INITIATING SYSTEM INNOVATION: A TECHNOLOGICAL FRAMES ANALYSIS OF THE ORIGINS OF GROUPWARE PROJECTS

Angela Lin

Department of Information Systems

London School of Economics and Political Science

November 2000

Dissertation submitted in partial fulfilment of the requirements for the award of the degree of Doctor of Philosophy by the University of London.

ProQuest LLC
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106-1346

To my parents, for a lifetime of love and devotion.

ABSTRACT

This research explores the origins of information systems innovation through two case studies of groupware projects. The thesis argues that the study of the origins of projects has an important role in explaining the subsequent events during the more formal implementation activity. This is particularly so in the case of groupware, where a substantial literature has emerged describing and analysing the unpredicted outcomes of such projects. The research is based on a model of systems adoption as a continuous process, and with the choices and decisions taken at an early stage with regard to technology having significant effects on the adoption across time. The analysis of the early stages of a project can be significant in explaining subsequent levels and degrees of system use. It is argued that in order to provide a more complete description of the adoption process one needs to go back to the origins of a project and to examine the choices and decisions made during that period. This period of initiation of groupware projects has received little attention in CSCW research and scarcely more in the broader IS field. The purpose of this thesis is both to address this absence of scrutiny and to argue for its significance.

The thesis presents a detailed review of CSCW and related literature, and explores how and to what extent the initiation of projects has been considered and addressed within this field. The thesis then develops a research framework to explore initiation, based on a synthesis of the contextualist approach with a cognitive model based on Orlikowski's notion of technological frames. The thesis then applies the framework in the analysis of two interpretive case studies of the initiation of groupware projects. These case studies were conducted in the British Oxygen Company (BOC) and the Bank for International Settlement (BIS).

These studies produce an account of initiation activity that offers a particular emphasis on how time plays multiple roles in the process, linking content, context and process. These roles include, in addition to conventional 'clock time', time as an indicator, time as an era, and time as measurement and control. The findings also illustrate the duality of individuals' technological frames; that is, individuals' frames are *both* the basis *and* the consequence of the choices and decisions made by those same individuals. The analysis explores how and to what extent changes in the organisational or cultural setting (context and process) can have an impact on frames of reference, and how they are shared and communicated.

ACKNOWLEDGEMENTS

This thesis would have not been possible without the love and support of my parents and family. I thank them with all my heart. I would also like to thank my husband, Jonathan, for his support and inspiration which he has given me. I am also extremely grateful to my father-in-law, Professor Paul Foster for reading my manuscript with such a critical eye.

I am most grateful to my supervisor Dr. Anthony Cornford for his continuous guidance and support. His critiques of my use of language and feedback on my work have been crucial in my development as a researcher. Most of all, I thank him for his immense encouragement which means a lot during the difficult moments of this research exercise. Thank you, Tony.

These years at the Information Systems department at the LSE have been an intellectual and enjoyable experience. I found support and encouragement from everyone there, but I would especially like to thank my fellow PhD students: Anna Psoinos, Leiser Silva, Jimmy Tseng, Tanai Khiaonarong, Ela Klecun-Dabrowska, Abby Bada, and Carol Hsu for helping me through this difficult process and for always being there.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

1.1 RESEARCH SCOPE

Various issues surround the early stages of an information system (IS) project. They include project definition, requirement collection and specification, decisions about acquisition and development, and allocation of resources (financial and human resources). Previous research has discussed these issues selectively from a number of perspectives notably from that of technology (Galegher and Kraut, 1990; Gallupe and McKeen, 1990; Hollingshead, et al., 1993; Whisler, 1970), of business strategy (Boynton, et al., 1992; Drucker, 1988; Martin, 1998; Rockart, et al., 1996; Porter and Millar, 1985; Schein, 1996), of economics (Benson, et al., 1990; Brynjolfsson and Hitt, 1998; Ciborra and Olson, 1998; Opper and Fersko-Weiss, 1992; Threlkel and Kavan, 1999; Venkatraman, 1994), and of organisations (Coombs and Hull, 1995; Davenport and Short, 1990; Grint and Willcocks, 1995; Keen, 1991; Taylor, 1995). Each of these perspectives rests on an assumption that an IS project occurs as a result of rational behaviour. In this analysis it is thereby assumed that the initiation of an IS project originates from problems within the current system (technological perspective), the needs for strategic alignment of IS with business (strategic perspective), the wish to increase productivity or to reduce cost (economic perspective), or the desire to make changes in organisation (organisational perspective); and that the adoption of a particular information system reflects an organisation's best interests.

Based, however, on experience of investigating user requirements in a financial services company, this thesis argues quite otherwise: that, in contrast to these rational models of

IS adoption, the acquisition of a particular information system is equally likely to originate from the deliberation of a few individuals. This deliberation will reflect individuals' perceptions and problems with a given technology rather than an organisation's overall rationality. It is maintained therefore that the ideas and decisions about what is to be achieved and what technology offers are explored and shaped at the early stage of a project; and that understanding of the initial and ongoing deliberation related to the decisions and choices made about an IS project becomes a source of explanation for phenomena observed in the post-implementation environment. In the light of this argument this thesis investigates and focuses on the issue of *how the perception and expectation of individuals influence the decisions taken with regard to the initiation and acquisition of a specific information system.* This will be achieved through a social cognitive approach that provides important countervailing insights into decisions about a specific system.

This thesis is both original and challenging on a number of accounts. First, it shifts attention from the rational (both technological and organisational) dimension to the less well represented social cognitive dimension. It emphasises the role of individuals' cognitive properties (i.e. experience, knowledge, perception, and expectation) in the process of making decisions and choices about technology. Second, the thesis provides evidence which illustrates the dynamic nature of these cognitive properties and highlights the shifts in the initial ideas and notions of the technology and the impacts of these shifts on individuals' attitudes towards the technology over time. Third, its focus on the origins of an IS project gives historical consideration to the phenomena observed in the later phases of the project. This challenges the implicit assumption that the technology only comes alive after its implementation.

According to the definition given by the UKAIS (1997), information systems are:

> "the means by which organisations and people, utilising information technologies gather, process, store, use and disseminate information" (p.5).

By this definition, a wide range of information technologies is then qualified to be called information systems. For the purpose of this research it is important to narrow the range of technologies to a specific type serving specific purposes. By so doing, it is possible to compare and contrast the processes of forming perceptions and expectations

as well as the choices and decision-making in different organisations. Groupware is chosen with this context.

In the late 1980s there was a growing interest in the design, implementation and use of technical systems which support people working cooperatively, and a group of researchers and practitioners gathered to discuss the topic. This special interest group later became a community engaged in discussion of related topics and technology, and the subject became known as computer supported cooperative work (CSCW). Systems including software and hardware developed and designed within this context became known as groupware.

Groupware is designed to support group work in an integrated way. Such systems have been described in these terms:

> "[...] they put coordination technology into the hands of the group members, giving them access to the positive aspects of coordination – not just preventing collisions, but enabling collaboration" (Grief 1988: 9).

Put another way, groupware is not something that stands alone but serves as a standard platform that allows users to exchange information uniformly; and to have similar levels of consistent support for users' collaborative work needs.

In the late 1980s and early 1990s the interest of groupware extended beyond academia and was introduced to the commercial sector. The trend is said to stem from an increasing attention to business process engineering (BPR), an emphasis on teamwork to achieve flexibility, the speed of globalisation, and booms in the software and hardware industries (Lloyd, 1994). The introduction of Lotus Notes in 1989 which marketed itself as a groupware to help companies to bring together their expertise around the world certainly pushed discussions of the topic further in academia, in business and in commerce.

A number of common assumptions are made and shared in the CSCW community: (1) to enhance or enable group work, (2) to improve communication, (3) to create a common platform for information sharing, and (4) to remove time and place restraints. The specific assumptions and expectations of groupware in these communities provide a well-defined range of information systems for analysis. Moreover, it allows investigators to examine and even challenge the assumptions made by organisations

about technology. For example, whether organisations adopt groupware for the reasons assumed by academia or the IT/IS industry; whether organisations' decisions about groupware adoption emerge from a process of IS projects; and whether organisations understand the implications of groupware when they choose to introduce groupware. Besides, although the groupware chosen as the subject for the case study it is believed that the experiences and lessons learned from how individuals and organisations understand and form their understandings and interpretations of this technology provide valid insights and can be applied to studies of other information systems.

The present study employs a case study research method in the empirical work to help to understand the subject area. This method provides an understanding both of the content of an object/event and the process over time of the mutual influence between the object/event and its context (Walsham, 1993). Three case studies have been carried out; a preliminary study and two main studies.

The preliminary case study was conducted in a well-established financial group in Taiwan – Jardine Fleming (JF). The study was commissioned in 1996 by a senior manager in the business division in order to identify potential areas in which the company could benefit from Lotus Notes. One of the two main case studies was carried out in the British Oxygen Company (BOC Group), a UK-based and world-leading industrial manufacturer. The company's Lotus Notes project was established to support its marketing sector reform in 1994. During the two years of experiences with groupware (i.e. Lotus Notes) information systems personnel as well as users learned about the system, in a hard way at the beginning, but their learning curves started to take off once they became familiar with the system and developed understanding. The other main case study was undertaken in the Bank for International Settlement (BIS). The Bank completed its WORKGROUP project a year before the case study was carried out, and had seen initiated and set up to replace the old electronic mail system in the Bank. Telling a different story, the project in the Bank was claimed by the team to be the most successful project ever in the Bank's IS history.

The rest of this chapter introduces the preliminary case study of JF Taiwan and discusses issues that emerged from the study. The chapter ends by presenting the organisation of this thesis.

1.2 PRELIMINARY CASE STUDY

The study presented here is based on fieldwork in the course of a project with Jardine Fleming, a Taiwan-based financial company. The project was commissioned by a senior manager to generate a report of whether Lotus Notes would bring value-added benefits to the company from its implementation. The project started in July 1996 and was completed with a report at the end of August. It involved two months staying on site and working side-by-side with other employees.

This case study was chosen to be presented as a preliminary not the main case study of this research for a number of methodological reasons.

The main methodological concern is data continuity. The project was commissioned by the senior manager in JF Taiwan and carried out prior to the decision to investigate the present research topic (indeed the present research topic emerged from the observations made in the project) therefore the data collected during the project was collected solely for the purposes of the JF Taiwan project. That is, the data was collected according to the requirements of the senior manager and not those of the current research and therefore if used the data would have been partial.

The second concern is the stage at which the project had reached in the company. The project at JF Taiwan was at its initial and exploratory stage which on the surface can be said to be an appropriate candidate for being the main case study of the present thesis. However, it is this initial and exploratory stage that raised our concern about suitability. The project carried out in JF Taiwan was at its early stage of development and a final decision about implementation had not been made at that time. Hence it is not possible for us to examine the choices and decisions about the system from an historical point of view. In other words, no examination was able to be made concerning the process of how the decision makers' perceptions and expectations formed, reformed, and changed over time.

1.2.1 Organisational background

The main data sources came from observations, interviews, and informal conversations (e.g. lunch, coffee breaks, dinners] with staff. Interviews with personnel were open-ended and intended to gather information of their job contents and needs, technologies

used in their jobs, and their perceptions of problems and expectations of the new information system. During these conversations, it was possible to make suggestions about the new system. A significant limitation of the interview technique emerged when it was found that employees were cautious with what they said since they felt that the contents of the interviews might be fed back to the senior manager and they might compromise their positions. Informal conversations with employees as well as observations[1] of interactions and overhearing conversations between individuals therefore became important sources of 'unofficial' views of problems.

Jardine Fleming Taiwan is a well-known financial service company in Taiwan and its major business activity is to sell local and overseas funds and mature bonds. The company's largest shareholder is JF Hong Kong whose activities cover investment management, securities broking, corporate finance, capital markets and banking. JF Hong Kong itself is a joint venture owned equally by a London based investment bank and an international trading house. Relatively speaking, JF Taiwan has a closer business relationship with JF Hong Kong than with the London based investment bank and international trading house. This is not only because of JF Hong Kong is the direct and major shareholder in JF Taiwan, but also because of financial legislation in Taiwan.

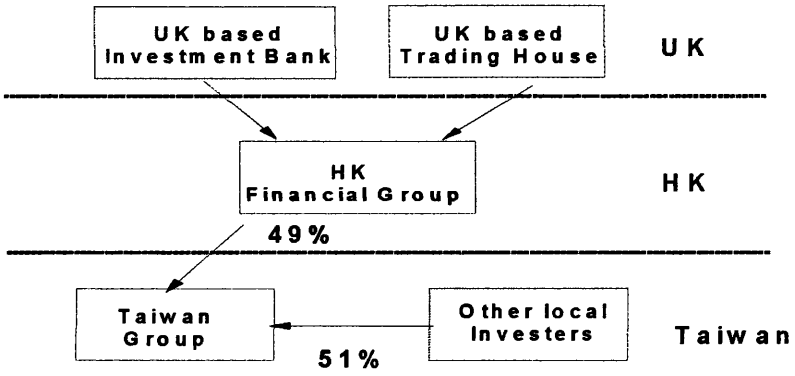
Under the current legislation no financial company in Taiwan can act on behalf of their clients to invest in overseas financial markets directly, so funds and mature bonds operations have to be carried out outside Taiwan. JF Hong Kong naturally became the candidate to managing and operating JF Taiwan's local investors' investments in overseas financial markets. In terms of selling overseas funds and mature bonds to local investors JF Taiwan can be described as a big sales department of JF Hong Kong since it only receives commission fees by selling overseas funds and mature bonds instead of managing fees[2]. It is also responsible for promoting, for dealing in overseas funds, and answering funds related questions from investors.

---

[1] At the beginning of the fieldwork direct observation was the only option to collect information. Employees suspected that I was there to spy on them on the behalf of the senior manager and it was only sometime later they found that I was 'harmless' and gradually accepted me as a part of the working force; at this point, participating observation became possible.

[2] Fund managing fee is counted as the major income in a financial service company like JF Taiwan.

Figure 1.1: Organisational structure



The company has three branches in Taiwan, in addition to the Taipei headquarters. These branches are distributed in different cities: the North, the Midland, and the South, to serve the regional customers. The power is centralised in the company, that is, the Taipei office gives orders and has absolute authority to determine business decisions and activities for these three branches. Communication between the headquarters and branches relies on the traditional communication tools including internal and external telephone lines, fax machines, face-to-face meetings. It was only since early 1996 that the Southern and Northern branches had installed cc:Mail™, which connects them with the Taipei headquarters.

Five departments were involved in this project, all of which except the information systems (IS) department are said to play critical roles in the company's daily business operations. These four other departments were fund administration, sales administration, sales, and marketing. Fund and sales administration departments are responsible for processing the administrative work of local investments transactions and if these investments are interested in overseas markets, they then pass them to JF Hong Kong. The sales department consists of four sales groups: Banking, Private, Institution, and International. Each of them targets different market groups; for example, Banking targets ordinary investors so its job is to negotiate with high street banks to encourage them to promote and sell funds and mature bonds for the company over the counters. Because each group has its target clients and pursues different interests there are not many interdependencies between these groups. The marketing department consists of two divisions: Customer Service and Research. Customer Service division is divided

into further two groups: Telephone Centre and Marketing. The former answers phone calls from clients who have questions, requirements, or complaints, and the latter is responsible for planing various business activities and promotions, and public relations. In the research division the primary task is to study and analyse financial markets around the world, and generate weekly and monthly market reports for both internal use and clients.

1.2.2 Project History

Lotus Notes was recommended by JF Hong Kong to JF Taiwan in early 1996. The system had been used in Research Departments both in JF Hong Kong and London and allows their market analysts to share information and have discussions on line. JF Hong Kong, convinced by its 'successful' experience with Lotus Notes, recommended JF Taiwan to develop applications within the system.

Before this suggestion was made to JF Taiwan, the IS department had run the first and only pilot application on Lotus Notes which involved Fund, Sales Administration, and Marketing departments. The application was designed to allow departments to submit their requests for IS service via the network. This pilot project was new to both users and the IS department. At the beginning, users found themselves struggling with the application since there was no technical support from the IS department, no user manual for reference, and bugs in the application. However, when the bugs were gradually sorted out and users were becoming familiar with the application they started to see benefits in it. One benefit was that with the application people kept both electronic and paper copies of the same requests whereas before only one copy was kept and was often lost in the process. With dual copies of the request form people could now provide electronic evidence to the IS department to prove that the department received requests but never delivered the services required. This pilot project stopped running six months later because the server broke down and was never fixed.

The pilot project running on Lotus Notes was the IS department's initiative and did not involve the senior manager; but the second introduction originated the senior manager who expressed her interest in having Lotus Notes in the company since JF Hong Kong 'recommended' them to do so. In early 1996 JF Taiwan had its first e-mail system, cc:Mail, to assist internal communication with its dispersed branches and with JF Hong

Kong. In general, people especially the senior manager were satisfied with the system, and believed that Lotus Notes, which is also Lotus' product, would be equally good for them. They expected that Lotus Notes would solve problems of information sharing and communication, and increase coordination between departments. The employees also expected Lotus Notes to replace the existing information systems and allow them to access information freely and immediately.

1.2.3 Findings

Three groups of people were interviewed: senior management, IS personnel, and potential users. The senior management group included the managing director, a senior manager in charge of market research, a general manager in charge of marketing, and a manager dealing with administration of transaction. The IS personnel group included an IS manager who was assigned to the Lotus Notes project, and two other people who worked on the project. The three IS people had technical backgrounds and had worked as computer support staff for most of their careers. The potential users group included employees from departments into which senior management was considering introducing Lotus Notes. These departments included a sales department which comprised five different divisions, a sales administration department which processed details of sales of funds and bonds, and a marketing department which included research and marketing divisions.

When senior management and potential user groups talked about the problems which they had in mind and their expectations of Lotus Notes, it was first found that their problems and expectations coincided with what has been described within CSCW literature. For example, they were having problems with information sharing and communication because of the dispersed locations between departments, and hoped that the new technology could improve the situation. However, under close scrutiny these problems and expectations were not, in nature, the same as those described in the literature. Comments on the perceptions of each group – senior management, potential user, and IS personnel – in relation to the problems and expectations of Lotus Notes are now presented.

Senior management

The primary reason for senior management to consider the adoption of Lotus Notes was that the system was recommended by JF Hong Kong. The latter was the company's major shareholder and the Managing Director (MD) felt that politically the company needed to consider the recommendation. As the Managing Director said: "they suggested the system, so we considered the system."

Their recent experience with Lotus cc:Mail was another reason which drove senior management to consider Lotus Notes. Lotus cc:Mail was the first e-mail system which the company had ever had and which was used for communicating between branches in Taiwan and between JF Taiwan and HK. Before the introduction of electronic mail, surface mail and fax machines were the primary means of communication. The MD expressed her satisfaction with Lotus cc:Mail and believed that Notes would achieve a similar outcome because it was a product of Lotus.

There was a general feeling in the company that the IS department had seen unable to deliver the service which people wanted. Indeed, it was known to the company that the MD was unhappy with the service provided. An interviewee from a user department who often attended IS-related internal meetings said

> "It is not unusual that the MD and the IS manager spend most of their time shouting at each other in meetings."

The MD expressed her view of the IS service in the company as follows:

> "The IS department never gives me what I want. For example, this time I simply want them to design a computer-generated report which can tell me each sales person's monthly, quarterly, and annual sales records, and now see how many months have passed and I still have not got it."

The dissatisfaction with the current level of service provided by the IS department along with the company's experiences with cc:Mail meant that the MD expected that Lotus Notes would change the current problem situations since she had a strong belief that "computers can solve any problem".

Potential users

Most employees interviewed had never heard of Lotus Notes before, and those that had heard about it did not know what it was about. Their expectations of Notes came partly

from the problems that they had encountered in their work and partly from a brief introduction which the researcher provided at the beginning of each interview.

Various problems with the current systems were described by the employees, among these the problem of information sharing was mentioned most of the time. However, definitions and interpretations of the problem differed from one employee to another depending on the interviewee's status (e.g. rank, department, and job content) in the company. For example, a market researcher who specialised in Asian financial markets saw the problem of information sharing in the context of not being able to access on-line reports, figures and diagrams generated by the HK company. She therefore expected that the future system, Notes, would enable her to access the on-line research data which she needed. A different market researcher in the same office who specialised in European and Russian markets had a different view of the problem. For the MD, information sharing was not a problem but finding information was. Other people in the company complained that information on marketing activities organised by the different sales divisions was not widely shared within the company. This caused embarrassment. The sales people sometimes felt that customers knew more than they did, for example one interviewee mentioned:

> "Sometimes customers called and asked us when such and such activities will take place and where, and we did not have a clue what the customers were talking about because the activities were organised by other divisions and they did not inform us what was going on."

Despite the fact the employees knew little about the system and how it could help them in their jobs, most of them welcomed the idea of Notes. This attitude could be interpreted as a result of the fact that employees were not happy with the current system and in common with the Managing Director they also had a conception that all the current problems could be solved by a new computer system. It was not unusual that the current AS400 system crashed at least twice a week and that each time the crash could last about half a day. Employees who needed to use the system to check, calculate, and report transactions were frustrated with the interruptions caused by the system's lack of stability. Others found switching between the AS400 and Windows working environments was not easy.

A further reason for some employees to welcome the system was that they expected that it would enable them to access information stored by the HK company such as data and

progress of transactions. Currently, because of banking and investment law in Taiwan, all the overseas funds were managed and handled by the HK company and JF Taiwan was only responsible for promoting and selling overseas funds to local people. When sales were completed administrators in Taiwan then sent the details of the transactions to the HK company; after that JF Taiwan had no rights of access to the information about the transactions. Employees in Taipei hoped that the new system could give them greater control over local transactions so that they did not need to rely on the HK company to answer customers' enquiries about their investments.

