group to help you create whatever domains initially. After that, you know.. so.. you still maintain the environment, you're still autonomous, you can still apply whatever group policies you want. You can do... pretty much er... pretty much everything except for adding a domain, extending the schema, and if a domain dies you need help depending on how you.. So if the domain controller dies you may need some assistance with er.. getting that domain controlled back up.. So.. from that perspective, you really have the autonomy.      |
| [...]   | [...]   |