IS personnel

The IS project manager was not enthusiastic and optimistic about the idea of having Notes. The manager was more knowledgeable about mainframes especially IBM AS400 and did not know much about the PC working environment. It was not until early 1996 that he had started to learn to develop applications within a Windows environment. Since it was not his field, the introduction of client-server computing was conceived by him to be a threat to his position in his department. Other IS personnel were unfamiliar with and not keen on the idea of Notes. Due both to their own lack of interest and incentive to adopt Notes the IS personnel put little effort into promoting Notes project within the company. Consequently, the majority of employees had never heard of Notes despite the fact that the system had been considered for sometime before this case study was carried out.

The project manager considered that groupware could only be used by small groups of people within the organisation, although one application developer argued that the system could be used in a wider arena such as the organisation as a whole. The manager also perceived that Notes was useful in terms of automating workflow processes. The project manager's perception of Notes as being limited to its being used by small groups of people and of Notes being a workflow system led to the development of a pilot application which was designed to change the processing of requests for IS services from paper-based to electronic-based. The pilot application was up and running for about three months until the server broke down; from then on no other application was developed in Notes. In fact Notes server was never repaired.

1.2.4 Discussion and implications

The assumed rationales for groupware adoption described in other research papers were not found in this case study. Even if organisations cite to users the vendors' advertisement about groupware applications, they are likely to interpret the system in the organisational context in order to pursue their own agenda. The observations of the case study also illustrates that organisations' decisions about groupware adoption do not necessarily reflect a match between their "real" needs and abilities of groupware; but more individualistic interests. It was noted that expectations held by individuals were influenced by their previous experiences with other technology which were both good (e.g. experiences with cc:Mail) and bad (e.g. frustration with the current system). The findings also suggest that individuals' expectations of Notes were not built upon the technology itself but on their own perceptions of how problem situations should be resolved. Furthermore, the observations suggested that individuals' perceptions and understanding are formed and reformed over time on the basis of their personal experiences and knowledge and are constructed through social and organisational interactions; and that perceptions of problems and understandings of technology change over time according to individuals' surrounding environment.

These observations have a number of implications for further research. It has been observed that individuals' interpretation of problems, and knowledge and experience of technology have influences on their expectations of technology and which in turn forms a part of the reason for adopting new technology. Thus, in order to understand the issue of why particular technology is chosen (i.e. groupware) the focus of the investigation should be on these cognitive properties.

It was also noted that decision makers could have made decisions about groupware adoption without any previous knowledge about the technology. Then it becomes important to understand on what basis that a particular information system is chosen and why, if one wants to know and make sense of what is observed in a post-implementation environment. This leads to another issue that whether the outcome of information system observed in post implementation stage is a reflection of the selection of inappropriate solutions to organisational problems, or mismatch of perceptions and decisions about the system to actual problems and offered by the system. In this context further research is needed to assess and examine the process of

selecting a particular system to support organisational problems so to track the origins of phenomena observed in post implementation stage and understand the phenomena from there.

These findings and implications, however, were not pertinent to be developed into a research question until later when they were compared with a review of CSCW literature; this review is presented in Chapter Two.

1.3 ORGANISATION OF THE THESIS

This chapter (Chapter One) has briefly introduced the research scope and objectives of this thesis, and presented a preliminary case study and the observations made in the study. The next chapter (Chapter Two) is organised to critically review the current CSCW literature and relevant literature in social cognitive research on information systems acceptance and adoption. Chapter Three introduces a social cognitive approach – technological frames analysis, explains how the framework will be used in the context of this research. Chapter Four, Research Issues, firstly reviews various research methods employed in CSCW and examines research topics associated with them. This is followed by a section which addresses the research strategy and design of the present study. Chapter Five presents the case study conducted in BOC Group whilst Chapter Six presents the study of BIS. Chapter Seven brings together the findings from both case studies and interprets them in a broader context. Finally, Chapter Eight summarises the whole thesis, demonstrates the implications of this research, comments on the contributions of this thesis to IS research, and addresses directions for further research.

CHAPTER 2

RESEARCH ISSUES

Since the late 1980s there has been a growing interest in the design, implementation and use of technical systems which support people working cooperatively. A research domain then emerged and has been known to many as computer-supported cooperative work (CSCW). CSCW is said to be a stream of the information systems field but because of its specific interests the domain actually develops a research agenda, organises conferences (CSCW and ECSCW), and publishes a specialist journal *International Journal of Computer Supported Cooperative Work (CSCW).* Whether CSCW research should be regarded as a pivotal branch of information systems study excites debates. Some scholars see that CSCW studies are built on the existing development in computing science and information systems and therefore it should be seen as a part of information systems study. Yet, some are against such a statement and suggest that the research is in itself a new discipline. The present study would argue that CSCW is a specific topic which investigates a special domain (computer-supported collaborative work) in the information systems discipline. This view allows issues relating to CSCW to be studied and with reference to IS research and at the same time issues drawn from CSCW studies can be applied to general IS research.

The first section of this chapter (Section 2.1) will be dedicated to a review of the development of the CSCW domain and literatures of cooperative work (CW) within the CSCW domain. From there, a gap in the current research of CSCW will be discussed: a lack of research on the activities undertaken between the stage of searching for possible technological solutions and of understanding the limitations of systems in use. The relevant literature of this area in IS will be reviewed (Section 2.2). Bringing together

the observations made in the preliminary case study and the literature review the third section (Section 2.3) of this chapter will refine the questions raised in Chapter One and tune them into an appropriate research topic for this study.

2.1 GENERAL REVIEW OF CSCW

In this section the development of CSCW research will be reviewed chronologically, followed by a comprehensive review of CSCW literature. The literature review is further organised into two subsections according to two main streams in the domain: workplace study and technology use study.

2.1.1 A brief of review of CSCW development

Broadly speaking, the development in the CSCW domain has followed a similar pattern to that that IS has been through – for instance, emerging, formalising, and maturing phases. Each of these phases involves specific interests in academia and technology development in the industry. This section provides a brief review of the research development in the field.

Emerging (1984 – 1985)

Although the very first concept of CSCW was mentioned by Engelbart in the early 1960s, the first CSCW workshop was not held only until 1984 and since then the domain begun to take off. The 1984 workshop was organised by Iren Grief of MIT and Paul Cashman of Digital Equipment Coporation and held at MIT. The delegates at this workshop came from different backgrounds but shared a common interest – which was to use computer technology to support people to work together (Grief, 1988).

At that time, CSCW was defined as a body of research which examines ways of designing systems – people and computer systems – that would have significant implications for the way people work. This stream of research was argued as differing from traditional computer science as it drew on contributions from various disciplines such as computer science, artificial intelligence, psychology, sociology, organisational theory, and anthropology, all of which supported an aim to develop computer systems on the basis of people and their working relationships (Grief, 1988).

A subsequent response to the discussion of a potential research domain – CSCW – was the development of a new class of commercial software, namely groupware, which was noted as being designed to take group work on board in an integral way. Grief (1988) described some software in these terms:

> "[...] they put coordination technology into the hands of the group members, giving them access to the positive aspects of coordination – not just preventing collisions, but enabling collaboration" (p.9).

Groupware does not, argued Grief, stand-alone but serves as a standard platform that allows users to exchange information uniformly; and to have similar levels of consistent support for the collaborative work needs of all users.

Formalising (1986 – 1991)

The stage of formalising the acknowledgement of CSCW in both computer and IS communities began with the first CSCW conference which took place in Austin, Texas in 1986. Like IS at its early stage, CSCW went through the stage of identity seeking which is reflected in debates over definitions of the term CSCW and research directions. Various definitions were offered but there was (and still is) no single definition agreed within the community. These definitions ranged from very broad and loose to very narrow and specific (Bannon, et al., 1988; Greenberg, 1991; Hughes, et al., 1991; Lyytinen and Ngweyama, 1992; Robinson, 1991; Schmidt, 1991; Schmidt and Bannon, 1992). As an example, Olson (Olson, 1987) defines CSCW as

> "a label for an emerging body of research on the relationship between computer systems and social systems. Part of the research has to do with building tools to help people work together. Part of it has to do with assessing the ways in which people use computer-based tools to work together and understanding how the tools and work relationship affect each other" (p.77).

Greenberg (1991:1) speaks from a computer science point of view: "CSCW should be the scientific discipline that motivates and validates groupware design", whereas Bannon and Schmidt (1991) argue that CSCW should be

> "an endeavour to understand the nature of characteristics of cooperative work with the objective of designing adequate computer-based technologies. The conceptual models of group processes" (p.5).

The fundamental problem was that people could not decide how the word "cooperative" should be dealt with. Some argued that the word is redundant while some argued that the word should be replaced with other C words in order to reflect the concepts of

CSCW fully. For example, Bødker et al. (1988) claims that all work is essentially cooperative and that there is no need to seek additional clarification by adding the term "cooperative" to that of "work".

Those who saw the necessity to keep the word – cooperative – argue that the term not only should be kept but also should be addressed and carefully analysed. This group of researchers discussed that a considerable number of Office Information Systems (OIS) which failed to live up to people's expectations was due to the fact that they failed to address and incorporate into the system designs ideas of cooperation and communication in intellectual work (Galegher and Kraut, 1990b).

Some agreed that the second C (operative) word in CSCW should remain on condition that it is replaced with other words, for "coordinated", "collaborative", "collective", or even with group/teamwork (Howard, 1987). Cooperative work, explained by Schmidt (1991) is

> "constituted by work processes that are related as to content, that is, processes pertaining to the production of a particular product. Cooperative work, then, is a far more specific concept than social interaction in the system of work in general. The concept pertains to the sphere of production. It does not apply to every interaction pertaining to the running of, say, a company" (p.10).

Building on the above definition, collective work is explained as a type of cooperative work where ensembles share responsibility to accomplish a task. Further, collaborative work is a "particular 'collaborative' or complying spirit among the cooperators, as evident, for example, in the expression 'collaborating' with an enemy" (Bannon and Schmidt, 1997: 7). In light of the above, coordination in a work process can be defined as a process of coordinating participants' activities to attain given goals. Cooperative work is an umbrella term to cover different concepts of working together.

Whether or not the name matters at all, and why we spend much time on debating the definitions of CSCW, are questions that one may ask. Those who argue that names matter believe that only when CSCW is properly defined will the research direction and focus become apparent. Ironically, the debates over various C words did not synthesise the disparate views of CSCW but led to further confusions and diversities of research focuses. Even more, it seemed that all the efforts put into the debates over the definitions had been wasted because technology development (groupware development) and other research studies rarely referenced those definitions. In fact, Hughes et al.

(1991) believe that it is wrong that people spend time on defining the terms which are irrelevant. They argue that what is important is not which C word should be focused on but to recognise that all work is socially constructed:

> "all work is socially organised; that most significant tasks are complexly social; and that it is largely for this reason that they have sometimes been poorly served by computer systems" (p.34).

Another feature of this period of time is that various theoretical frames were proposed to study cooperative work. A lot of work came from computer-mediated communication literature (Dietz and Widdershoven, 1991; King, 1991; Lea and Spears, 1991), group decision support systems studies (Gallupe and McKeen, 1990; Poole and DeSanctis, 1990; Tan, et al., 1991; Watson and Bostrom, 1991), and studies of group dynamics (Bikson and Eveland., 1990; Galegher and Kraut, 1990a; Gutek, 1990; Kraemer and Pinsonneault, 1990; McGrath, 1991).

Technology development in this period focused on computer – mediated communication tools and emphasised the issues about synchronously or asynchronously communications and cooperations. For example, the discussions on remote meeting (Bikson and Eveland, 1990; Cook, et al., 1991; Egido, 1990), e-mail system (Eveland and Bikson, 1988; Mackay, 1988; Sproull and Kiesler, 1986), and asynchronous conferencing systems (Borenstein and Thyberg, 1988; Galegher and Kraut, 1990a) were the themes at that time. Most of applications/systems discussed in the research in this period were not commercially available.

Maturing (1992 – 1998)

At this stage, debate over definitions and directions of CSCW evaporated, for papers written to discuss the matter (definitions and directions) in this period were either summaries or reiterations of the earlier studies and did not intend to provoke further debate. It is also noted that the number of heterogeneous research proposals decreased, and research topics became focused and coherent. Interestingly, the number of theoretical and conceptual frameworks offered to study dynamics of group/team work, and coordination process decreased too. Instead, empirical work such as ethnographical studies to study workplace and work, case studies to study interactions between technology and organisations, action research to develop and design groupware; and

hands-on groupware designs such as virtual spaces, conferencing systems, collaborative authoring systems came to dominate the field.

The terms CSCW and groupware had been used by many indiscriminately as if they were the same thing, and a consequence of this was that the early research of CSCW was limited to small group work. But examining the definitions given, CSCW was never defined exclusively to study "group/team work". There are possible reasons for the confusion: firstly, the name group-ware misleads people to think that CSCW and its related technologies are for group/team work; secondly, people had been mistakenly thinking that cooperative work exists only among a small group of people who share and work together towards the same ends. In this phase people began to explore areas beyond small group work and look into "cooperative" work in general within an organisation.

There were an increasing number of studies in this period which moved out of the laboratory into the real world to study CSCW technology in its hosting organisations; but only then was it realised that the benefits promised by the technology were not there. Disappointment with the technology was explained as the result of the failure to incorporate ideas of social constructions of work into the design (Galegher and Kraut, 1990a; Hughes, et al., 1991; Olson, 1987). The theme, social organisation of work, was therefore developed to replace the formal models of cooperative work used previously (Harper, 1998; Hughes, et al., 1996; Rouncefield, et al., 1995). The aim of this line of study is to provide insights into work in reality, through observations made in workplaces so as to inform system/software design.

Another research development in CSCW is the increasing number of case studies undertaken to investigate the relations between technology and hosting organisations by exploring questions such as why or why not the technologies fail to live up to their expectations; and what changes have been made around the technologies. This development is related to the availability of the technologies in the commercial sectors. The aim of this body of research (Bikson, 1996; Ciborra and Patriotta, 1996; Failla, 1996; Gallivan, et al., 1993; Orlikowski, 1995; Wynn, 1996) is to inform system design (but not software design) and to inform system management (including implementation strategies).

The above development in research was evidently reflected in the changes in the principles of CSCW system designs. An example can be given by comparing the papers included in the book *Design Issues in CSCW* edited by Rosenberg and Hutchison (1994) published in 1994 and the book *The design of Computer Support Cooperative Work and Groupware Systems* edited by Shapiro et al. (1996) published in 1996. The papers included in Rosenberg and Hutchison's book seemed to concentrate on rational conceptual models of group process, coordination activities, software engineering and multimedia conferencing designs only. In contrast, the papers included in the volume by Shapiro et al. gave equivalent consideration to both practical systems/software design and real world work. The shift from engineering modes of design to more socially oriented modes of design is also reflected in the increasing number of published studies adopting participatory design (PD) method. For example, the CSCW'96 and ECSCW'97 conference proceedings, included articles on PD, and a special issue of the *Journal of Collaborative Computing* was dedicated to the topic in 1998.

Later in the same period it was observed that technology breakthroughs in both the hardware and software industries had advanced systems development and designs in CSCW too. For example, more advanced than it was in the early 1990s the multimedia technology was now being used to help to create Collaborative Virtual Environment (CVE) which aimed to permit individuals to interact with others in a computational environment (Benford, et al., 1996; Benford, et al., 1997). Breakthroughs in The Internet related technologies have also benefited design in CSCW and prompted some radical changes which have led the domain to another stage of development (Bentley, et al., 1997; Dix, 1997; Ginsburg and Duliba, 1997).

Internet Era (After 1998)

The development of the Internet has been an agent in driving the CSCW research and design to another stage. Within the commercial sectors the term groupware was gradually replaced with "Intranet" and then with "Extranet". This development is shown by the increasing number of papers published in the conferences and journals to discuss the possibilities, problems and perspectives for CSCW on the World Wide Web. Commercial products such as Lotus Notes also introduce the Internet alike interface, Domino, to reflect the trend.

In IS research the related concepts and technology of CSCW seem not to be discussed as intensively as they used to be in the early days. At one extreme this is viewed by some as the sign of the decline of the research like other fashionable ideas but the reviews of the development patterns suggests that the field has simply moved on. CSCW related topics were widely discussed when the field began to emerge because the idea of using the computer to support cooperative work was unfamiliar and new to people. Prior to that information systems research talked about information retrieval (database), improving effectiveness and efficiencies (office automation), increasing individual productivity and so on but it seldom addressed the issues about using the computer to support cooperative work or any similar work. Now, after a decade the concepts that CSCW studies attempt to draw people's attentions to have been widely accepted in the IS community, and have been considered by systems/software designs. The domain now tries to widen its research focus to cover diverse research topics with respect to work in workplace and applications of collaborative technology, as is evident in the flyer of call for papers for CSCW2000:

> "[...] we also encourage submissions that explore the applications of collaborative technology to areas such as the domestic environment, health and education. Specific topics of interest might include augmented environments for collaborative activity, studies of specific work settings, the use of the Internet in the home, technologies for organisational knowledge sharing, the impact of The Internet technologies on organisational life, or collaborative practices in education."

2.1.2 A review of Cooperative Work

Broadly speaking, CSCW literatures can be reviewed in two main streams; one focuses the surrounding issues of computer applications to support cooperative work, and the other focuses on the surrounding issues of cooperative work in the workplace; that is, one centres on "CS", the other on "CW". This study is categorised in the latter stream because of its investigation in how CSCW technology is perceived and has determinations of adoption are made in organisations (workplace). Studies of CW can be further grouped and examined in two categories, for example workplace study and assessment of technology use. The former considers the issues of how work is organised in the workplace (in the real world settings), and the latter considers phenomena observed in interactions between individuals/organisations and the technology. The rest of this section details the review of literature in these two areas.

2.1.2.1 Workplace study: searching for possible technological solutions

Workplace study is often initiated to study how work is organised in the real world settings with an aim to inform system/software design. This body of research argues that the nature of work and of the workplace have long been neglected or taken for granted by both practitioners and researchers. Workplace studies strongly object to the idea that work and workplace can be understood by using formal models, and that systems/software are designed on the basis of such understandings. The main reason for the objection is that work and the workplace is context specific and can only be understood through studying the actuality in context (Ackroyd, et al., 1991; Anderson and Button, 1993; Bentley, et al., 1992; Hughes, et al., 1994; Hughes, et al., 1991; Randall, et al., 1995). Hence, to design a system to support specific work, it is necessary to uncover what that work is really about and how it is organised; if the system is to support a specific workplace, then consideration should be given to how work is carried out within that workplace. Disappointments that organisations have with technology are seen as the result of the failure to incorporate the real-world settings in the designs, especially in terms of how organisation arranges this work.

Organisations of work.

Work has been, in organisational studies, IS and CSCW research, examined and understood through formal organisational models (Hackman and Oldham, 1980; McGrath and Hollingshead, 1994; Sproull and Kiesler, 1991). Most of these formal models treat organisations as machines so that work, tasks and people can be articulated and modelled since they are routine, efficient, reliable, and predictable (Morgan, 1986). *Work* is therefore a collection of many discrete-entities (Kling, 1987). Each discrete-entity has its own tasks to perform, means to use, and ends to meet. Therefore computer applications are perceived as a coordination mechanism to link those discrete-entities together, as a way of routinising and automating procedures (Walsham, 1991). This view of work implies that computer applications can be used to connect discrete-entities and even to automate flows between the entities (Malone, et al., 1987; Malone and Crowston, 1994). Work here is understood as status quo and can be modelled and generalised.

Some scholars reject such a simple view of work and argue that *work* is a social activity which is largely unstructured, covert, political and symbolic (Hirschheim, 1985). In this

sense, characteristic of *work* is influenced by its surrounding environment (Ackroyd, et al., 1991; Hirschheim, 1985; Kling, 1980). The contextual factors that have impacts on work including socio-organisational structures (Checkland and Scholes, 1990; Lyytinen and Ngweyama, 1992; Mumford, 1987; Mumford and Weir, 1979), power relations (Knights and Murray, 1994; Knights and Murray, 1997; Markus, 1983), and external business environments (Bjorn-Andersen and Turner, 1997; Galliers and Baets, 1998).

Similarly, a body of research in CSCW regards that work is socially rather than formally constructed; and that people perform their jobs in situ (Button and Harper, 1993; Sachs, 1995; Suchman, 1995). This view rejects the idea that work and tasks can be articulated in advance or be studied indiscriminately in different institutions and participants. Sachs (1995) writes:

> "Studies of actual work practices have yielded evidence that the efficiency of work is in fact determined not so much by the logic and sequencing of task flow as by the capabilities of people for troubleshooting vexing problems in complicated situations, which inevitably arise in all workplaces" (p.38).

Going further, researchers argue that immediate surroundings and local contingencies have more direct influence on work than some broader contextual factors (Hutchins, 1991; Rogers, 1994). For example, in a constantly interrupted office a secretary has to perform several jobs simultaneously (i.e. filing, answering telephone, booking rooms, etc.) and sometimes needs to cover for the colleagues when they are off sick or on their break (Rouncefield, et al., 1995). The study of work is then carried out to underline the fact that work is socially organised and situated within the context of a particular workplace, and to examine the interplay of work and technology.

Wynn and Suchman (1996) illustrate how procedures of work are much more heterogeneous and complex than they first appear, and that to accomplish the process effectively there is a need for regular, constant, informal interactions between employees. Harper (1998) suggests that this 'sociality' of work underscores work practice; and that it is this 'sociality' which needs to be supported by technology. Hughes et al. (1992) illustrates the sociality of work by demonstrating how work is socially organised and how tasks and cooperation carried out for accomplishment of work are constantly negotiated between participants and changed all the time.

Various studies of the organisation of work demonstrate that work is context and time specific as most activities undertaken to accomplish the work are situated actions. This contrasts to the formal organisational or engineering models that believe human actions can be formulated and predicted and even summarised in limited number of categories (Suchman, 1987). For example, Bentley et al. (1992: 126) conclude on the basis of their analysis of work in an air traffic control room (ATC) that although the air traffic controllers in the ATC had individual tasks to perform they "move into a 'working division of labour'" in which the individual work is organised dynamically according to need and does not necessarily follow a prescribed form. A similar statement is also made by Heath et al. (1993) in their study of works performed by dealers in a City dealing room. Heath et al. notice that the dealers' work relied on other people's activity as well as ongoing business in the dealing room; and because the work could not be predicted and planned in advance the dealers were required to have ability to respond to situations quickly and promptly.

The most effective mechanism which connects or coordinates discrete-work, in an event-driven working environment, is individuals' awareness of ongoing business in the workplace (Patterson, et al., 1999). Heath and Luff (1991) in their study of the London Underground Control Room remark that awareness of surroundings and ongoing business is the most effective mechanism to coordinate various tasks. Watts et al. (1996) drew the same conclusion from their study of voice loops used in the Space Shuttle Mission Control Room at NASA as they noted that in order to initiate their own activities which coordinated with others', individuals had constantly to be aware of ongoing events and activities which were relevant to their divisions of labour. It is "awareness" that affords opportunities of cooperation rather than technology (Heath, et al., 1993).

Implications of studying organisations of work are twofold: for research and for systems design. As for research, the findings of the studies draw attention to organisation of *work* which has been, for some reasons, neglected or taken for granted despite the fact that computer applications are expected to support it. As for systems design, the studies demonstrate that designs of systems should be able to support the *actual* underlying process of the work rather than the *supposed* process of the work. And most importantly the technology should be designed to support the work rather than to

undermine it (Harper, 1998). In order to achieve this, understanding work in its settings is suggested as the only way.

2.1.2.2 Assessment of technology use: interactions between technology and organisations

The other main stream of CW studies technology use in the workplace. This body of research stresses and assesses surrounding issues of post implementation of CSCW related technology such as evaluating and reflecting factors contributing to acceptance or disappointment with the technology (Bowers, 1995; Bullen and Bennett, 1991; Ciborra, 1996a; Grinter, 1997; Grudin, 1988; Grudin, 1994; Markus and Connolly, 1990; Star and Ruhleder, 1994), and investigating organisational changes around technology within the workplace (Bikson and Eveland, 1996; Ciborra and Suetens, 1996; Failla, 1996; Karsten and Jones, 1998; Orlikowski, 1992; Orlikowski, 1996b; Wynn, 1996). The research undertaken in this area, by and large, is carried out in workplaces where CSCW related technology is adopted, and the findings drawn from the data aims to inform implementation management.

In general, the assessment of technology use is motivated to know why CSCW related technologies fail to live up to people's expectations as "a significant investment has been made in their development, and their successes have consistently fallen far short of expectations" (Grudin, 1988). Here, "expectations" refer to general promises given by CSCW related technology to adopting organisations, and to expectations of organisational changes around the technology.

A set of general expectations tightly coupled with CSCW related technologies is that the technologies can improve communication, enable group/teamwork, enhance information sharing, and remove obstacles of time and place (Section 1.1). It is then assumed that organisations' decision about adoption is to pursue this set of interests, and consequently the assessment of technology use is to evaluate the use of technology against the promises. When the result of the assessment does not match the initial promises given by the technology, then the adoption will be labelled as failure. This approach is termed as matching technique.

The mismatch between the promises and the actual outcomes of adoption, however, is noted not because of the technology failure per se but because of disparity of benefits

(Grudin, 1988; Grudin, 1991; Grudin, 1994), because of a lack of critical mass (Markus, 1990; Markus and Connolly, 1990), and because of unfamiliar working practice (i.e. working together) (Ciborra and Patriotta, 1996; Karsten, 1995; Markus and Benjamin, 1997). The emphases are placed upon compatibility of the technology and its environment. Compatibility refers to how well needs for the technology and the new working concepts introduced by the technology fit into the current infrastructure (e.g. organisational settings, computer networks). IS practitioners are strongly recommended to choose an appropriate technology which fits into the existing infrastructure; to make necessary changes in order to install the chosen technology; or to compromise properties of both the technology and organisation.

Another kind of assessment carried out in post-implementation environments is to examine whether changes which are supposed to take place have occurred. Traditionally, this kind of assessment is about comparing alterations observed after the technology has been put in use with some pre-defined intended changes. If the intended consequences are not observed after the technology is put in place, then the mission of the technology or project would be declared as a failure. The studies are usually carried out during and shortly after technology implementation in organisations and their findings represent outcomes at one particular point of time. Recently, researchers have began to recognise that change is an ongoing process that does not have an end (Orlikowski, 1996a), and argue that the previous approach to assess most can mislead organisations to draw a partial conclusion. Viewing change as an ongoing process enriches the initial understanding that change can only be of one kind, that intended, and provides opportunity to examine changes under different headings, including unanticipated (Bikson, 1996; Heath and Luff, 1996), strategic/tactical (Sellen and Harper, 1996), opportunistic (Orlikowski, 1996b), emergent (Orlikowski and Hofman, 1997; Weick, 1993), and drifting (Ciborra, 1996).

Recognition of different types of changes and their dynamic nature provides an alternative viewpoint from which to draw conclusion of the outcome of technology adoption. Ciborra (1996a: 8) argues that when changes do not occur as they are anticipated or occur when they are unanticipated they should not always be regarded or interpreted negatively; for example, drifting can occur for both successful or failing applications. An implication of this assessment exercise is to draw people's attention to

what makes different types of change occur and how IS practitioners should harness the processes of change.

This section (2.1) has firstly described the development of CSCW research in four phases: emerging, formalising, maturing, and post modern. Each of these phases has special research interests linking to technology development in both software and hardware industry. From there, the section has reviewed research literature within the *cooperative work* (CW) domain under two headings: workplace study, and assessment of technology use. The research on workplace study usually ends with "thick" (i.e. detailed) descriptions of organisations of work under study, and with a list of recommendations or guidelines for systems design. The research on assessment of technology use ends with a list of factors which contribute to whatever was observed in the post-implementation environment, and with a list of recommendations for IS managers.

These two mainstreams in CSCW research present different phases of a system development lifecycle: problem definition and post-implementation. The literature review of CSCW presented in this section reveals that we know much about the issues concerned in these two phases but very little about the processes and activities in between despite they are equally important and interesting. The experience obtained in JF Taiwan shows that many important decisions about system adoption are indeed made in this period such as which problem definition is agreed to be translated into system requirement; which system is chosen to support the problem; how the system should be rolled out, and so on. These decisions although are made in the early stage of an IS project their long-standing effects on the subsequent consequences and events should, nevertheless, overlooked. In this sense, the reasons for a particular problem definition is translated and for a particular system is chosen need to be examined. Next section (2.2) will look at how these two issues are dealt with in IS research.

2.2 ORIGINS OF TECHNOLOGICAL SOLUTIONS

Technology adoption is often interpreted as a result of a careful assessment of all possible alternative solutions for problems recognised by an organisation. That is to say, the technology adoption is a rational solution for an organisation's problems. Some IS as well as CSCW commentators, however, question this approach of looking at

technology adoption and claim that individuals' subjective views of problems and of technology sometimes predominate the situation and determine the decisions about the solutions chosen. In this sense, the technology adoption does not necessarily reflect objective reality but subjective interpretation of the reality. This section begins with the discussion of the literature which views technology adoption is a rational solution (2.2.1), it is followed by the discussion of the literature that argues otherwise (2.2.2). The last part of this section (2.2.3) synthesises the literature reviews and the findings of the JF case study.

2.2.1 Technology adoption is a rational solution

It is suggested by some IS commentators that IS project are initiated or originate from the need for technological solutions to support business operation (automating process), to improve business practice (tactical), or to gain/maintain competitiveness (strategic) (Earl and Feeny, 1996; Fiedler, et al., 1995; Ives and Learmonth, 1984; Porter and Millar, 1985; Ward, et al., 1990). For example, Ward *et al.* (1990) identify four types of strategic needs:

- Linking the organisation via technology-based systems to its customers/consumers and/or suppliers;
- Improved integration of internal value-adding processes;
- Enabling the organisation "to develop, produce, market and deliver new or enhanced products or services based on information";
- Top management support, especially external databases (pp. 22-4)

Similarly, CSCW researchers assume that the motivation of CSCW technology adoption is to satisfy organisations' needs for collaborative work (Section 1.1 and 2.1.2.2). The assumptions underlying the argument of "needs" are that problems can be analysed and broken down into their component parts from which rational solutions are derived; and technology is chosen to be *the* solution.

The evidence shows that in reality when companies adopt a technology they neither have any formal strategy in mind nor execute the strategy in expected ways (Knights, et al., 1997: 17). The processual approach argues that a rational model of strategic planning which assumes that strategies can be articulated and planned in advance in fact is not pragmatic in practice. Instead, it claims that "decision-makers proceed

cautiously, testing the waters, building on their competence, adapting to their interpretations of the environment, while maintaining internal cohesion so far as possible" (Knights, et al., 1997). Despite the processual approach claims that it provides an alternative view of assessing organisations' strategic needs for technological solutions, its underlying assumption remains the same as that of the rational models: decision-makers make "rational" choices and decisions through constant assessment of environments. In other words, the assumption indeed is not, at bottom, different from the conventional rational approach.

A group of IS management writers argue that technology adoption is not always driven by the strategic or technological needs but by political needs. This approach sees that organisational politics is not deviant, occasional, informal, and irrational activity that prevents organisations from the achievement of their goals and strategies. Rather, it asserts that organisational politics predominate the process of the development and deployment of information technology (Knights and Murray, 1994: 28). Knights and Murray (1994: 30) argue that the central motor of organisational politics is the struggle that individuals compete to secure and pursue their career in organisations. Thus politics is not occasional and irrational conduct but is rationally derived from individuals' *objective* operating conditions. To examine the process of technology deployment as political exercise can provide different views of the activities which other approaches conclude as irrational. But to rationalise individuals' political activities and to claim that all conducts are politically driven only helps the analysis to certain extent. The approach assumes that individuals are aware of their surrounding socio-political and -economic environments all the time and constantly justify themselves, engineering and engaging in organisational politics consciously. Organisational politics is rational product and deployment of technology is the consequence of this product.

Although the above schools of thought demonstrate different views of the origins of the needs for technology adoption, a common underlying assumption found between them is that decision-makers are rational and that the decision they make are objective. The observations obtained in the preliminary case study (Section 1.2) suggest that individuals are not always rational and conscious of their choices and decisions. At times, it may be true that individuals' decisions are influenced by their surrounding

environment and may be motivated by the economic and political lure; however, they are predominately made on the basis of individuals' personal insight and knowledge of problems, experiences, and expectations. In fact, decisions may also be made based on personal emotions (e.g. personal like or dislike). For example, it was frustration with the current systems that led employees in JF Taiwan to express their enthusiasm for Lotus Notes during interview despite the fact that they knew nothing about the system. This emotional frustration, together with politics between divisions/departments had direct impact on the employees' expectations of Notes; for instance, the requirements for the new system collected from users showed that the expectations were unrealistically high and that as a result people reflected their feelings about the current systems and conflicts between individuals onto the new system.

A lesson learnt here is that individuals' attitudes towards the technology are highly dependent on personal cognitive elements rather than on the result of cost-benefits analysis or of similar rational assessment. Put differently, origins of the need for technology may come from some cognitive reasons that decision-makers have. Cognitive elements have been played down in the main stream studies but are now gaining recognition within research on users' attitudes to the technology (Adams, et al., 1992; Davis, 1989; Harper and Randall, 1992; Orlikowski and Gash, 1994; Schneider and Angelmar, 1993). The following section will review the relevant literature of the impact of cognition on system designs and technology use within IS research. The review will then be compared to the observations made in the JF case study and from there move to articulate the role of individuals' cognition in the initiation of IS solutions.

2.2.2 Technology adoption is subjective process

2.2.2.1 Subjectivity in IS research

The contribution of cognition to IS is often associated with human computer interaction (HCI) and interface designs and is thought only to be important in these areas. The main stream IS literature seldom discusses the relation between individuals' cognition and IS development or considers the issue with the seriousness it merits. Bostrom and Heinen (1977) claim that system designs are often the reflections of systems designers' frame of references which consist of a set of assumptions, perceptions, beliefs, and

expectations of the world and of technology. Bostrom and Heinen note that the frames of reference held by individuals have a strong influence on how designers perceive the problems and translate them into the design. IS failure, in their explanation is, in fact, the gap between the needs of users and the design of the technology.

Hirschheim (1989) termed sets of different thinking of the world and of technology as paradigm thinking. Hirschheim borrows four paradigms developed by Burrell and Morgan (1979) to illustrate how different assumptions of the world and technology that individuals have could impact on their system designs or on their style of managing information systems. Hirschheim therefore urges IS researchers and practitioners to be consciously aware of the set of beliefs and expectations that they adopt when designing or managing the system.

Walsham (1991) expresses a similar concern. He argues that how individuals think about and see organisations have impact on how they design and manage the system "either via the prescriptions which arise from information systems theory or as part of the way that analysts or systems developers view the organisational world in which they work" (p.83). For example, if an organisation is viewed as a machine which operates in a routinised, efficient, reliable and predictable way, then the information system would be expected to be designed in such a way to secure the routine and maintain stability; whereas as if organisation is viewed as a political system which consists of loose networks of people with divergent interests, the information system is likely to be used as means to achieve an equilibrium of divergent interest and power.

User acceptance has been a long-standing issue in IS research, as it determines the fortune of the system in an organisation. Past research has explored organisational and technological factors which influence user attitudes towards the technology, but factors such as individuals' motivation and cognitive properties have not been discussed widely. Davis (1989) argues that user acceptance of information technology is largely affected by users' subjective views of usefulness of the technology to their work, and by ease of use. The former is termed "perceived usefulness" and is explained as "the degree to which a person believes that using a particular system would enhance his or her job performance" (p.320). The perceived ease of use is defined to be "the degree to which person believes that using a particular system would be free of effort" (p.320). Davis' finding suggests that both perceived usefulness and ease of use are significantly

correlated with self-reported indicants of system use. This echoes Robey's (1979) thesis that "A system that does not help people perform their jobs is not likely to be received favourably in spite of careful implementation efforts" (p.523). Davis (1989) notes in his study that "perceived usefulness and ease of use are people's subjective appraisal of performance and efforts, respectively, and do not necessarily reflect objective reality" (p.335). He therefore argues:

> "... beliefs are seen as meaningful variables in their own right, which function as behavioural determinants, and are not regarded as surrogate measures of objective phenomena. ... Thus, even if an application would objectively improve performance, if users don't perceive it as useful, they're unlikely to use it" (p.335).

Davis' work offers alternative measurements to examine and predict user acceptance of the new technology which have been proved by other researchers to be useful (Adams, et al., 1992); however, the work ignores the complexity underlying the measurements. For example, Davis assumes that the beliefs are intrinsic and independent from the environment, and then draws a general conclusion that people act according to their beliefs about performance (p.335). So the possibility that the beliefs change according to the environment or to the accumulated time of using the technology is altogether ignored in his study. Another weakness of Davis' study is that only one set of cognitive property is recognised and regarded important to users' acceptance of technology, belief in usefulness and ease of use, in practice other cognitive properties such as experiences, expectation, and knowledge (i.e. paradigm thinking) are equally influential to users' attitudes towards the technology.

Ginzberg (1981) proposes that users' early expectations of a technology could offer early diagnosis of MIS failure. In the study of a Trust Department of a large US bank Ginzberg noticed that a degree of realism of users' pre-implementation expectations was positively correlated with a range of project success measures. In other words, when users hold *realistic* expectations of particular system they are more likely to be satisfied with the result then those who do not. Realism refers to how close users' expectations are to designers' versions of (1) the reasons for developing the system (its goals and objectives); (2) the importance of the problem being addressed; (3) the way the system will be used; (4) the impact the system is likely to have on the organisation; and (5) the criteria which should be used to evaluate the system. As pointed out earlier, systems designers' expectations of the technology are also subjective appraisals of their

own assumptions and beliefs of the world and technology, which, in turn, makes is difficult to tell whose expectations are realistic and whose are not.

Lyytinen and Hirschheim (1987) in discussion of IS failure derive a term "expectation failure" to give consideration to the influence of expectations on IS projects. Expectations here consist of stakeholders' interests, beliefs, and desires concerning how IS serves their interests. Lyytinen and Hirschheim argue that some failures by nature are not actual failure but are regarded to be occasions when individuals' expectations are not met. Hence, they propose that expectation failure is intrinsically bound to individuals' perceptions since it is not the failure of the technology but the dis-confirmation of expectations. As they comment, "failure is the embodiment of a perceived situation" (p.64).

In a study of the introduction of the microcomputer in three companies Caroll and Perin (1988) conclude that managers' expectations of microcomputers directly affect the direction of implementation. Managers' expectations of the technology could be seen as the sources that determine perceived alternative solutions, choices of specific system, perceived change strategies, and chosen strategy. Caroll and Perin derive three types of expectations (automating, informating, and networking) which they suggest to be explanations for why the scope and scale of organisational consequences differ; and why conventional understandings of centralised and decentralised management and cost control have different consequences. For example, the manager in one of the companies saw the microcomputer as a calculator and the employees were allowed to use it when they needed to prepare financial reports only. Thus, other benefits that microcomputers could have brought into the company were not realised. Carroll and Perin therefore conclude that "the kinds of expectations with which an organisation approaches new information technology does much to define the consequences that will be observed" (p.348).

Although the above notions offer alternative approaches to investigate systems design, user acceptance of technology, and IS failure, the lack of systematic investigations undermines the significance of the findings. Despite the fact that the above studies have given some thought to individuals' subjective perceptions and expectations of the technology, they are still categorised within the traditional "objective" school of thought

because little consideration has been given to the social and political dimensions (Lee, 1999).

Compeau et al. (1999) propose social cognitive theory (SCT) as a method to study self-efficacy which they believe determines user attitudes to technology. By self-efficacy Compeau et al. mean "beliefs about one's ability to perform a specific behaviour – recognising that our expectations of positive outcomes of a behaviour will be meaningless if we doubt our capability to successfully execute the behaviour in the first place" (p.146). SCT, argued by Compeau et al., explicitly acknowledges the existence of a continuous reciprocal interaction between the environment in which individuals operate, and their cognitive perceptions and behaviours. Compeau et al. specify some of the issues that imagine on the interactions as related to personal social status and to personal feelings about the technology and then employ these issues to measure outcome expectations, performance outcomes, and personal outcomes. The findings confirm their initial hypothesis that there is a causal relation between cognitive perceptions and individuals' attitudes towards the technology, including the effect of realistic and unrealistic expectations on users' satisfactions with the technology noted by Ginzberg (1981) previously. The major weakness of the study by Compeau et al. is that the authors do not explain how personal social status links to how individuals feel about the technology; where the feelings about the technology come from; and whether changes in self-efficacy take place and why and how.

Karahanna et al. (1999) challenge the lack of a dynamic model in the above study by proposing that users' perceptions and use of IT are different before and after adoption. Karahanna et al. argue that whatever sociological factors all involved in the process, they may have divergent impact on individuals' attitudes towards the technology at the various stages of sourcing and implementation. The model that the study adopted has two components: attitude (behavioural) and subjective norm. Behavioural belief refers to individuals' salient beliefs about the consequences of adopting the IT and evaluation of these consequences. Normative belief refers to that individuals' salient belief about what others expect them to do with respect to adopt the technology and their own motivation to comply with those beliefs. The finding of the study suggest that *normative* beliefs predominate individuals' decisions about whether to accept the technology prior to the adoption; and that *behavioural* beliefs predominate users'

decisions about continuing to use the technology after the adoption. This finding gives point to the possibility that decisions are made under social pressures; and that individuals' subjective perception of experiencing the technology forms a part of it. Such considerations are regarded as significant because they addressed social situations and personal feelings about the technology and imply that there is an interplay between social norms, (potential) users, and technology. And most importantly, the process is second dynamic and individual reactions one perceived as changing throughout time.

2.2.2.2 Subjectivity in CSCW research

Comparing with IS research, there is a lack of systematic investigation of subjective determinants of decision about technology adoption in CSCW. Bullen and Bennett (1991) specified four general categories of organisational factors that contribute to CSCW technology adoption process; "expectations" was one of them. Expectations here refer to the purposes that lead organisations to introduce groupware into companies. According to Bullen and Bennett, if the purposes of adopting groupware are well defined, then the likelihood of having a successful system deployment is greater because "the way in which new groupware tools are introduced to the work group will influence the ways in which they are used" (p.227). In a study of the adoption of Notes in a consulting company, Orlikowski (1992) argues strongly that cognitive properties have ability to both enable and constrain use of technology. In other words, individuals' perceptions and expectations of technology directly influence the way that it is introduced and used[3].

In a late study, Grinter (1996) argues that individuals' or organisations' perceptions and expectations of groupware can be an obstacle to prevent groupware from being utilised and optimised as it should be. Some individuals and organisations tend to use technology according to their expectations and interpretations rather than according to actual or defined functionality of the technology. A similar point was made by Hutchins (1991), despite his being more concerned about how artefacts could support problem solvers to interpret problems in particular way. Hutchins studied artefacts used for ship navigation and revealed that artefacts do not, as many might assume, amplify

---

[3] Further discussions of this case study will be provided in the next chapter.

individuals' cognitive abilities but present a different cognitive problem which requires a different set of cognitive abilities or a different organisation of the same set of abilities to achieve useful resolutions. Hutchins argues that solving a problem simply means representing it so as to make the solution transparent and that the way that a problem is represented changes in compliance with the problem solvers' views. He came to the conclusion that the ship navigators did not switch to those intelligent computer artefacts but continued using traditional instruments because the latter possessed the ability to make problems transparent to the individuals who have encounters with them. Problem transparency makes problems easier to be understood and allows navigators to find the solutions readily, this reduces the ambiguity embodied in interpretation.

Rogers (1994) and Plowman et al. (1995) also raise concerns about discrepancies between expectations of groupware and groupware in practice. Rogers and Plowman *et al.* notice that so-called groupware failure may be the result of a mismatch between promises made by vendors/practitioners and managers' and users' expectations. As Plowman et al. put:

> "implementation of CSCW systems in work settings note how they have fallen short of expectations, being used sub-optimally, not at all, or in different ways than intended. It appears that there is a mismatch between "the promises of software companies promoting their groupware products, management's expectations of how these can be realised in their particular organisations, and the changes in work practices that have to be adopted by employees to enable the groupware to work in the ways intended and project" (p.317).

2.2.3 Choices and decisions about technology

The review of literature discussed above reveals a common phenomenon that individuals' decision about adopting, continuing to use, or using a particular technology is not necessarily made on the basis of the concern about maximising institutional benefits but on the basis of subjective perceptions and expectations of the technology. This challenges the conventional assumption that technological solutions originate from the strategic and technological needs, as well as the assumption that choice and decision are bounded by rationality.

March (1997) summarises and identifies three conspicuous interrelated assumptions of choice taking in organisations; they comprise pre-existence of purpose, necessity of consistency, primacy of rationality. The assumption of *pre-existence of purpose* refers to a strong tendency to believe that choices and decisions are based on a set of pre-

defined objectives. The assumption of *necessity of consistency* centre on concerns that actions taken by different parts of an organisation should be consistent with each other; that is, that individual and organisational activities should be seen as connected with each other in terms of their consequences, that there should be some consistent set of purpose. The *primacy of rationality* assumption is to decide "what is correct behaviour by relating consequences systematically to objectives" (p.341). March argues that studies which over-emphasise the concept of rationality usually implicitly reject the two further procedures for choice and decision making: one is the process of intuition, by means of which people may do things without fully understanding why; the other is the processes of tradition and faith, through which people do things because that is the way they have been done in the past and hence, should be in the future.

March's argument coincides with the findings of the JF case study. First, Lotus Notes was considered to be JF's next IS project not because of some pre-existent purposes but because of frustrations with the current technological and political situations. In fact, the purposes were learnt and emerged during the process of problem definition and objective searching. Second, the idea of necessity of consistency was also challenged by the finding that there was no consistent interest, interpretation, expectations, and objective of problem situations and of the technology across the departments. This inconsistency of interest, interpretation, and expectations of the problems and technology was caused by individuals' social and hierarchical status within the company and by particular patterns of work.

Both the review of literature and the findings of the case study demonstrate the interplay between individuals' subjective perceptions and expectations of the technology, social and organisational properties, and the technology itself. Choices and decisions about adopting a particular technology do not necessarily reflect rationality of maximising that one can get from the technology benefits but reflect individuals' experience. Because choices and decisions may reflect subjective preferences, the literature suggests that disappointment with the outcomes of implementation can be interpreted as a mismatch between an individual's circumstance, the "real" problems, and the properties of the technology. The question then emerges: "Can the outcome of system adoption be determined in the early stage of the project if decisions about technology adoption are based on the ambiguous objectives?" Ginzberg (1981) raises the same issue and argues:

> "If the key decisions which determine the ultimate success or failure of an MIS are made near the start of the project (i.e., at Definition), we should be able to assess the chances for successful implementation at this early stage" (p.461).

The question forms an central part of the research agenda of the present thesis. The following section will discuss this research question and the agenda for the study.

2.3 RESEARCH QUESTION

Discussion in preceding sections (2.1 and 2.2) has highlighted two, if not substantial but fundamental, areas in both IS and CSCW research. The literature review in section 2.1 draws attention to the lack of consideration given to the origins of technological solutions in CSCW research. This lack of research can be explained as a consequence of the motivation for organisations to adopt CSCW related technology too often being seen as the same as that that the technology aims to achieve. This has a further impact (Section 2.2) in that topics such as why and how technological solutions emerge and on what basis they emerge are seldom touched upon. Studies which take the origins and motivations of technological solutions for granted present what might be termed a "tidy" picture; that is that decisions about adopting a particular technology emerge and are decided without any difficulty or conflict. In addition, such studies lead many of us to think that the solutions chosen must be the best ones that organisations can have. On these accounts, investigation or assessment of technology adoption tends to match the perceived solution and actual outcome of the adoptions, and draws a conclusion about the relation between technology and its hosting organisation. The findings of the preliminary case study discussed in Chapter One, however, does not support such a picture and argues that the process in which decisions about technology solutions emerge is in fact "messy". Also, the preliminary study shows that decision-makers do not necessarily have the best knowledge of the problems and technology in order to make the "best" decisions. The decisions may reflect only the decision-makers' personal views of their personal situations and agenda; in such circumstances, ideas about the best or rational decisions about the technology are indeed, a myth.

Developing ideas from the findings of the preliminary case study together with emerging questions from the literature review, this thesis proposes to investigate the origins of technological solutions for organisations' problems. Such a proposal rests on a belief that the answers to why and how solutions originate hold the key to a better

understanding of what is observed in post-implementation environments. In other words, the history of the project is substantial importance for what is currently happening. Ciborra (1996a) notes the significance of history with respect to a better understanding of what is currently happening:

> "I strongly recommend the reader refer to each case history for a fuller picture and the details" (p.4).

Latour (1987) also expresses a similar concern and states

> "[...] As a consequence, listeners make sentences less of a fact if they take them back where they came from, to the mouths and hands of whoever made them, or more of a fact if they use it to reach another, more uncertain goal. The difference is as great as going up or down a river. [...] We understand now why looking at earlier stages in the construction of facts and machines is more rewarding than remaining with the final stages" (p.24).

The importance of addressing the origins of a technological solution can be illustrated by providing extreme examples which demonstrate that the outcome of a project can be determined as early as the first stage of its development (Drummond, 1996; Keil, 1995). The disastrous Taurus project at London Stock Exchange (LSE) is an example which illustrates that decisions taken at an early stage of a project are indeed influential and have continuous impact on subsequent events (Drummond, 1996). Drummond claims that the outcome of the Taurus project as presented to the public could have been different if the decisions relating to the project were not made persistently in directions that individuals involved within it knew would not work.

This thesis takes a social cognitive approach to examine the origins of technological solution in organisations and emphasises the role of individuals' cognitive properties in the process of determing and choosing the solutions. The present thesis takes a number of theoretical stands:

(1) Individuals' attitudes towards a particular technology do not necessarily reflect what the technology offers but reflect individuals' interpretation of problems, experience and expectation of technology, and personal agenda.

(2) Individuals take actions towards technology on the basis of the meanings which the technology has for them within the context. Therefore the same technology may be assigned with different meanings depending on individuals.

(3) Individuals' attitudes towards the technology change over time in accordance with their surrounding situation and knowledge of the technology.

(4) The decisions and choices made in the early phase of an IS project have an impact on the subsequent development of the project.

The research question is formulated to investigate *how the perceptions and expectations of individuals influence the decisions taken with regard to the initiation and acquisition of a specific information system.*

The findings of this study are expected to provide some insights into the process of how organisations come to determine a particular technological solution, if not on the basis of rationality and of choice. Predicted contributions to research literature are twofolds: firstly, a contribution to the knowledge which is less well presented in the current IS and CSCW literature. Secondly, a contribution to the knowledge of social cognitive approach in IS research.

2.4 SUMMARY

The development of CSCW research domains and the main streams of investigation concerning the areas of "CW" have been reviewed in this chapter. Through the literature review a less well represented research area was highlighted, that is, about the origins of groupware solutions in host organisations. Together with the findings from the JF Taiwan case study, this thesis found that decisions and choices about particular technology are influenced by individuals' subjective understandings and expectations of the technology rather than organisations' rational objectives. The present thesis, therefore, proposes to provide insights of why and how an IS project is initiated by studying the origins of an IS solution from the perspective of social cognition.

The next chapter will discuss the research framework deployed to assist the investigation.

CHAPTER 3

RESEARCH FRAMEWORK

Based on the review of the CSCW literature the previous chapter revealed research negligence towards origin of groupware adoption in current research. It was interpreted as a consequence that the motivations of initiating groupware adoptions have been either taken for granted or been assumed to be indifferent across organisations. However, the findings of the preliminary case study presented in Chapter One (Section 1.2) demonstrated that decisions about groupware adoptions do not always reflect the objective reality but individuals' subjective interpretation of the reality. In this sense, any decisions made about groupware adoption at the early stage could potentially affect the direction of further development of the technology. Because of the lack of literature of this area in CSCW the mainstream IS literature was reviewed. It is surprised that even the mainstream IS research pays little attention to the topic. This research therefore proposed to study origin of IS development and its focus will be on why the project is initiated and how a particular technological solution is determined to support the perceived problems. The findings of the preliminary case study suggested that individuals' cognitive properties and interactions with others significantly influence their perceptions of problems, expectations of the technology, and decisions about the technology, thus, the questions will be approached from a social cognitive perspective.

In IS literature, it is evident and widely believed that individuals' decisions about adopting information systems are by and large influenced by organisational politics (2.2.1) and by individuals' political interests within organisations. This was also observed in the preliminary case study when the senior manager was under pressure to accept JF Hong Kong's suggestion to look at the possibility of installing Lotus Notes in

the Taipei office. The senior manager might not have any idea about the technology, indeed showed little interest in it, but for various reasons she had to be seen to be interested, in the eyes of others'. The senior manager's political motivation was reflected in her subjective views of technology. It is noted that an individual's political motivation is likely to be reflected in his or her subjective view and decision about technology adoption. In this context, it seems appropriate to deal with the political and power related issues as if they are a central and integral part of individual's subjective interpretation of technology rather than a separate problem.

Issues of decision making about innovation adoption have been considered in the diffusion of innovation approach (Rogers, 1995). The approach considers individuals' decisions about acceptance or rejection of innovation. Rogers (1995) suggests that the process of individuals' decision making about innovation can be analysed into five stages. These are: knowledge, persuasion, decision, implementation, and confirmation. Rogers argues that the innovation–decision process begins with a 'knowledge' stage which commences when an individual is exposed to the innovation's existence and gains some understanding of how it functions. However, the individual's knowledge of the innovation is selective and depends on the individual's interest, needs, or existing attitudes. It is these interests, needs, existing attitudes and their impact on the individual's decisions about having the innovation that the present study is investigating. It is worth noting that we are interested in the impact of "having" rather than "adopting" the innovation. The difference between these two is that individuals who decide to have the innovation are not necessarily the same individuals who will adopt and use the technology. In the diffusion of innovation approach the former is understood as "change agency" while the latter is understood as "innovation adopters", and the approach is focused mainly on the latter's decisions about adoption. In this sense, we argue that the approach would be more suitable for studies which are interested in the *process* of information system adoption within organisations not for the study of this kind which focuses on the process in which change agencies' formulate their perceptions and expectation of information systems and make decisions accordingly.

The ideas introduced by the technological frames analysis appear to echo the assumptions and arguments made by this research, hence, the analysis was employed to

study individuals' cognitive properties and the impacts of these properties on individuals' decisions about the technology. A contextualist approach was employed and synthesized with the technological frames analysis to develop a conceptual framework to pursue the research interest. This chapter is dedicated to discussing the research framework and organized into three sections.

The first section (Section 3.1) introduces technological frames analysis and issues relating to the analysis. The second section (Section 3.2) outlines a contextualist approach developed by Pettigrew (1987) and its role in this research. The third section (Section 3.3) synthesizes the technological frames analysis with the contextualist approach and discuss as how the synthesised framework will be applied later in the thesis.

3.1 TECHNOLOGICAL FRAMES ANALYSIS

Technological frames analysis was developed by Orlikowski and Gash (Orlikowski and Gash, 1992; Orlikowski and Gash, 1994) to study underlying assumptions, expectations, and knowledge that people have about technology. It is important, according to them, to understand such underlying cognitive threads as they have influential effects on individuals' behaviour towards technology. As Orlikowski and Gash (1994) write:

> "We argue that an understanding of people's interpretations of a technology is critical to understanding their interaction with it. To interact with technology, people have to make sense of it; and in this sense-making process, they develop particular assumptions, expectations, and knowledge of the technology, which then serve to shape subsequent actions toward it. While these interpretations become take-for-granted and are rarely brought to the surface and reflected on, they nevertheless remain significant in influencing how actors in organisations think about and act toward technology" (p.175).

The underlying assumptions and arguments of Orlikowski and Gash's technological frames analysis and of the present study share a common ground as they both emphasis the importance and role of knowledge, of interpretations, and of expectations of technology in the interactions that occur between individuals and technology. It is for this reason that technological frames analysis was deployed: in order to acquire insights into the proposed topic.

Discussion in this section will be organised into several sub-sections: Concept of Frames (3.1.1), Technological Frames Analysis (3.1.2), Applications of Technological Frames (3.1.3), and Critiques of Technological Frames Analysis (3.1.4). Section 3.1.1

is dedicated to a discussion of some concepts of 'frames' in social cognitive research; from there the technological frames analysis is introduced (3.1.2). Literature reviewed and referenced here follows the literature used by Orlikowski and Gash in order to understand the ideas embedded in the technological frames analysis better. Section 3.1.3 introduces other studies which are applications of the technological frames analysis, and is followed by a consideration of some of the limitations of the approach (3.1.4).

3.1.1 The Concept of Frames

Orlikowski and Gash's technological frames analysis has its roots in research which studies social cognitive processes within the context of organisations. Most of their arguments are drawn from work included in the book *Thinking Organisations* (Sims and Gioia, 1986). This book aims to study the underlying processes that bear on the reasons for human actions, rather than the results.

> "Much of what has been written about organisations has focused mainly on behaviours and outcomes, without an in-depth understanding of the cognitive processes that influence those behaviours and outcomes" (p. 3).

Social cognition emphasises the importance of "meaning" for individuals' actions when individuals enact things such as objects, social occurrences, and concepts. The main argument of social cognitive research is that "people act on the basis of their interpretations of the world, and in doing so enact particular social realities and endow them with meaning" (Orlikowski and Gash, 1994). These interpretations of the world can be described as being based on a set of "cognitive maps", "frames", "interpretive schemes", "mental models", "paradigms", "scripts", or "thought worlds". These terms all have a common characteristic in that they are each used as a sense-making device in order to describe how people attribute meanings to things. Orlikowski and Gash adopt the term "frames" and develop it further in the context of organisational study. According to them frames are "definitions of organisational reality that serve as a vehicle for understanding and action", and consist of sets of assumptions, beliefs, knowledge, expectations, and interpretations. Frames, on one hand, as Orlikowski and Gash argue, enable individuals to make sense of events and on the other hand guide individuals' behaviour to act appropriately in their situations.

It is worth noting the differences between mental models and Orlikowski and Gash's idea of frame. Mental models are argued to be the foundations of reasoning which

consist of formal rules of inference, like those of a logical calculus (Johnson-Laird, 1989). Theories of mental models are various but most of them share a similar feature that the boundary of a mental model is drawn around an individual. That is, it is self-contained and processing information independently from the external world. In this sense a mental model is individualistic. On the contrary, Orlikowski and Gash argue that individuals' ability to interpret an even relies not only on the existing body of knowledge which they have but also on their relationship with the external world. In this sense, frames are shared (Bijker, 1995) or have potential to be shared by individuals (Orlikowksi and Gash, 1994). This view is particularly important to the present study as it argues that through interactions individuals are likely to alter their own frames or others' in order to achieve decisions.

A frame has a number of qualities. First, it is a device for sensemaking. People use it to organise and make sense of information and to ascribe meaning to the world around them. A frame directs appropriate behaviour or even sequences in specific situations, so people can act on the basis of the meaning that things have for them.

A frame operates as a short cut and a filter with which to understand some things and to ignore others. If a similar situation has happened in the past, the individual is likely to deal with the current situation in accordance with the experience and knowledge gained from that past situation and at the same time expect to see a similar result. If there is no historical occurrence which the individual can use as a model to handle the current situation, the individual will search for knowledge of other events in the same category of frames in order to facilitate understanding and action. Frames are particularly useful when they structure organisational experience, allow interpretation of ambiguous situations, reduce uncertainty in situations of complexity and change, and provide a basis for taking action.

As a cognitive structure a frame is unique to an individual. It is assumed that frames are formed through social background, learning process, and experience with events hence they are only meaningful to the individuals who own them. This explains why different individuals interpret the same event differently and act towards the events differently.

Frames are interpretive flexible and context specific. Individuals referencing to the same frame to make sense of the same event or thing in different context are expected to

arrive at different interpretations and conclusions of the event. This explains existence of inconsistency of frames which refers to the phenomenon that individuals may believe, for example, a new technology will be benefit to people's general performance but they themselves do not use the technology.

Finally, frames operate in the background and do not have physical forms. Since frame is a cognitive property and individuals have difficult to describe it in words it can only be observed *via the meanings given to things by individuals and through observation of their actions.*

Typology of frames

At least three broad types of frame are identified within organisations: individual, group, and organisational. As its name suggests, individual frames are held and owned by individuals and used as vehicles to enable individuals to understand the world around them and as guides for appropriate behaviour. With individual frames individuals make sense of what is going on around them both in their personal and in their working lives.

A group frame is shared by people in the same group who have common interests, educational background, or jobs. The social cognitive perspective develops the concept of frames as individual cognitive structures but suggests that after a period of time individuals within a group or organisation tend to think, at least to some degree, alike. That is that individuals tend to share a set of frames with peers within a group or organisation. Within social cognitive research a frame which is shared by individuals within the same group is termed 'cognitive consensuality' (Gioia and Sims, 1986). Consensuality does not mean that all members of a group will think and behave identically, rather it implies that "whatever the process – conscious or unconscious, deliberate or not, individuals have achieved a certain similarity in the way they process and evaluate information" (Gioia and Sims, 1986: 8). Instead of following the argument of consensuality in social cognitive research Orlikowski and Gash employ Wittgenstein's notion of *family resemblance*. Following the notion of family resemblance a shared frame refers to how the members of a community share some core assumptions, knowledge, and expectations of the same thing. A *shared frame* serves as

a device to facilitate group to make sense of events and in turn to take actions to respond to the events.

Building upon the same argument of shared frame organisational frames are expected to serve as a facilitator to help members of staff to some sort of common understanding of the organisation and organisational occurrences such as formal meetings, decision situations, performance appraisals, and day-to-day employee interactions (Gioia, 1984).

The relationship between the above three types of frames is not linear. In other words, an organisational frame is not a collection of group frames and similarly a group frame is certainly not the sum of individual frames. The relationship between individual, group, and organisational frames is interdependent and interconnected and one cannot operate without others. An individual is expected to reference his/her frames to make sense of an event within the constraints of group and organisational frames. Similarly, an organisational frame is built-in with individual and group frames, so it is common to find that organisational visions reflect a particular individual's or group of individuals' frames.

Shared frame and subculture

The notion of shared frame especially group frames in particular may be confused with the concept of 'subculture' in organisations. Schein (1996) defines culture as:

> "[...] a set of basic tacit assumptions about how the world is and ought to be that a group of people share and that determines their perceptions, thoughts, feelings, and, to some degree, their overt behaviour" (p.11).

In Schein's view 'subculture' is understood as a set of shared assumptions, knowledge, and goals formed around the same function. Schein therefore argues that the problem of why cross-functional project teams do not perform well arises from the difficulties of integrating different subcultures into one (e.g. the hierarchical view).

Confusion between the concepts of shared frames and subculture arises if the definition of organisational subculture by Schein is taken literally. Schein's definition seems to blend various things into the term 'culture' and assumes that 'culture' holds the key to answering questions of cross-functional unity, the unique characteristic of each function, management style, and so on.

Morgan (1986) argues, however, that using shared assumptions, knowledge, and shared sense-making to describe organisational culture or subculture does not really describe the whole characteristics of culture. He proposes rather that in talking about culture one should focus one's attention on a process of reality construction since it allows people to "see and understand particular events, actions, objects, utterances, or situations in distinctive ways" (Morgan 1986: 128). Morgan (1986) argues that constructing social reality is important because the nature of a culture can be found in its social norms and customs.

> "The characteristics of the culture being observed will gradually become evident as one becomes aware of the patterns of interaction between individuals, the language that is used, the images and themes explored in conversation, and the various rituals of daily routine" (p. 128).

'Culture' here is defined with a more 'contextual' view. Morgan uses several terms to describe culture including patterns of behaviour, social norms, circumstances, and context. These terms are used to describe the characteristics of a space / environment in which people's thoughts and behaviours are bounded.

In contrast, Orlikowski and Gash (1994) want to distinguish the differences between subculture and types of frames in their model and argue that frames are essentially cognitive structures or mental models while culture refers to a "living historical product of group problem solving":

> "[...] individuals – drawing on their shared frames – engage in symbolic action and thereby construct a social reality that reflects their common assumptions, beliefs, and understandings, and that includes particular rules, rituals, and customary practices" (p.178).

Put simply, the notion of frames is about cognitive structures or knowledge structures which facilitate individuals' understandings of the world; and the notion of culture and subcultures is about social systems which govern the thoughts and behaviour of the majority of the individuals who are within such systems. Hence, the subculture should be seen as a context in which a specific shared frame is formed but it is in itself not a frame.

3.1.2 Technological Frames Analysis

Building upon the ideas of social cognitive research Orlikowski and Gash take the concept of frames further and develop a conceptual model – technological frames analysis – which aims to investigate the use of technologies in organisations. Technological frames analysis helps to understand the reasoning behind individuals' behaviour rather than to record events, and this is an area that Orlikowski and Gash argue much of the current research has overlooked.

Frames are then an abstraction for the cognitive and knowledge structures which serve as vehicles for understanding and action. Technological frames are referred to as "a set of assumptions, meanings, knowledge, and expectations that people use to understand the nature and role of technology in organisations. This includes not only the nature and role of the technology itself, but the specific conditions, applications, and consequences of that technology in particular contexts" (Orlikowski and Gash, 1992: 3).

The principal thrust of technological frames analysis is that individuals interact with technology in accordance with the meaning that the technology has for them. In other words, individuals make sense of technology and then interact with it. In this sense-making process individuals develop a set of perceptions, assumptions, definitions, interpretations, and expectations of the technology namely technological frames current context. Once technological frames are formed, individuals decide their own actions towards technology.

The features of technological frames are inherited from the general concept of frames in social cognitive studies (Section 3.2.1). Technological frames are unique and belong to the individuals who hold them; based on the technological frames individuals develop their personal views of a piece of technology. Because technological frames differ from one individual to another, interpretations of the same piece of technology therefore differ between individuals. As a consequence interactions between individuals and the technology are various.

Technological frames serve as a short cut and a filter by which individuals make sense of technology based on their experiences with technology earlier. In JF Taiwan, the employees' experiences with other information systems and knowledge of the problems serve as a device to help them to form the expectations of the new system despite they

knew very little about the technology. For example, the Managing Director had high expectation of Lotus Notes because the personal experience of using Lotus cc:Mail was successful.

The notion of 'relevant social groups' from the literature of the social construction of technology (SCOT) was brought into the technological frames analysis to enrich the framework. Orlikowski and Gash use the notion to explain how social groups have influences on, and at the same time are influenced by, the artefacts in which they come in contact. According to Pinch and Bijker (1987) a problem can be defined only when relevant social groups are identified. The concept is straightforward because the meanings that the social groups give to the artefacts determine the role that the artefacts play. Pinch and Bijker write:

> "[...] the different interpretations by social groups of the content of artefacts lead by means of different chains of problems and solutions to different further developments" (p.42).

Once relevant social groups are identified other components of technological systems can be brought into the picture such as economics, politics, and institutions. Hughes (1987) notes that a technological system not only consists of physical objects (technology itself) but also organisations, legislative artefacts, and natural resources. A technology functions as a component and interacts with other components in a system, all of which contribute directly or indirectly through other components to the common system goal. If one component is removed or if its characteristics change, other components in the system will alter their characteristics accordingly. Because components are invented and developed by system builders and their associates, they are socially-constructed artefacts, meaning that their material form and function will embody the relevant social groups' objectives, values, interests, and knowledge of that technology (Orlikowski and Gash, 1994). Since all the components within both technological and social systems interact with one another, the characteristics of technology are likely to derive from these interactions. For example, a management structure depends on the nature of the business and on the character of the functioning hardware, especially so in the manufacturing sector. In turn, the management component in a technological system is likely to choose a technology that can support the structure of management.

Since it is assumed that individuals within these social groups, to some degree, share the same set of technological frames, they are expected to act more or less the same towards the technology as a group. Nevertheless, the set of shared technological frames within a group may not be shared by other groups as others have different interests to pursue and different experiences of the world. This phenomenon is explained as "interpretive flexibility" which maintains that technological artefacts are socially constructed and interpreted. This concept helps to explain why there is incongruence of technological frames between groups as different social groups interacting with the same technology have different concerns and even radically different interpretations of that technology.

Orlikowski and Gash define congruence of technological frames existing when groups share "similar expectations around the role of technology in business processes, the nature of technological use, or the type and frequency of support and maintenance." Incongruence of technological frames refers to the fact that "there are differences in important expectations, assumptions, or knowledge about some key aspects of the technology" (p.179).

In the Alpha case study Orlikowski and Gash identified three social groups which they argue play key roles throughout a system life: the traditional trinity of management, systems designers/IT personnel and users. They found that technological frames around the Notes technology held by technologists and users were not much in common. Contrasting technologists' and users' technological frames in three areas (nature of technology, technology strategy, and technology use), Orlikowski and Gash argue that differences in expectations and actions between technologists and users which led to unwanted outcomes can be said to reveal the differences in the respective technological frames of the two groups. In fact, technological frames incongruence between the two groups was found in all three areas.

Orlikowski and Gash further argue that frames may be internally inconsistent. By inconsistency they mean that frames can "embody ideas that are ambiguous, obsolete, incomplete, or incorrect" (p.181). This inconsistency in technology frames has important consequences for the implementation of technology. For example, managers may think that an electronic scheduler can speed up the process of arranging meetings or appointments because the system provides the facility to let people view others' schedules to check availability, while at the same time they themselves do not want to

use it (Grudin 1988). One reason for an unwillingness to use the system is that the managers have an idea that the system is useful for others but not to themselves, since they don't want others to see their own schedule.

The notion of technological frames is also discussed in Bijker's (1995) study of Bakelite. A number of fundamental assumptions of both technological frames analyses are similar. As for both Bijker and Orlikowski and Gash, a technological frame provides goals, ideas, and tools needed for actions and it guides thinking and interactions performed by the relevant social groups. Moreover, both technological frames analyses emphasise the nature of the interpretative flexibility of technology. The meaning of a particular technology depends on who is associates with it, as Bijker (1995) writes that "*working* and *nonworking* of an artefact are socially constructed assessments, rather than intrinsic properties of the artefact" (p.75). This leads to the element of relevant social group in both analyses. Each relevant social group has its own technological frame which allows group members to communicate with the same vocabulary and guides their actions towards the technology.

In spite of their similarities, Bijker's work on technological frames differs from Orlikowski and Gash's in many respects. A fundamental difference is that the former has roots in the social construction of technology (SCOT) and focuses on both change and constancy in technological development; while the latter has strong roots, as claimed, in social cognitive theory and is interested in meanings that individuals assign to the technology. On closer scrutiny, it can be argued that social-cognitive technological frames, is similar to the semiotic scope of technological frames (Bijker, 1995). This scope views that the frames "mirror technological development and provide the vocabulary for forming artefacts, and constitute another type of world" (Bijker, 1995: 195). For example, Orlikowski and Gash has demonstrated that technological frames provide individuals with a set of values and assumptions to enable them to formulate the meanings of the technology and then they act toward the technology according to the meanings. Moreover, the social constructionist viewpoint of technological frames analysis argues that a technological frame does not reside in but external to individual and is located at the level of social relevant group. However, social cognitive technological frames analysis argues that a technological frame belongs

to individuals and at the same time individuals who may share the same group can share a technological frame which is sustained continuously through interactions.

3.1.3 Applications of Technological Frames Analysis

On the basis of a literature search there are four studies in information systems research that explicitly use technological frames analysis to study technology use and organisational changes in the post implementation period including two studies conducted by Orlikowski and Gash (1992, 1994). These studies are *Changing Frames: Understanding Technological Changes in Organisations, Learning From Notes: Organisational Issues in Groupware Implementation* (Orlikowski, 1992), *Technological Frames: Making Sense of Information Technology in organisations* (Orlikowski and Gash, 1994), and *Implementing Radical Change: Gradual versus Rapid Pace* (Gallivan, 1994). How technological frames analysis is applied in each of these studies will now be considered.

Changing Frames: Understanding Technological Changes in Organisations

In this study Orlikowski and Gash (1992) use technological frames analysis together with the topology of technological changes (which consists of first order change, second order change, and third order change) to discuss shifts in technological frames held by the three critical social groups – management, technologists, and users – in relation to technological changes which occur in organisations. Orlikowski and Gash claim that "comparison of frames across groups over time reveals the nature of change that particular groups have experienced as well as the areas and extent of incongruence around new information technology" (p.9).

Orlikowski and Gash identify at least seven sets of dimensions that constitute the core dimensions of technological frames. They are shown in Table 3.1. They assume that when individuals face a piece of technology their actions towards the technology will be led and influenced by some of the dimensions identified.

When first order change takes place, existing frames and processes will be reinforced incrementally so current assumptions, meanings, knowledge and process are modified (the term 'process' is understood as a business process revolving around the technology). When second order change happens, existing frames and process shift

dramatically. Usually, second order change is associated with organisational transformation which involves radical changes not only in frames but also in evaluation criteria, formal roles, structures, and social norms. Third order change refers to the capacity of individuals and organisations to be able regularly to reflect on their existing frames, processes, and interactions, and to change them if necessary.

The archetypal outcomes of technological changes include aligned intended change, partial intended change, and unintended change. Aligned intended change implies that the three social groups share a common understanding, agreement, and commitment to the direction of the changes. Partial intended change means that not all three groups have changed their technological frames either incrementally or radically. Finally, unintended change indicates that one or more members of a group experience changes which are not planned or expected.

Orlikowski and Gash's synthesised framework, which consists of technological frames analysis, a typology of changes, and a description of the archetypal outcomes of technological changes, is grounded in the argument that it is the underlying assumptions, meanings, expectations, and knowledge that people have about technology which guides their behaviour towards the technology. Through the lens of this framework, conflicts between the plans and the outcomes of technological change can be explained. Various scenarios are summarised in Table 3.2.

Dimension	**Definition**	*Components*
Philosophy towards technology	Beliefs and assumptions about technology and information technology in general, as held by self and perceptions of organisations' philosophy	Personal philosophy Organisational Philosophy
Issues around initiation	Knowledge and experiences of the initiation stage of a specific technology, including background, participants, feasibility assessment, and perceptions of the technology's objectives, utility, and importance.	Rationale/History, Costs/Benefits Decision process, Managerial Support
Issues around implementation	Knowledge and experiences of the implementation process of a specific technology, including background, participants, stages, design issues, support from users, managers, ethnologists, and others.	Involvement, Barriers/Facilitators Cost / Scope / Timeframe Training, Managerial Support
Issues around use	Knowledge and experiences of the use of a specific technology, including frequency and discretion of use, level of customisation, satisfaction, technical support, maintenance requirements, and expectations and experiences about the technology's criticality, ease of use, usefulness, quality, reliability, integrity, and availability.	Customisation, Maintenance Technology attributes
Criteria of success	Beliefs about how the success of a specific technology is being or should be assessed, and which particular criteria and measures are or should be used. Assessment of how a specific technology is meeting these criteria.	Criteria, Measures, Experiences
Impact	Expectations or experiences about the impact of a specific technology on the strategy, structure, culture, and way of doing business, as well as how a specific technology should or has/will change jobs, tasks, autonomy, control mechanisms, skills/knowledge, responsibility, social relations, status, workload and stress.	Organisation-wide effects Task-level effects, Individual effects
Relations with other players in the computing social world	Expectations and experiences about the frequency and extent of interaction with other players about IT, the nature of the interaction including the role played in this relationship, and perceptions of attitude towards and understanding of technology	Managers (senior, middle) Technologists, Users Third parties (e.g. Consultants)

Table 3.1: Seven dimensions of technological frames *Source: Orlikowski and Gash, 1992*

	First order Change	Second order change	Third order change
Characteristics	- Incremental change intended to refine and extend status quo - Technological frames are modified to reflect extensions to technology - Motivated by desire to cut costs, increase efficiency, or improve productivity.	- Radical change intended to transform or replace the status quo - Technological frames are changed to reflect the new technology - Motivated by crisis or significant innovation opportunity	- Human, organisational and technological systems are intended to be open to the possibility of future change - Acknowledges that frames need frequent monitoring and modification when assumptions become invalid - Motivated by desire to be more flexible and reflective in fast-changing world
Examples	- Typically systems built in the 1960s and 1970s - Accounts receivable system that automates existi9ng manual procedures	- Typically systems built in the 1980s - Just-in-time inventory system that replaces manual order entry and purchasing procedures by creating direct electronic link between retailers and suppliers	- Future systems - Tax software that monitors and updates its routines when it detects changes in tax law or changes in interpretation and application of the tax law
Incongruence	- More subtle than in second or third order change - If occurs, is not likely to be disruptive - May be addressed with increased training or communication	- More obvious than in first or third order change - If occurs, is likely to be very disruptive - Increased training or communication may be less effective if incongruence is due to political battles; requires process workshops and change management education. - Either one group forces the other/s to change their frames or revert to old ones, or the organisation becomes increasingly dysfunctional and unstable over time.	More likely due to divergent interpretations of change rather than resistance - Requires training in learning systems and process workshops, as well as belief in the high probability of future change
Measurement Issues	- Traditional research designs can detect measurable improvements in process and outcome with pre and post measures - Traditional research designs cannot detect any unintended changes	Traditional research designs can detect measurable improvements in outcomes, but cannot detect paradigmatic change with pre and post measures - Traditional research designs cannot detect any unintended changes - Alternative research designs and measures may be more useful to capture unintended changes and paradigmatic change	- Traditional research designs cannot detect change in paradigm to continual learning - Alternative research designs and measures may be more useful to capture change in paradigm, such as the development of learning and reflecting mechanisms.

Table 3.2: Summary of orders of intended technological changes *Source: Orlikowski and Gash, 1992*

Learning From Notes: Organisational Issues in Groupware Implementation

Borrowing concepts from technological frames analysis Orlikowski (1992) suggests in this study that the lack of communications and of formal training on the new system (Lotus Notes) is one of the reasons that the system did not live up to original expectations. The argument is that the employees used the system in accordance with their existing technological frames. Since there was no new concept relating to groupware technology, the employees did not use Lotus Notes as groupware but used it like other systems which they knew of and for which they had developed frames. The assumptions behind the argument are that how users change their technological frames in response to a new technology depends on (1) the kind and amount of information about the technology communicated to them, and (2) the training they receive on the technology. The less the communication and training on the new system, the more likely the company will create incongruences in its technological frames.

Technological Frames: Making Sense of Information Technology in organisations

It is in this study that Orlikowski and Gash (1994) fully describe technological frames analysis, and use the analysis to analyse the Alpha case study. Based on their empirical findings three frame domains were used to understand the interpretations that participants made about Notes and its role in the company. Orlikowski and Gash (1992) explained that the seven dimensions which they had derived earlier in another paper were not employed because technological frames are both time- and context-dependent, and should be examined *in situ* and not defined in advance. This can be illustrated by the fact that only two of the seven dimensions were observed in Alpha.

The three frame domains derived from the findings include the 'nature of technology', 'technology strategy', and 'technology in use'. The nature of technology refers to people's understandings and perceptions of the technology; technology strategy refers to people's views of their organisation's motivations for adopting the technology; and technology in use implies people's understandings of how the technology should be used on a day to day basis. The technological frames held by the technologists and users were examined.

The findings of the study show that the users' visions of the nature of technology, technology strategy, and technology in use "scattered" around the technologists. For example, the technologists perceived that the Notes would provide a standardised communication platform for information sharing, electronic communication, document management, and on-line discussion. From this understanding Notes is a potential device for enabling group work in the company. In contrast, user groups saw Notes as a means to augment personal productivity rather than as a group tool. As a result, the capability of the tool to facilitate group work and collaboration was largely ignored. The findings also suggest that the incongruence in frames between the technologists and users caused, to some degree, an initial barrier of scepticism both within the technology group itself and the user group, as well as frustration and the perception that the company did not recognise the system's potential of supporting groupwork.

Implementing Radical Change: Gradual versus Rapid Pace

Gallivan (1994) employs technological frames analysis to study different stakeholders' visions of organisational and technological changes in the Information Systems (IS) Department of a regional telecommunications company. These changes coincided with other changes which occurred in the company during the period of the study; however, Gallivan focuses on organisational and technological changes only in the IS department and treats other changes as part of the organisational context within which changes in the IS department were taking place. The changes in the IS department arose from the adoption of new technologies including client/server technology, object-oriented development, and graphical user interface (GUI) development tools. Adopting these new technologies meant some necessary hiring, training and other learning processes; in other words, reskilling was required. Reskilling is defined as replacing or realigning the existing IS staff and resources. The study was conducted to investigate the reskilling process and the stakeholders' understandings and knowledge of reskilling in the Information Systems Department. The result of the study suggests that there was an existing incongruence[4] in the technological frames across groups. For example, the

[4]Although Gallivan uses the term 'inconsistent' instead of incongruence in the paper, it can be argued however that the term 'inconsistent' is misused. Gallivan uses the term to describe how 'reskilling' presented different meanings to the different stakeholders and how these meanings are not only not shared across groups but may even be contradictory to one another. This phenomenon is understood as

group of change management specialists saw reskilling as more than the migration of the new technologies within the company. They were concerned about a broader set of changes introduced by the new technologies which began with new ways of organising and serving users. On the contrary, the IS managers and employees perceived that reskilling is merely updating the IS personnel's technical skills. Finally, "outsiders" to the reskilling initiative shared some assumptions with the change management specialist group such as the degree of organisational transformation necessary, but they did not share a belief about how this transformation might be achieved.

3.1.4 Critiques of technological frames analysis

The above studies demonstrate the virtue of applying technological frames analysis to examine interactions between individuals and technology; nevertheless there are a number of weakness in the framework. These weakness can be divided into two kinds that one is generic and can be found in most cognitive arguments and while the other is specific to the technological frames analysis.

3.1.4.1 Generic problems of the technological frames analysis

Despite the fact that Orlikowski and Gash (1994) claim that the framework was developed from the ideas of social cognitivism and other social theories (SCOT and Wittenstein's *family resemblance*) nevertheless the framework faces similar criticisms that the traditional cognitivist study faces. Cognition is defined as "information processing as symbolic computation – rule-based manipulation of symbols" (Varela, *et al.*, 1993: 42). Traditional information studies of symbolic processing assume that "all the action is inside the head, yielding a natural distinction between the stuff out there and the processes taking place inside here" (Norman, 1993: 3). In such a view the context in which an individual situates is seen to take place in the head and the actions taken are determined directly by the outcome of that process. It is therefore thought that human behaviour can be described in formalism.

It was found that the technological frames analysis, to extent, shares the above assumptions and arguments made by the traditional cogitivist study. The framework

---

incongruent rather than inconsistent in the context of technological frames analysis.

believes that human cognition can be articulated and made visible in turn interactions between human and technology can be articulated and predicted in advance (Orlikowski and Gash, 1994: 199). Moreover, cognitive process has been seen as essentially a linear relationship and process. For example, it is often assumed that symbols are regarded as media with which people communicate; schemas which store individuals' experiences, knowledge, philosophy and other psychological elements in different categories are used to make sense of situations that individuals face; and scripts guide individuals' behaviour according to the 'suggestions' prompted by the schemas. The technological frames analysis seems to suggest that interactions with outside (i.e. outside the cognitive process) are not considered (self-contained); and frames are structural and procedural, meaning that they are made up of elements and that each of the elements are prosecuted at an appropriate time.

Such ideas must question whether technological frames have actual form and whether they can be observed and captured by human beings. But despite the definition of technological frames and the several dimensions of technological frames given by Orlikowski and Gash, which may lead us to think otherwise, the answers might be negative. It is wrong to imagine that technological frames have physical form and can be formalised to predict individuals' actions. Nevertheless, the framework is useful as it provides a conceptual model to examine motivation behind individuals' actions towards the technologies. Because it is a conceptual model, it should not be imagined that it can be used to formulate connections between actions and cognition.

A school of thought criticises the traditional cognitivism because of its context independent view and argues that human behaviour is largely determined by the structure of the world. It argues that human behaviour is constrained and guided by the world in which human beings are situated. This school of thought – situated action – emphasises the importance of historical influences, social interaction, culture, and the environment, and minimises the importance of internal cognition – whereas traditional cognitivism tends to downplay the importance of these external environment but focuses on internal cognition (Norman, 1993).

Orlikowski and Gash were aware of the above problems of the traditional cognitivism; to overcome the issue of context-independent in particular they incorporated a number of ideas from other modes of social theories such as SCOT and structuration. Although

social context is considered in technological frames analysis, social interactions which are believed to have influence on technological frames are not discussed at length. Technological frames analysis argues that individuals' actions towards a specific technology are dependent on what they see and how they interpret the technology, and how they interpret the technology depends on their technological frames. In other words, individuals' actions towards the technology are determined by their mental process.

The present study asserts that this view neglects the notion of social interactions. In order to develop this critique further and make it specific to the technological frames analysis the study will deploy ideas from Herbert Blumer's (1969) arguments surrounding symbolic interactionism.

3.1.4.2 Specific problems of the technological frames analysis

Symbolic interactionism is grounded in three fundamental premises. They are: that actions are based on meanings, that meanings are products of social interaction, and that meanings are processed by individuals and in so doing action can be taken. The first premise is that "human beings act toward things on the basis of the meanings that the things have for them" (Blumer, 1969: 2). This premise is in fact the same assumption underlying the argument of technological frames analysis, and has been discussed earlier.

The second premise is that "the meaning of such things is derived from, or arises out of, the social interaction that one has with one's fellows" (Blumer, 1969: 2). There are traditionally two ways to account for the origin of meanings. One is that the meaning is intrinsic to the thing that has it; that is, the meaning of the thing is in the thing, and it is 'there'. The other view is that meaning arises from psychological elements such as sensations, feelings, ideas, memories, motives, and attitudes. Symbolic interactionism, however, rejects both the above explanations of the origin of meanings; it argues instead that meanings are social products and that they arise from social interactions between individuals and their fellows. It is this notion of social interactions that technological frames analysis neither takes account of nor provides any detailed explanation for.

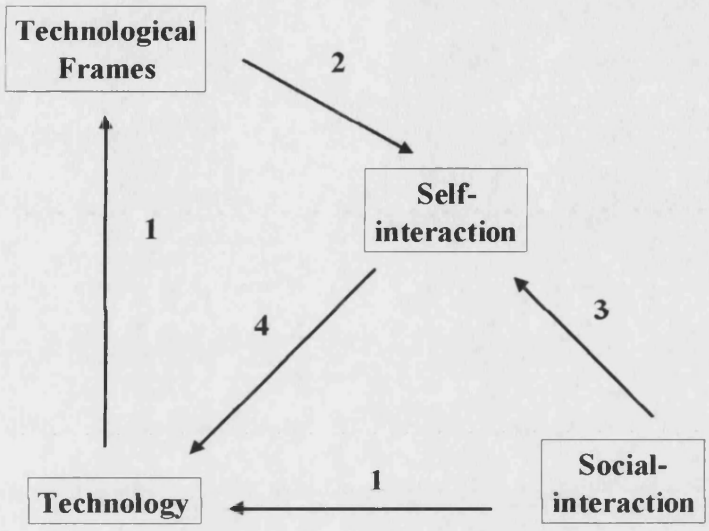
Social cognitive theorists assume that "meaning created is seen as influencing action taken, similarly action taken is seen as influencing meaning created. Both processes are

viewed as inextricably reciprocal" (Gioia, 1986: 51). Based on this assumption, Orlikowski and Gash assert that by using technological frames analysis people would be able to explain and "anticipate" outcomes. Such a causal relationship between meaning and action shows that technological frames analysis oversimplifies the process of the formation of meanings to their being relevant predicates of human conduct. Even more, their assertion overlooks the importance of social interactions in the process of forming meanings on the one hand, and overemphasises the importance of cognitive structure to human behaviour on the other.

This is not saying that individuals' existing technological frames do not have impact or influence on how individuals see and interpret a specific technology; rather it tries to extend technological frames and argues that meaning is not simply retrieved from these frames. Meaning indeed emerges from social interactions. Although social cognitive scholars recognise the role of social interaction for understanding individual conduct, they view social interaction as a neutral medium for operating outside factors (Blumer, 1969). Put simply, social interaction is a process in which individuals express their psychological elements such as motives, feelings, attitudes, perceptions, or personality. In symbolic interactionism social interaction is regarded as a process in which participants take account of each other's ongoing acts, interpret those acts and so adjust their own understandings and intentions, which, in turn, determine their own acts. In other words, meaning is not just a psychological but also a social product.

Building on the above argument, individuals' actions towards the technology can be analysed in four steps. It is worth noting that these four steps take place simultaneously rather than linearly. Figure 3.1 depicts how an individual decides his or her actions towards the technology. It is assumed when individuals come across a new technology that they will reference their technological frames (vertical arrow 1) and try to make sense of it (arrow 2) to themselves. According to the technological frames analysis, the next step should be that individuals decide their actions towards the technology (arrow 4). Building upon the idea of self- and social – interaction in symbolic interactionism (Section 3.1.4), we argue that the next step should be that individuals try to make sense of others' behaviour towards the technology in relation to their own positions (arrow 3). Then individuals will come about meanings of the technologies and act according to these meanings.

Figure 3.1: Sensemaking process



This can be illustrated with an example. A Network was installed in the Central Government Office (CGO) with the aim of improving document productivity (Bowers, 1995). The Network allows not just for documents to be available on-line, to be shared by others, but also allows the documents to be visible, inspectable, and manageable. This function gave senior managers in the CGO an opportunity to ensure their aim of becoming a "quality organisation" by allowing them to trace the history of the documents (e.g. who does what part) so to support quality reviewing and inspection.

> "... by having a "peek in" at the status of work, Jon could ensure that work was being done according to approved "quality methods" and was on schedule and so forth" (Bowers, 1995: 199).

Employees, however, were not willing to put their contributions on-line if their preliminary draft would be inspectable by both the branch head and line managers. To those employees the Network was understood as a means for managers to carry out surveillance rather than as a means to help them increase their document productivity. As a result, some members decided to make their work 'invisible' to their managers. This illustrates that people's understanding of a specific technology not only derives from their technological frames but is also built from their interpretations of what other people's intentions are towards the technology; in the light of this knowledge, they determine their own acts. In this case the action taken by the employee is to continue "real work" of document production off-line.

Contents of frames are not only changed via social interactions but also via self-interaction. As the third premise of symbolic interactionism argues, "these meanings are handled in, and modified through, an interpretative process used by the person in dealing with the things he encounters." Once the meaning is formed individuals will first indicate to themselves the meaning of the things that they encounter. The process of indicating the things to themselves and the meaning of the things is known as *self-interaction.* By virtue of interacting with oneself, interpretation becomes a matter of handling meanings. The individual "selects, checks, suspends, regroups, and transforms the meanings in the light of the situation in which he is placed and the direction of his action" (Blumer, 1969: 5).

The concept of "self" is essential to symbolic interactionism. Borrowing Meads' idea Blumer argues that the human beings is an organism having a self, such that individuals may perceive themselves, have conceptions of themselves, communicate with themselves, and act toward themselves. Since the human being has a self as well as the ability to interact with this self, Blumer therefore argues that "with the mechanism of self-interaction the human being ceases to be a responding organism whose behaviour is a product of what plays upon him from the outside, the inside, or both" (p.63). He continues that the human being "instead, acts toward his world, interpreting what confronts him and organising his action on the basis of the interpretation."

The notions of both social and self-interactions within symbolic interactionism highlight dynamics of technological frames which contrast to Orlikowski and Gash's, more or less, static view of technological frames. Orlikowski and Gash see technological frames as a set of existing cognitive properties and individuals develop their understandings and interpretations of technologies on the basis of such a set. Because technological frames are treated as given in their analysis Orlikowski and Gash's discussion focuses mainly on the properties and dimensions of frames, and the process of formation, reformation, and change is overlooked. This static view of technological frames allows Orlikowski and Gash (1994:174) to claim that technological frames analysis can "offer an interesting and useful analytic perspective for explaining and *anticipating* actions and meanings." But the concepts of social and self-interaction tell us that it is naïve to claim that actions towards technology can be anticipated through examination of technological frames since social and self interactions can change the contents of frames

and then change individuals' actions towards technology. Since social and self-interaction are in themselves unpredictable, it is impossible to predict how the contents of technological frames will be changed.

Orlikowski and Gash further argue that technological frames analysis can be used to examine the changes associated with implementation of a new system over time, especially organisational changes. It seems here that the dynamics of technological frames is finally noted but the argument is still inclined to understand technological frames as static. In contrast, this study believes that the dynamics of technological frames should be considered in two modes: changes in the contents of technological frames together with an analysis of how these changes are made (i.e. a process-oriented view). Orlikowski and Gash emphasise properties of technological frames which shift from one state to another but the persistence of technological frames and the social interactions which influence technological frames are underplayed in their argument.

Although Orlikowski and Gash do not develop discussion on how social and self interactions influence the content of technological frames, Orlikowski notes elsewhere (Orlikowski, 1992) that communication is critical when existing technological frames need to be changed or a new set of technological frames needs to be formed.

Building on social and self-interactions symbolic interactionism also argues that individual conduct is not determined by cognitive structures alone. That is, that individuals do not just react to what their technological frames 'tell' them to do; rather, that they take actions towards their technological frames including revising, examining, modifying, and replacing them through interactions with others and with self.

To sum up, the main concerns regarding technological frames analysis are perceived as the absence of the notion of social interactions in spite of its importance in the process in which meanings are formed. Moreover, technological frames analysis oversimplifies the process of meaning-action and considers it to be a positive causal relationship. Furthermore, technological frames analysis inherits the weakness of social cognitivism which views frames as static and as having properties and structures.

To resolve the problems just mentioned this study will expand the technological frames model and also use a contextual approach to capture both the dynamic nature of

technological frames and social interactions. It is to the details of this latter approach to which attention is now given.

3.2 CONTEXTUAL APPROACH

Technological frames are dynamic and shift over time to be able to capture a process of changes in frames Orlikowski and Gash employ structuration theory developed by Giddens (1984). Structuration theory aims to end a polarised dilemma between voluntaristic and deterministic approaches in social science as it argues that the basic domain of study of the social sciences is "neither the experience of individual actor, nor the existence of any form of social totality, but social practices ordered across space and time" (Giddens, 1987: 2).

One of the main theses of structuration theory is the duality of structure. The duality of structure is concerned with the idea that agents and structures are not two independently given sets of phenomena, but that they are highly interdependent. That is to say, the structural properties of a social system are both the condition for and the consequence of human interaction, and that it is through interaction that social structures are produced and reproduced. Based on the notion of the duality of structure Orlikowski and Gash argue that in organisational structuring processes individuals draw on shared technological frames (e.g. either group or organisational) to accomplish their action, and therefore reinforce or change the social and technological structures of an organisation (and their frames). Moreover, individuals design or use information in accordance with shared technological frames, and hence reinforce or modify not only the organisation's structural properties but also their own (and shared) technological frames.

Although Orlikowski and Gash (1992) claim that structuration theory is employed to understand shifts in individuals' and organisations' technological frames, it seems that the theory is merely used to describe phenomena relating to how structural properties of organisations and their technological frames are reinforced or changed over time. Issues such as how a sequence of change starts and what elements mark the opening of a sequence of change are barely touched upon. Moreover Orlikowski and Gash argue that the theory can be used in an attempt to capture both the historical and contextual nature of frames, but the question of how this might be achieved is not explained or demonstrated. Thus, we are left with questions as to what the significant contributions

of structuration theory are in relation to the study of understanding changing technological frames and how theory can capture the historical and contextual nature of technological frames.

This thesis is interested in (i) the relationship between individuals' technological frames, their surroundings (context), and the process of the changes in technological frames and (ii) the effects of these three elements on individuals' choices and decisions about technology. In this sense, the clear emphasis of the contextualist approach on multi-level contexts, on process and on the links between process and contexts seems to match the research interest. In considering the changes which occur in individuals' technological frames structuration theory appears to be more appropriate than the contextualist approach on the grounds that the former focuses on agents and agents' interpretations and interactions with technology and with others. It has been argued that structuration theory has the ability to offer a detailed and subtle view of the constitution of social life (Walsham, 1993), however in the present study it is argued that its analytic dimensions of the duality of structure and its associated modalities are too detailed and complex in some instances. For example, the theory was used to interpret the data collected in the preliminary case study and it was found that the analytical dimensions of duality of structure and its associated modalities blurred the research focus. Walsham (1993) raises a similar concern and suggests that such a detailed and complex analysis could have a negative impact on the process of analysis. He argues that "the choice between a simpler or more complex model to explain a particular empirical example is a matter for the researcher's judgement, depending on the view taken concerning the additional depth of insight to be gained by using the more complex theory" (Walsham, 1993, p.70).

Re-examining the research interest of the present study, it is apparent that an analytical tool is needed to capture the state of changing technological frames and the multi-level contextual factors associated with those changes. It is worth noting that the issue of the relationship between changes in technological frames and the duality of organisational structure is not the main concern of this research. In light of the above considerations, the contextualist approach therefore appears to be a more appropriate model for this study than structuration theory.

3.2.1 *Outline of the contextual approach*

The contextual approach was developed by Pettigrew (1987) from the experience gained in a research project to investigate strategic decision making and change in Imperial Chemical Industries PLC (ICI). Pettigrew argued that in order to understand organisational changes a theoretically sound and practically useful analysis needs to be employed. The analysis has to take account of the "continuous interplay between ideas about the context of change, the process of change, and the content of change" (Pettigrew, 1987:64).

The contextual approach is grounded in the notion of contextualism in Pepper's (1942) "World Hypotheses". Within the contextualist approach one can identify a number of different kinds of proposition; Pepper calls them 'world hypotheses' and distinguishes four kinds: formism, mechanism, contextualism, and organism. Each of them presents a distinct view of seeing the world around us. For example, formism takes account of classifications; the appropriate truth theory is correspondence, and the underlying metaphor is similarity. Mechanism is concerned with the law-like relationships between classes and phenomena, and its underlying metaphor is cause and effect. Contextualism deals with "the event in its setting; the truth theory has to be qualitative confirmation since the context will change and knowledge will need to change also, and its underlying metaphor is the historic event" (Pettigrew, 1985: 59). Organism is concerned with enduring patterns of events, irrespective of time and place, and the underlying metaphor is harmonious unity.

With the benefit of Pepper's idea Pettigrew exposes some of the strengths and weakness of literature on organisational change, and concludes that the dominant studies in this area are ahistorical, aprocessual, and acontextual so that there are theoretical limitations to those studies. To overcome the pitfalls of these literatures on organisational change Pettigrew proposes a contextual approach which, he argues, instead of dividing the world into limited sets of dependent and independent variables isolated from their context, helps people to understand emergent, situational, and holistic features of a process of organisational change in its natural settings.

The contextual approach has three basic components: context, process, and content of change. These three components interplay with one another.

Process Processual analysis emphasises that an organisation or any social system is an ongoing system with a past, a present, and a future. Two frames of reference are introduced in the procedural analysis: process and time. Process is seen as "a continuous, interdependent, sequence of actions and events which is being used to explain the origins, continuance, and outcome of some phenomena" (Pettigrew, 1985:67). Time indicates what changes are seen, their relation, and how those changes can be sequenced and explained. It is the notion of time which provides meanings for and conditions the process (or even the context).

Pettigrew also points out the importance of the concept of 'time' in the study of organisational changes and criticises how dominant literatures have overlooked its significance:

> "... change in this mode of analysis is regarded either as a single event, or a set of discrete episodes somehow or other separate from the immediate and more distant antecedents which give those events form, meaning, and substance. [...] they limit themselves to 'snap shot' time series data, fail to provide data on the mechanisms and processes through which changes are created." (Pettigrew, 1985:62)

It is not possible to separate the present from its past and similarly the future cannot be foreseen without examining and responding to the past and present. Time should not be conceived as narrowly as clock or calendar time, but as the mode that indicates the duration and location of a particular social interaction or occurrence.

Context Context is usually referred to as an environment where a process takes place. The environment not only implies the physical environment but also social, economic, and political environments. To study changes in organisations two sets of context are said to have an influence on the content and pace of change, namely inner and outer context. Inner context is said to be the intra-organisational environment, and outer context is the socio-economic and political environment in which an organisation is situated.

Intra-organisational environments include structures, cultures, managerial style, and in terms of the study of information systems also includes the IS development and operation environments. The characteristics of the inner context are usually changed by two modes: social interactions taking place within it and outer contextual factors. Using the ICI case study as an example Pettigrew (Pettigrew, 1985) illustrates how individuals' positions in a company differentiate their interpretations of the same thing

from others and concludes: "managerial action is fundamentally located in differential perception and understanding of intra-organisational and socio-economic context" (p.70).

An IS development environment consists of the development methods and techniques, the organisation and management of IS development, maintenance, and other existing information systems that may interface with or be impacted on by the system under development. The major components of the IS operations environment include software, hardware, organisation and management of IS operations, and the operations personnel. The operations personnel include computer operations staff, technical support staff, and the end users.

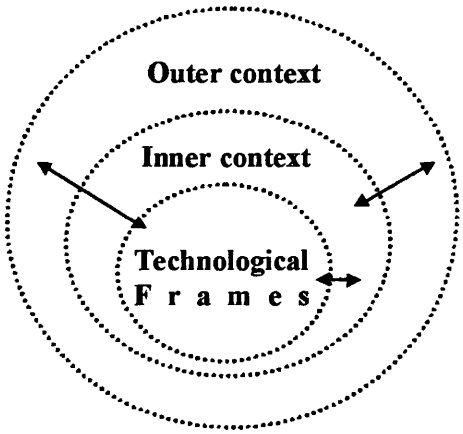
Outer contextual factors can be market conditions (i.e. in recession or booming), structure of the industry (i.e. competition within the industry), domestic politics and regulations, and so on. Because of globalisation, the domestic economy and the market is likely to be influenced by the global economic and political climate; the rise of multinationals in the past two decades also introduces another variable to the local economy and market. Because of the connections between local and global markets, companies nowadays need to consider not only local competitors and market conditions but also global ones. That is, the boundary of outer context has been push back further from a 'local' to a more 'global' environment.

When studying an information systems related topic, one needs to take into account the development and condition of the IT industry (including hardware and software) along with working practice introduced by IT as an outer contextual factor (Swanson and Ramiller, 1997). The availability of hardware or software has direct effects on companies' internal decisions and on choices of which technology to employ.

Content Content refers to the object or problems in question. The content of change is about what changes there are, and the implications for the organisation in general. Content of change reflects the significance of intervening between a process and the surrounding context both inner and outer. That is, a process is both constrained by structures and shapes structures, either in the direction of preserving them or altering them; the content of changes will show those constraints and alterations either in the structures or in the process itself.

The above are three basic elements of the contextual approach which suggests that the key to studying a process of change or forming expectations, lies in positing and establishing relationships between context, process, and the content of change. Two levels of analysis are involved in contextual analysis. The vertical level of analysis concerns "the interdependencies between higher or lower levels of analysis upon phenomena to be explained at some further level" (p.66). Higher or lower levels of analysis means the analysis of higher or lower level contextual factors and process. Each level is recognised to have its own properties, processes, and relationships. Also, the phenomena at one level cannot be reducible to or inferred from those at another level, hence a key to the analysis is to identify the interactions between levels through time. Figure 3.2 illustrates the possible higher level and lower level factors in the context of this research.

Figure 3.2: Higher and lower level factors and their interactions



The horizontal level of analysis (e.g. time) refers to the "sequential interconnectedness between phenomena in historical, present, and future time" (Pettigrew, 1985: 66). The process of change is said to be revealed through the horizontal level analysis since it exhibits the different states of the phenomena and their interconnections over 'time'.

Pettigrew argues that a wholly contextualist approach should have the following qualities. First, a clearly delineated set of levels of analysis, each level having its own properties, processes, and relationships. Moreover, the process under investigation needs a clear description which gives the details of the sequence of actions and events within a specific time frame. Furthermore, a model of human behaviour is required. Hence individuals' capacities and desires to shape the social system to meet their own

needs, and the power relationships in the emergence and ongoing development of processes can be examined. Finally, the most crucial part of the analysis for a contextual approach is the linkage between contextual variables and categories in the vertical analysis and the process under examination in the horizontal analysis.

Both individual and organisational expectations pertaining to the perceptions of the situations and capabilities of a new technology change over time. Specifically, expectations are likely to be amended to fit an actual situation and achievements (Tyre and Orlikowski, 1991). The contextualist approach's ability to link content, context, and process together to track changes in the subject within its situation provides a conceptual framework to analyse changes in technological frames that the technological frames analysis is unable to do. The next section (3.3) will discuss how contextual approach together with technological frames analysis to form a synthesised conceptual framework to assist in investigating the research topic.

3.3 SYNTHESISED CONCEPTUAL FRAMEWORK

The synthesised conceptual framework consists of two theoretical frameworks: technological frames analysis and contextualist approach; and these frameworks have been discussed separately and extensively in the preceding sections (3.1 and 3.2). Table 3.3 summarises the components of the synthesised conceptual framework.

Table 3.3: Technological frames and choices and decisions made about technology: Synthesised analytical framework

Key components of the framework	*Associated conceptual elements*
Technological Frames (content)	Individuals' interpretations and expectations of current problems and the technology.
Outer context	National and global social, economic, and political environments. Inventions in the software industry.
Inner context	Structure, task, actors, and technology.
Process	Changes in technological frames

The first component of the framework is technological frames which is the subject under the examination in this study. Technological frames are context and time specific

(Section 3.1) hence there is no pre-identified/ defined set of technological frames in this synthesised framework. In fact, it is expected that specific technological frames derive from empirical work to represent specific case and situation.

The second component is context within which individuals recall certain dimension of frames to help them make sense of technology. Context is categorised into two broad types: outer and inner. The synthesised framework does not intend to articulate a set of contextual factors (both inner and outer) in advance and argues that the contextual factors should be like technological frames deriving from the field. It is important to note that the relationship between outer and inner contexts is not hierarchical but interconnected. The outer context may create a context in which an inner context operates and organisational activities undertaken with the constraints imposed by these two environments, but it is not in anyway superior to the other. In an oligopoly industry in which only few major companies dominate the industry, it is likely that those companies' business strategies and activities become part of the industrial structure or standards in the industry. For example, the series of software products developed by Microsoft have become the standard operating system or applications in user PCs.

The third component of the framework is process in which changes in technological frames are undertaken. The process links individuals' technological frames and contexts within which technological frames operate and individuals act towards technology accordingly together to reveal the dynamics of technological frames.

These components will be analysed at two levels. At the vertical level, consideration is given to the contents of frames, and to inner and outer contextual factors. The analysis seeks to show that the meanings and interpretations (contents) ascribed to the same situation or technology are likely to be altered by interactions between various contextual factors. General concepts of outer and inner contextual factors have been described in the previous sections. It is not possible to derive a sets of contextual factors here, a priori, since they are in themselves context- and time-specific and can be observed *in situ* only.

At the horizontal level time is used as an indicator to point out different stages/phases of actions and even contents of technological frames, and as a mechanism to show that technological frames are interconnected sequentially in historical, present, and future

time. Since technological frames are dynamic in nature the meaning of a specific technology based on them accordingly changes over time. So, choices and decisions made about the technology based on that meaning can be examined in the light of the fact that they have a past, a present, and a supposed future (e.g. expectations). One can therefore argue that decisions and choices made in the past have a certain impact on present decisions and choices, and that the relevance for the latter will be carried forward into the future. The 'impact' can be observed from the interpretations of, expectations of, and experiences (technological frames) with the technology or from the outcomes of the decisions. Within this broader context and perspective some adoption outcomes that are originally explained as emergent phenomena or accidents may not be so, and indeed may have strong roots in the past.

3.4 SUMMARY

The technological frames analysis was developed on the basis of the assumption that the expectations, and interpretations of, and assumptions held by individuals about a specific technology have influences on individuals' attitudes and actions towards technology. A set of expectations about, interpretations of, and assumptions about technology is a technological frame, and serves as a vehicle enabling people to ascribe meanings to the technology and take actions. Once the meanings are assigned to the technology individuals will take actions towards the technology. Technological frames analysis, then, is a conceptual model that helps us to analyse the meanings attached to individuals' behaviour towards the technology.

As has been argued here, technological frames analysis alone cannot be adopted for this research because it does not provide a dynamic view of how technological frames shift, and are altered, or replaced over time. This research, therefore, employs the contextual approach to situate changes in the state of technological frames; it is an approach which incorporates the components of context, process, and content of change.

Section 3.3 has drawn together the analytical strengths of the above two approaches to form a synthesised framework which serves two purposes in this study. It serves as a mode of analysis informing the process of change in technological frames which, in turn, is followed by changes in choices and decisions about technology. In terms of practical research the framework is used for gathering data, and sorting that data into

broad categories for analysis. The case studies in chapter five and six will demonstrate the ways in which the synthesised framework is applied.

The contributions of this chapter are several. First, it has elaborated arguments within technological frames analysis at length so as to make clear the origins of assumptions and arguments made by Orlikowski and Gash. Second, it has demonstrated the usefulness of technological frames analysis and how it may be applied in conjunction with other social theories to examine changes taking place around technologies with or without intentions. The third contribution of this chapter in IS research is that it has explored and provided a critique of technological frames analysis at length, which Orlikowski and Gash omitted in their papers. The critiques of technological frames analysis have been largely based on concepts in symbolic interactionism and argued that, despite Orlikowski and Gash taking care of criticism of the traditional cognititivism (context independent), they pay little attention to the roles of social and self-interactions to individuals' frames. Fourth, the adoption of technological frames analysis has brought social cognitivism further into IS study. Furthermore, the chapter demonstrated how a contextualist approach which is often used to study organisational development or changes, can be used as a mechanism to connect an object's past, current, and future in order to view it in a continuous manner. Finally, the synthesised analytical framework introduced in this chapter has dual roles at different stages of this research: data design and collection, and data analysis.

The next chapter is devoted to research design, and discusses how this research was carried out with what method and what techniques.

CHAPTER 4

RESEARCH DESIGN

This chapter introduces a discussion of the empirical research strategy employed in this thesis. The chapter begins with a review of research method adopted by articles published in the CSCW and ECSCW conference proceedings between 1988 and 1997, and is followed by a discussion of the research design of this work. The section explains why an interpretive case study method is employed; what data techniques are employed; and why a hermeneutics mode of analysis is seen as an appropriate approach to analyse the data. The chapter ends with a summary.

4.1 REVIEW OF RESEARCH DESIGN IN CSCW

Many assessments of published information systems have been undertaken to review and examine a community's constellation of beliefs, values, and techniques. Results of these assessments show that the largest number of research topics and research designs are scientific focused. Galliers and Land (1987) note that research in the information systems field has treated IS as a science, with as much as 50 percent of effort being placed on laboratory-based experimentation or on field surveys. Orlikowski and Baroudi (1991) present a similar result from their examination of published information systems literature between 1983 and 1988 in four major information systems outlets (i.e. survey 49.1% and laboratory experiment 27.1%). An intention of those papers is to remind researchers in the field to be aware of the philosophical assumptions of their studies, as well as to encourage researchers to look at topics and modes of research beyond a scientific focus.

Assessment and discussion of research methods of this kind are few in CSCW. Olson and Olson (Olson and Olson, 1997) provide a description of some of the methods and issues involved in CSCW research in which method such as survey, interview, diaries, ethnography, analytic field study, case study, experiment, Quasi-experiment, Longitudinal studies, historical studies, and simulation and formal modeling are mentioned. The description of the research methods however is based on the general principles of the methods rather an attempt than to show how the methods are applied to study particular topics in CSCW. Although Plowman et al. (1995) analyse strengths and weakness of research methods such as ethnographic study and case study in workplace study in CSCW, the analysis is limited to specific topics and methods only.

The intention of this section is to examine a range of commonly used research methods and to discuss how those methods are employed for particular topics in CSCW studies.

4.1.1 Selection of papers

This study chooses to examine the ten years of published CSCW literature between 1988 and 1997 in two major CSCW conference proceedings: *Proceedings of CSCW* and *Proceedings of ECSCW*. The first European CSCW (ECSCW) was held in Gatwick London 1989, and like its American counterpart ECSCW is organised every other year.

Over this period a number of journals organised special issues to reflect emerging interest of CSCW such as *Office: Technology and People* (1987), *International Journal of Man Machine Studies* (1991). These special issues however are not included in this review for two reasons. First is their partial status and the potential influence of editors. Second, such special issues are essentially collections of conference papers, for example, a special issue published by *Office: Technology and People* was a collection of the papers in CSCW'86 conference proceeding.

More generally, journal articles are not included in this review owing to a concern with continuity. Two specialist CSCW journals: *Organisational Computing* and *International Journal of Computer Supported Cooperative Work,* began in the early 1990s. Prior to the establishment of specialist journal articles on CSCW related topics were published in occasional issues of mainstream journals in computing, information systems, or organisation and management disciplines. As a result, the consistent trend of research interests and research design is difficult to retain. However, the continuity

of conference proceedings between 1988 and 1997 allows examination of trends in their popularity.

Table 4.1 displays the conference proceedings included in this review. A total of 304 articles published in 10 conference proceedings between 1988 and 1997 were examined. These 304 articles were reviewed to eliminate those that focus on computer modelling, theorem discussion, and so on and 130 papers which contain some empirical work were left for further review.

Table 4.1: Proceedings in review

Year	CSCW	Empirical work	ECSCW	Empirical work
1988	30[5]	14 (50%)	Nil	
1989	Nil		23	8 (33%)
1990	30	9 (32%)	Nil	
1991	Nil		21	11 (50%)
1992	48	19 (46%)	Nil	
1993	Nil		23	10 (40%)
1994	39	17 (44%)	Nil	
1995	Nil		21	8 (40%)
1996	45	16 (33%)	Nil	
1997	Nil		24	18 (60%)
Total	192		112	

The potential limitations of this method are twofold. First, the papers included in the proceedings are subject to conference themes and editorial boards' preferences. The editorial board of the conferences may need to choose appropriate papers according to the conference themes which means that papers employing certain types of research methods would be inevitably excluded from the proceedings. Thus, the papers counted here may not have reflected the actual but partial trend of methodology employment in the field. It is worth noting that the judgement of the research methods that the papers employed relied on the authors' claims rather than on the researcher's subjective assessment.

[5] The number of articles included in the proceeding.

4.1.2 Analysis

The review identifies five frequently adopted research methods in CSCW such as laboratory experiment, field experiment, field study, case study, and ethnographic study (Olson and Olson, 1997). Table 4.2 shows the distribution of each method in the field in general. Except for field experiment research method all other methods were used consistently in CSCW studies.

Table 4.2: Papers classified by research methods

Research Method	**Number of papers**
Experiment	29
Field experiment	9
Field study	30
Case study	38
Ethnographic study	24

When these figures were analysed further by looking at the frequency of adoption in each year, a slightly different story is told. Table 4.3 displays the breakdown of these figures. The breakdown shows that field experiment methods was favoured in the early days but the number of paper that adopting this method decreased. In contrast, experiment, field study, and ethnographic study methods are consistently used by the researchers in the field. Like its counterpart, the information systems field, case study method gradually catches up in the CSCW field; for example, in 1988 there was only one paper that adopted the method but there were nine papers in 1996 and six papers in 1997 claimed that they adopted case study method in their research.

Table 4.3: Articles classified by years

CSCW	Experiment	Field Experiment	Field Study	Case Study	Ethnographic Study	Total
1988	2	3	4	1	4	14
1990	5	Nil	2	1	1	9
1992	3	1	4	7	4	19
1994	4	3	2	4	4	17
1996	Nil	1	2	9	4	16
ECSCW	**Experiment**	**Field Experiment**	**Field Study**	**Case Study**	**Ethnographic Study**	**Total**
1989	6	Nil	Nil	1	1	8
1991	2	Nil	6	2	1	11
1993	1	Nil	4	4	1	10
1995	4	Nil	Nil	3	1	8
1997	2	1	6	6	3	18

Looking beyond these figures this review shows two things: a linkage between research methods and objectives, a trend of research development in CSCW studies.

Based on further analysis of the proceeding review, the linkage between different research methods and research objectives is made, as follows:

(i) Research to improve the effectiveness of groupware in practice (utilising either the laboratory experiment, field experiment or field study approaches).

(ii) Research to study groupware failures or implementation efforts (utilising case study methods).

(iii) Research to study the impact of information technology and information systems on organisations (again utilising case study methods).

(iv) Research to study the work such as group work and workflow in practice with and without groupware (ethnography method).

The linkage made here does not take into account the influences from various institutional contexts within which researchers are trained and work, and researchers' personal preference for particular methods.

The linkage between research methods and objectives of the research shows a changing trend of research interests in the field. For example, the review shows that in the early

days of the field methods that could be deployed to investigate effectiveness of technology were popular as the field was emerging and new to establish its worth. Case study method, however, is increasingly employed by researchers as research interests in the field shifts from technology development to technology within adopting organisations.

4.1.3 Research methods in CSCW

Laboratory experiment, field experiment, and field study. As in other disciplines, experiments in CSCW research are carried out in a controlled environment so objects can be observed and tested where disturbance to the objects can be minimised. Similarly, field experiments involve manipulation and measurement of clearly defined variables, but in natural settings. In field studies researchers measure independent variables and dependent variables in their actual context; however, no control or manipulation is involved. Regardless of whether a study is carried out within or outside laboratories, the three methods assume that technology is independent from its context and has impact on users (Eveland and Bikson, 1988; Galegher and Kraut, 1990a; Hindus, et al., 1996). Research adopting these three approaches usually aims to identify and measure relationships between technology and users for in so doing the impact of technology can be seen and explained.

For example, in their paper *"Work group structures and computer support: a field experiment"* Eveland and Bikson (1988) present the results of a study to illustrate the possible advantages and disadvantages of electronic communication compared with more standard media. An objective of the study was to generate general findings that could be applied elsewhere; in order to do so they chose to use a field experiment method. Eveland and Bikson write

> "the field experiment would allow us randomly to assign group members to computer-based vs. traditional support in the completion of identical work goals as well as to design and control the introduction of new information and communication technology" (p325).

Case Study. Case study methods investigate contemporary phenomena within natural settings and with minimum interference to the objects and environment as possible (Yin, 1994). Studies that employ case study research method in CSCW usually engage with topics like examination or evaluation of groupware adoption, impact of groupware on individuals, groups, or organisations (Bikson, 1996; Bowers, 1995;

Rogers, 1994; Anderson, 1993; Orlikowski, 1992); a few are interested in development of prototyping (Bellotti and Bly, 1996; Isaacs, *et al.*, 1996; Schwab, *et al.*, 1992).

Orlikowski (1992) conducted an in-depth study of the adoption of Lotus Notes at a consulting company with an aim to explore groupware use in practice. As Orlikowski argues, the method allows exploration of the topic further so a thorough understanding of technology in its natural settings and interaction between technology and its immediate social world could be generated. Orlikowski stress the intention of adopting the case study method by saying:

> "In this paper I describe the findings of an exploratory field study which examined the implementation of groupware product Notes® (from Lotus Development Corporation) into one office of a large organisation. My interest in studying the implementation and use of this product was to investigate whether and how the use of collaborative tool changes the nature of work and the pattern of social interactions in the office, and with what intended and unintended consequences" (p.362).

The case study approach can also be employed to obtain better understandings of a workplace prior to groupware adoption so suggestions of new systems can be made (Auramaki, *et al.*, 1996; Berlin and Jeffries, 1992; Gronbek, *et al.*, 1992; Rogers, 1992), and in some cases prototypes are developed based on analysis of studies (Bellotti and Bly, 1996; Isaacs, *et al.*, 1996; Schwab, *et al.*, 1992). For example, the aim of Egger and Wagner's (1992) study was to develop a new prototype of coordination mechanisms to solve current time management issues in a clinic. A case study was chosen as the research method, the research team argue, because the method would allow them to examine the clinic's social practices of managing in great depth. By doing so, a prototype could then be developed based on the result of the study.

Apart from conducting exploratory case studies to uncover issues, the explanatory case study method is adopted in the field to provide some explanations for particular phenomena such as success or failure of groupware in practice (Grudin, 1988; Grudin and Palen, 1995; Whittaker, 1996). In a 1988 conference paper, Grudin presents the findings of case studies of why a meeting scheduling application did not live up to the original expectations. Grudin and Palen (1995) use the same method to demonstrate that meeting scheduling applications could be successful if the interface of a system is well developed. Similarly, Grinter (1996) uses a multiple case study method to suggest some critical elements to successful workflow system adoptions.

Ethnographic study. The ethnographic method originated with anthropologists, and was used to study cultures in different human societies. More recently the method has been used to study everyday work in the workplace. The mode of ethnographic study has a long history in CSCW, four papers out of fourteen in the CSCW'88 conference proceeding adopted this method. The ratio of adoption of ethnographic study as a research method in CSCW seems to keep steady throughout the period. Researchers at CSCW Research Centres in Lancaster University UK and at Rank Xerox Research Centre in Cambridge UK argue that the method has an ability to produce detailed descriptions of 'workday' activities of social actors within the 'real world'. An ability of this kind, it is argued, is critical to groupware design since designing a large-scale interactive system needs an adequate analysis of sociality of work. Heath et al. (1993) write:

> "Despite impressive technological developments in CSCW, it is widely recognized that there are relatively few examples of successful applications in real world settings. [...] it is suggested that the lack of success of CSCW systems derives not so much from their technological limitations, but more from their insensitivity to the organisation of work and communication in real work environments" (p.155).

As mentioned previously, studies which are interested in examining workday work in the workplace in order to inform system design usually employ ethnographic study as the appropriate research method. The method requires researchers to stay in the workplace in question in order to observe, to participate, and to talk to people. In so doing, it is claimed that in-depth understanding of the workplace can be obtained. Researchers are then able a to provide thick descriptions of phenomena and highlight problem domains which might be supported by groupware (Bentley, 1992; Twidale, 1994; Heath, 1991; Harper, 1997; Heath, 1993).

In a study of Air Traffic Control Room (ATC) Hughes and others say that an intention of their study was to "to explore some ways of linking ethnographic studies of work in context with the design of CSCW systems" (Hughes, et al., 1992: 121). An Ethnographic study method was chosen to examine *how* work is socially organised rather than to *prove* that work is socially organised.

Ethnographic method has also been applied in the area of exploring groupware use in post-implementation environments, but this is not a common research practice in CSCW study. In research with CGO (Bowers, 1994), Bowers demonstrates that the

method can be used to study implementation processes. Spending nearly five years at the site, Bowers was involved in undertaking a study of installation and early and mature use of a network. The study states that it intends to add to the literature of CSCW applications use, and avail itself of and point to connections between the sociology of science and technology. Bowers carefully presents data in a thick descriptive format and stresses issues of how the network and usage of application became of concern and required management interaction, of how the behaviour of organisations and users of the network changed after the introduction of technology, and of how organisational context influenced the effectiveness of Network.

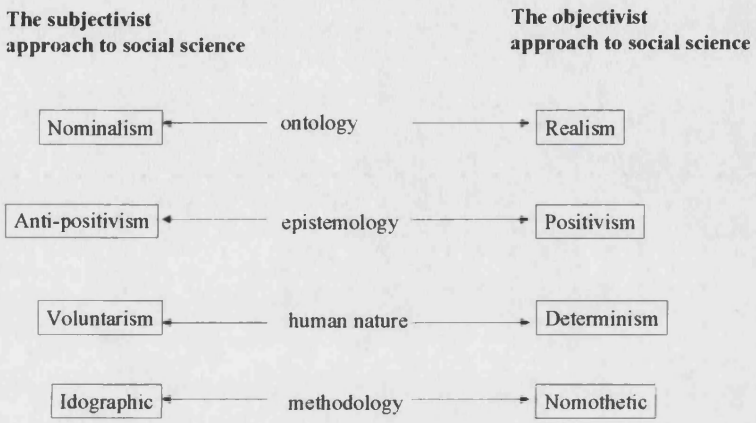
4.2 RESEARCH DESIGN

The review of the frequently used research methodologies in CSCW studies identified and summarised the linkage between different research methods and research objectives. The first part of this section examines the underlying philosophical assumptions of the research arguments made in Chapter Two by using Burrell and Morgan' model. Then the frequently adopted research design in CSCW will be compared and matched with this study's interest and lead to selection of an appropriate research method for this study. The second part of this section, *research design*, addresses practical issues of the research method chosen – for example, site selection, data collection, and data analysis.

4.2.1 Research strategy

It is understood that each research method has its underlying philosophical assumptions which enable it to view and explain things from certain angles. In order to identify an applicable research method for this study it became important to examine the underlying philosophical assumptions of the research question (Chapter Two) and to compare and match them to those of the research methods. Following Burrell and Morgan's (Burrell and Morgan, 1979: 3) model the examination will emphasise four dimensions: ontology, epistemology, human nature, and methodology.

Figure 4.1: A scheme for analysing assumptions about the nature of social science



The subjective-objective dimension

Ontologically speaking, arguments of this work are inclined towards nominalist arguments that 'reality' exists through an individual's consciousness and there is no world which exists independently of an individual's appreciation of it. Epistemologically, this research inclines towards compatible arguments of anti-positivism, the main argument of anti-positivism being that "the social world is essentially relativistic and can only be understood from the point of view of the individuals who are directly involved in the activities which are to be studied" (Burrell and Morgan, 1979: 5). Anti-positivism rejects the idea that there is a general and universal law waiting to be discovered. It also rejects the notion that social activities can be understood from outside, whilst arguing that the only way in which to understand human activities is to see things from where the participants stand. In line with these arguments this research argues that individuals act towards things on the basis of the meanings those things have for them. Meanings of things to individuals cannot be understood and interpreted from 'outside' but only from 'inside' (e.g. from individuals' points of view).

Arguments contained in this work are neither as extreme as voluntarist, which views human beings behaving freely without considering their external environment, nor as extreme as determinist, which sees human beings only responding to their external environment mechanically. The work can be said to be in the middle of such a spectrum.

The methodological stance of this research emerges when underlying ontological, and epistemological assumptions, as well as the model of human nature in this research are put together. The research, it is argued, tends towards an ideographic approach that emphasises analysis of subjective accounts and the importance of 'getting inside' and seeing situation 'through the eyes of actors'. In methodological terms, an ideographic approach argues that "one can only understand the social world by obtaining first hand knowledge of the subject under investigation." That is, one has to get as close as possible to the situation in which the actors are situated and in which social activities take place.

Burrell and Morgan systematically summarise the above four dimensions of philosophical assumptions and on this basis identify four paradigms in social science study: radical structuralism, functionalist sociology, interpretive sociology, radical humanism. In relation to this model, this research is regarded as falling into an interpretive paradigm.

An interpretive approach makes three basic claims. Ontologically, it claims that 'reality' is intrinsically meaningful and that its meanings are constituted by the meanings that social actors within it give to it. Epistemologically, it argues that the social world can be understood only through discovering the meanings that constitute it, and by a process that involves understanding situations from the actors point of view. Methodologically, it rejects the idea of causal explanations, inductive generalisation and prediction in the social science. To an interpretivist researcher, interpreting and understanding a situation is the process by which to generate knowledge of the social phenomena.

Research methods in the interpretive paradigm emphasise the importance of being inside situations and understanding them from inside. Based on this idea, interpretivists argue that scientific methods, such as laboratory or field experiments, cannot provide sound understandings of human activities in the social world. Alternatively, interpretivists practice interpretive methods with which they engage in a series of dialogues and through interaction with actors. Understandings of situations can then be generated from the dialogues and interactions.

Predominated by positivist field research traditionally, in recent years IS researchers are aware that the conclusions drawn from the positivist research may not be able to address particular underlying phenomena such as organisational, social and political dimensions of information systems. Interpretive field research however emphasises in-depth understanding of phenomena through accessing the meanings that participants assign to them. Unlike positivist, interpretivist does not seek for generalisation from the setting to a population but intends to understand the deeper structure of a phenomenon (Orlikowski and Baroudi, 1991). Galliers (1991) argues that "the strength of such methods is their ability to represent reality following an in-depth self validating process in which presuppositions are continually questioned and our understanding of the phenomena under study is refined" (p.158). Similarly, Walsham (1993) claims that the interpretive method of research helps IS researchers to produce "an understanding of the *context* of the information system, and the *process* whereby the information system influences and is influenced by the context" (pp.4-5).

Interpretive field study includes interpretive in-depth case studies and ethnographies (Klein and Myers, 1996: 11) and they have been frequently used in CSCW study. Klein and Myers claims that there is no hard distinction between these two methods, the principle difference between the two is length of time spent on site but the underlying ontological and epistemological assumptions are the same. A similar assertion is also made by Yin (1989): "Ethnographies usually require long periods of time in the field and emphasis detailed, observational evidence... In contrast, case studies are a form of enquiry that does not depend solely on ethnographic or participant observation data" (pp.21-22). Klein and Myers identify seven underlying principles of interpretive research, as follows:

1. The principle of contextualisation
2. The principle of interdependence between the researchers and the subjects
3. The principle of abstraction and generalisation
4. The principle of dialogical reasoning
5. The principle of multiple interpretations
6. The principle of suspicion
7. The fundamental principle of the hermeneutic circle

Klein and Myers argue that a good interpretative study should have the above qualities. Despite the underlying philosophical principles of ethnographies and of interpretive case studies are the same and both methods can be employed to study the same topics, there seems to be an unspoken rule that the both methods are deployed to pursue rather different research topics in CSCW.

As for ethnographic studies, it is claimed they allow people to uncover taken-for-granted phenomena in the workplace, so those who argue that system failure is a result of a lack of understanding of work in practice employ the method to obtain needed insights (Anderson, 1996; Bannon, 1996; Bentley, *et al.*, 1992; Button and Dourish, 1996; Hughes, *et al.* 1996; Randall, *et al.*, 1995; Shapiro, 1996). Thus Hughes *et al.* (1994) argue

> "The intention of ethnography is to see activities as social actions embedded within a socially organised domain and accomplished in and through the day-to-day activities of participants. It is this which provides access to the everyday ways in which participants understand and conduct their working lives" (p.430).

As for interpretive case studies, its detailed analysis of observed phenomena is presented to expose potential unexpected relationships that had not been noticed before, or to find counter examples to claims made by theories (Olson and Olson, 1997). Therefore researchers who are interested in exploring or explaining particular phenomena, especially technology in post-implementation environments, frequently employ such case study.

As for this work, which is interested in studying shifting patterns of perceptions and expectations during the pre-implementation stage, both ethnographic study and case study methods could be adopted to explore the issue and most importantly to examine matters from participants' points of view. However, after taking some general and practical issues into account the interpretive case study method has been chosen and not the ethnographic study method.

The choice of the interpretive case study method is made on the basis of three criteria: timescale of research, accessibility to sites, and suitability of method. Timescale of conducting an ethnographic study was judged as not feasible for this research as it may take excessive time to complete fieldwork compared to an interpretive case study. Two things were considered on account of access to sites. First is the confidentiality issue of

exploring choice and decision making of groupware in organisations which would be a major obstacle of getting access to sites. Second, although this work stresses activities taking place prior to technology implementation, it argues that conducting a study in an organisation which has groupware and which has been using it for a while provides a broader view of roles of particular choices and decisions in a project rather than at a specific point of time. Issues of timescale and access to sites highlight the unsuitability of ethnographic approach for this research.

The alternative, interpretive research case study method was then chosen. The case study method is deployed for the following research purposes.

1. The research argument needs to be studied in a natural setting and focus needs to be on contemporary events including the events happening and decisions made during the period of the study.

2. The research argument would lose its significance if the study is carried out in a controlled environment.

3. The research needs 'rich' descriptions in order to support interpretations from various perspectives.

4. The research aims to draw multiple implications as to the relationship between the technological frames and decisions on groupware. An interpretive case study can be expected to advance knowledge of this kind.

The first three purposes stated above are broad but the last purpose is specific to this study. Except for the specific research purposes practical aspects were also taken into account. First, length of research time spent on empirical work becomes manageable and flexible with the method. Second, it is possible to examine choices and decisions made of groupware from a historical point of view which provides a holistic view to see their positions in a project. Third, the writer has experience of conducting case study work but lacks proper training and skills to conduct an ethnographic study; therefore, case study method was chosen on balance of advantages because of existing knowledge of the method.

It must, however, be acknowledged that the interpretive case study method has its drawbacks. These drawbacks centre on the generalisability and reliability of analysis (Galliers, 1987; Orlikowksi and Broudi, 1991). Concern of generalisability of analysis arises from comparison of analysis with scientific research methods. As Walsham (1993) says "the criticisms of the in-depth case study method for empirical research tend to focus on the non-representativenss and lack of statistical generalisability arising from the work" (p.14). Yin (1994) also notes that people are concerned that case study work provides little basis for scientific generalisation. Questions such as "How can you generalise from a single case?" is a frequently heard limitation.

Mitchell (1983) argues that concern of generalisability is based on a common assumption that the only valid basis of inference is that which has been developed in relation to statistical analysis. This common assumption has been associated with scientific research for more than a century, and as information systems study has often and usually been seen as 'scientific research', generating statistical analysis to generalise phenomena has been preferred by many in the past.

Only in recent years have significant numbers of scholars in the field begun to question whether the requirement of generalisability is necessary or not. An observation made in the review of literature in both information systems and CSCW studies is that most researchers who employ the interpretive case study method seem not to have any intention of generating universal laws from their studies. Instead, they report what they observe in studies and suggest possible explanations for particular problems with the aim of highlighting some interesting issues and in so doing to attract practitioners' and other scholars' attentions and urge them to be aware of them.

Even if we accept the validity in general of the approach there is the issue of reliability and quality of interpretations made by researchers. This is another area that receives criticism. Interpretations of case studies largely rely on researchers' conceptual apparatus and the researchers' positions within the research, hence an argument about reliability of analysis arises. In terms of research endeavour, case studies method has often been criticised as lacking rigour, and case study investigators are characterised as sloppy, letting biased views influence the direction of their findings and conclusions (Yin, 1994).

It can be argued, however, that reliability of or basis of analysis should not be regarded as a particular or unique issue associated with interpretive case study method. Most methods have their built-in biases or opportunities for bias. For example, results of laboratory experiment method are affected by variables chosen to be controlled during experiments; results of survey method are determined by design of questionnaire, choice of sample from population, and sample size.

This research is aware of the major weakness of case study research; however for the purpose of this research the decision of employing the method is not changed (Podsakoff and Dalton, 1990; Smith, 1990). The decision of employing the case study research method was made after examining the research assumptions and arguments and comparing them with other similar research. This led to a decision that the case study method would be the most appropriate method in the context of this research, despite some disadvantages of using it. These drawbacks however are minimised if research design takes extra care of areas such as data collection and analysis. The following section will discuss what various data collection techniques should be deployed and how data should be analysed in order to reduce methodological concerns.

4.2.2 Research Design

The previous section has explained why the interpretive case study method is chosen for this work, and discussed two main criticisms of the method. This section addresses considerations of data collection and analysis so to reduce concerns associated with the research method. Before discussion of data collection and analysis consideration is given to site selection for the case study.

4.2.2.1 Site selection

The research began with some general criteria for site selection. A basic criterion was that sites should have implemented groupware and been using it for a considerable length of time, and that outcomes of choices and decisions made related to groupware had been experienced. As mentioned previously, issues around groupware post-implementation phenomena is not the main focus of this study, but organisations' experiences with groupware would be a source of 'expectations' of groupware and enable choices and decisions made to be viewed from a historical stance.

The second criterion of site selection was that organisations studied were preferred to be multinational. An assumption made about groupware is that this technology appeals to large distributed organisation multinationals, as it facilitates people to work together regardless of different times and places. By this account, conducting case studies in multinational firms may either confirm the assumption or reveal another characteristic of the nature of multinationals which drive companies to adopt a particular technology. Not only is the nature of an organisation assumed to influence decisions about groupware, but also is the business environment in which the company is situated. This work chooses to have case studies in different industries with an aim to appreciate whether and in what ways contextual factors play a part in formation of organisations' expectations of and choices and decisions about groupware.

Based on the above criteria investigation began by looking to newspapers, magazines, and the Internet to collect information on companies that were using groupware. A particular article was noticed attention which was a summary of discussion at a workshop on Lotus Notes. The delegates of that workshop were mainly IT managers of Taiwan-based firms or multinationals in Taiwan. After approaching companies whose names appeared in the article, one company suggested that contact should be made with business partner, as decisions of adoption of Lotus Notes were largely determined by their its business partner. The company was then known as British Oxygen Company (BOC Group) and became the subject of the first main case study. The second main case study was carried out in Bank for International Settlement (BIS) located in Basle, Switzerland. Contact here was established through informal contacts. The Bank adopted Novell's GroupWise in 1997, but had experiences with other technologies.

4.2.2.2 Data Collection

The data collected from BOC and BIS are from interviews, articles in newspapers and magazines, company's annual reports, management letters, meeting minutes, internal management letters, memoranda, e-mail messages about the projects between the personnel, informal conversations with employees during lunch breaks, and e-mail questionnaires.

The primary data source was unstructured interviews. The selection of participants is made according to the research aim. Thus, the interview participants are limited to

those who had participated in the initial process of making choices and decisions about the technology.

The interview questions are designed and guided by the elements of the framework described in Chapter Three. The questions prepared for the selected interviewees were initially organised under a number of headings. Each heading looks at different aspects including the history of the project, decision-makers' initial and developed perceptions and expectations of the problems and technology, decision makers' choices and decisions about the technology, and the consequences of their choices and actions. The interview questions however were modified for one of two reasons. One depended on the interviewees' job title and position within the organisational hierarchy; and the other was initiated through the dialogues between the researcher and interviewees.

At the beginning of the interviews the researcher asked the interviewees for their permission to tape record the interviews and assured them that the tapes would not be available for other people to access. The tapes were fully transcribed to allow the researcher to engage in dialogue with the full interview data on a continuous basis, and this would be difficult with partially transcribed data. The transcribed interview data serves two purposes. First, it informed the history of the projects and of the organisations studied, and provided an opportunity to understand events from the participants' point of view. Second, it was used as a source of reference to support the observations and arguments made in the thesis. Along with the interview data further sources of data were also collected and through an awareness of the possibility of participants' biased views or false memories about events.

In addition to formal interviews, informal conversations with employees during breaks deepened our understandings both projects and company background, and exposed more personal feelings about projects. Such data is difficult to acquire through formal interview. Notes were taken after such conversations.

Secondary data is another significant data source, as well as that from formal interviews and informal conversations. Secondary data can be used in conjunction with other sources to complement primary research material. Kiecolt and Nathan (1985) suggest that secondary data, can be employed in combination with primary data particularly in-depth interviews, to establish sound research. Secondary data in this research is

employed for triangulation and tracking trends and came from annual reports , newspapers and magazine articles, and ABI/Inform's database.

Annual report study Chairman's, Chief executive's, and Managing Director's letters to shareholders, in only a few pages, give highlights of the year and summarise actions and decisions made to confront events in particular years, and strategies for coming year. Taking the case study of British Oxygen Company (BOC) as an example, BOC's marketing sector was reorganised to meet demands from its customers, and had, to a certain degree, implications on its business strategy and organisational settings. The annual report then became a useful source to track and examine changes made in the company with respect to the marketing division reorganisation. Analysis of annual reports between 1992 and 1997 showed that marketing reform had been constantly mentioned in the Chief Executive's, Chairman's and Managing Director's statement since 1994, and that business strategies also changed after the reform. Annual reports were also used to identify possible environmental elements that might have influenced organisations' business activities such as in the depression global economy, political environments, and so on.

Newspapers and magazine articles, ABI/Inform's database search Learning from interviews, some intensively discussed management ideas and technologies appear to play an important part in organisations' expectation, choices, and decisions of groupware. To support this claim newspapers and magazine articles were examined and ABI/Inform's database was searched. The search was based on a number of keywords including groupware, Lotus Notes, Microsoft Exchange, etc.

4.2.2.3 Data Analysis

Mode of analysis

Hermeneutics is chosen as the mode of analysis used here. Hermeneutics can be viewed as both an underlying philosophical assumption and/or a specific mode of analysis. As a philosophical assumption, hermeneutics is concerned with "interpreting and understanding the products of human mind which characterise the social and cultural world" (Burrell and Morgan, 1979: 235-235).

Being used as a mode of analysis, it focuses on establishing underlying meanings of a text. In order to understand a text, one is expected to be open to the text and engage in a

series of dialogues with it, and to move forward and backward to ask questions, examine questions as well as answers, and to revise one's understanding and interpretations of the text. This process of interpreting a text is named as the 'hermeneutic circle'. Because the circle is continuous, one should not expect that there is a fixed and single interpretation of the text. Also, due to prejudice (preconceptions) on which one's interpretation is made, interpretation is changing throughout a period of time according to the state of certain prejudices. The awareness of prejudices is realised through entering into dialogues with the world in which one's horizon of understanding is opened to that of another person (Introna, 1997).

The hermeneutics mode of analysis was originally used for text analysis, but it has been adopted to understand human activity other than text based documentation. Lee (1994) says:

> "[...] many hermeneutic scholars have extended their conception of text to include not just the documentary artefacts that human subjects create, but also their individual actions, group behaviours, and even social institutions, all of which, as text analogues, have meanings that can be read and interpreted" (p.148).

Researchers in the IS field employ this approach to make sense of wholes and relationship between objects other than text such as technology, individuals, and organisations (Boland Jr., 1985; Boland, 1991; Lee, 1994; Myers, 1994). For example, Boland (1991) argues that the design and study of information systems should be understood as a hermeneutic process:

> "In designing an information system, the designer reads the organisation and its intended users as a text in order to make an interpretation that will provide the basis for system design" (p.196).

In line with hermeneutic scholars, this investigation views the relationships between perceptions, decisions, individuals, organisations, and technology as texts that are open to interpretation. This means that the researcher not only *looked at* them, but also *entered into dialogue with* them, to search for understanding and interpretation. Despite certain prepositions prior to interpretation process, it was through a series of dialogues that understandings and interpretations of situations under investigating came to a richer and fuller shape.

Data analysis

Following ideas of the hermeneutics mode of analysis, data collected from the field was first read to gain background knowledge of organisations and of projects that were

generated; and then interpretations were formed through continually reading and re-examining the materials. Continuous engagement in dialogue with the materials was pursued in order to re-examine and revise emergent arguments and assumptions. When 'interaction' between the materials and the researcher stopped owing to a lack of information, further work was pursued by returning back to the interviewees for more information either by arranging another interview or by e-mails. Documentation was carefully reviewed and analysed to complement interview materials. When inconsistency emerged between information contained in documents and statements made by the interviewees on the same topic, explanations were sought first from other available sources first, if this proved inconclusive, further interpretation and explanation was sought from the interviewees.

4.3 SUMMARY

In this chapter a review of research methods adopted in CSCW studies is presented, followed by discussion of research design for this research. Reviews of research methods and objectives have been done in the information systems field, but there are few such studies of the same topic focus in particular on CSCW. Therefore, one of the main contributions of this chapter is considered to be its detailed and close review of various research methods which link research objectives and methods together in CSCW studies. The second part of the chapter examines the philosophical assumptions of this work, and argues that the work falls into an interpretive paradigm. Two research methods within an interpretive paradigm were considered as potential methods for this work: ethnographic study and interpretive case study. Taking timescale, accessibility, and knowledge and skills into account, conducting an ethnographic study was not seen to be feasible for this work. An approach grounded in an interpretive case study was then chosen as the research method for this work. Table 4.4 summarises research design of this research.

Table 4.4: Summary of the research design

Research Design	Detailed Description
Type of research question	Questions regarding to individuals' and organisations' perceptions and understanding of the problems and technology and based on them the decisions are made.
Assumptions	*Ontology:* actors give meanings to the world and act accordingly.

Research Design	Detailed Description
	Epistemology: the meaning of the technology is interpreted and given by the actors so they are different from one company to another. In order to understand the decisions based on those meanings, they need to be studied within the context.
	Human Nature: the actors make decisions within the context; however the consequences of the decisions may modify or even generate a new context for the next decisions to be made.
Conceptual Framework	A synthesised framework consists of two parts: technological frames and contextualist approach.
Paradigm	Interpretive paradigm.
Strategy	Descriptive / Interpretive case study.
Data collection	Unstructured interviews, documentation, informal conversations, and secondary data.
Data Analysis	Hermeneutics mode of analysis.

CHAPTER 5

BRITISH OXYGEN COMPANY

This chapter presents a case study that concerns the choices and decisions about a groupware project at British Oxygen Company (BOC). The groupware project was launched in 1995 to support BOC's internal market function reform, but for various reasons the system failed to achieve its prescribed objectives. A considerable number of explanations from different perspectives could be offered, but this research is interested principally in individuals' and the organization's technological frames which brought the project into being and ultimately had impact on the choices and decisions made.

BOC was chosen for this research for a number of reasons. First and most important is that the company uses groupware technology. Second, it is a global company and much of its expertise is dispersed around the world. Most case studies done by other researchers have been carried out in large and multinational companies, and groupware was often seen as a communication and collaboration tool to assist global teamwork in those organisations. Hence, in order to connect with the assumptions and arguments made by others it seemed important to minimise the differences between organisations for this research and others. Furthermore, BOC Group is an experienced information systems / technologies user, ranked as the 70th among top 100 IT spenders in the UK in 1997 (Computing, 1997).

Multiple techniques of data collection were used. Six semi-structured and tailored interviews of an hour or hour and a half in length were conducted. All interviews were tape recorded and transcribed. Four interviews were with the participants from the BOC Group's Information Management Department (Group IM), one with a manager from a business division, and one with an IM manager at BOC's business partner in Taiwan

(Table 5.1). Some follow up questions related to the opinions or data given by the participants were subsequently asked of the participants via e-mails. Documents were also examined, including company's internal documents, meeting minutes, and annual reports from 1992 to 1997.

Table 5.1: Primary interviews

Date	Time	Title
July 1997	1½ hours	New Development Manager
July 1997	1 hour	Project Manager
July 1997	1 hour	Project Manager: infrastructure
October 1997	1 hour	Project Manager
October 1997	Via e-mail	Business Manager
August 1997	1 hour	IM Manager (Taiwan)

Table 5.2: Titles of principal documents studied

Date	Document
9 February 1994	Management Letter
May 1996	Information Management: The Way Forward (Presentation by the Director of Information Management)
December 19996	Knowledge Management Programme, Internal Web Project, IM Infrastructure Standards
May 1997	BOC Technology (i.e. company's internal magazine)
June 1997	BOC World (i.e. company's internal magazine)
1 July 1997	Minutes of Internal Web/Knowledge Management workshop
1992-1997	Company Annual Reports
1996	*"Getting Notes right: A guide to the effective use of Lotus Notes within The BOC Group"*

Among the various documents, the company's annual reports are the most important to this case study. They are important because, first, they provide the information on the condition of the business environment and organisational context before and during the project. Second, the statements made by the company's chairmen, chief executives, and managing directors provide a trace of a series of changes in BOC's business principles and strategies. Finally, they are the sources used for triangulating the interviewees' statements. Since there was only limited access to interview those who participated in the Lotus Notes Project (e.g. some people had left the company, some were beyond the

reach because of their business duties, and others are based in the USA), we therefore used the secondary sources including BOC Group related news in *Financial Times* between 1994 and 1997 (Appendices 2), and on-line CD-ROM to build up the background knowledge of the Group.

The description and analysis of the case is based upon the synthesised framework developed in Chapter Three and summarised in Table 3.3. The next section outlines the case history as a general introduction, and this is followed by the section of analysis. The analysis section consists of three parts that present three phases of the project. In each time frame the data is presented and analysed within the synthesised framework. The final section of the chapter discuss some findings from section two, followed by a short summary of the chapter.

5.1 BRITISH OXYGEN COMPANY (BOC GROUP)

5.1.2 About the organisation

The BOC Group, a UK based industrial manufacturer, has grown and developed over the past 100 years. It was known as Brin's Oxygen Company Ltd in the late 19th century, and produced oxygen and developed technology to separate atmospheric gases for industrial use. The company changed the name to The British Oxygen Company Ltd in 1906, and it has been operating its business under this name since then. BOC Group expanded its business operation to the United Sates of America in 1910, and after that it has consistently sought for new business opportunities abroad. Today, the Group has business in over 60 markets in Europe, Africa, America, and Asia / Pacific, and employs 40000 people around the globe. Profits for the year to 30 September 1997 were £287.6 million, growth of about 3%[6].

The Group has business in four different areas: Gases, Health Care, Vacuum Technology, and Distribution Services. Among these four business, Gases is the Group's core business in terms of sales, profit, number of employees and capital investments, accounting for 70% of the £4 billion turnover, and 76% of operating profit.

---

[6] 1997 BOC Group Annual Report

It provides a range of products including atmospheric gases (e.g. oxygen), non-atmospheric gases, and a wide range of speciality gases, medical gases, gas mixtures, and gaseous chemicals to its customers who are in electronics, food, glass, chemicals, petroleum, metals fabrication, and medical industries. Gases' business operation spreads over five geographical regions: Europe, the Americas, North Pacific, south Pacific and Southern Asia, and Southern Africa. Each has its own Regional Director and management team.

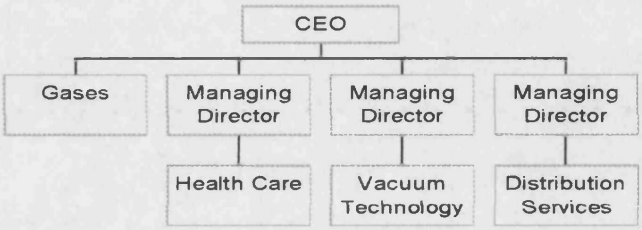
Ohmeda was the Group's Health Care business, and is made up of four divisions: pharmaceuticals, medical systems, medical devices, and speciality products. It has its roots in providing high quality anaesthesia products and services used in operating rooms, emergency departments, and in post-anaesthesia, intensive, neonatal and cardiac care units around the world. Together with its sister company, BOC Gases, Ohmeda offers a combination of capabilities to meet the customers' special needs, such as the gas in facilities designed to meet the US Food and Drug Administration's (FDA) Good Manufacturing Practices regulations for pharmaceuticals.

The Vacuum Technology business was an acquisition in the 1960s. Its main activities are the design and manufacture of vacuum equipment for semiconductor, scientific and industrial applications. Many of its vacuum pump customers around the world are also customers for BOC Gases.

The Distribution Services business grew from the Gases business, which had given the Group Expertise in food chilling and handling and in complex distribution systems. It was created in the 1950s as an exclusive service to the food business of Marks & Spencer in the UK; since then the business has grown moderately.

Health Care, Vacuum Technology, and Distribution Services are managed by their own managing directors (MD) who have responsibility to report to the CEO, but Gases is different since it is under the direct control of the CEO. Figure 5.1 shows a simple version of BOC Group management structure.

Figure 5.1: Group Management Structure (1996)



5.1.1 Background of the Project

Traditionally, Gases concentrated on developing strong business relationships within the regions and countries it served, and its business strength and competitive advantage in the market was believed by many to come from there. Strongly focusing on local and regional management, Gases' overseas offices and joint venture companies had discretion over business operation and decision making most of the time. Along with this emphasis on local and regional markets, Gases practised a simple supply driven marketing strategy by organising its market functions around the mode of supply such as 'compressed', 'liquid', or 'tonnage.' Moreover, Gases thought much about how to produce cheap industrial and speciality gases and less of what customers' real needs were.

In the late 1980s and early 1990s BOC Gases faced increasing pressure from customers especially those in the electronic industry. The message sent from the customers was clear and demanding: Gases had to act under a single name – BOC Gases – instead of acting as several regional and local gas companies in the name of BOC. These customers were world class semiconductor manufacturers and, while their manufacturing facilities were geographically dispersed, they expected a standard and consistent services from their suppliers regardless of where they require the services. However, their experiences of dealing with BOC Gases were that they had to deal with several regional or local companies instead of with only one BOC. The very same

customers also asked Gases to supply much higher purity of gases than industry standard[7], as well as rapid turnaround.

The demands from its customers forced Gases to re-examine the existing business approach and to seek a new way of doing business[8]. In order to meet the customer requests Gases needed to be synchronised, regardless of where the customers are or where the work is carried out. In other words, all overseas offices and joint venture companies would have to cooperate with each other, so that standard and consistent services could be delivered to the customers. A global market sector – the Electronic Market Sector – was therefore set up in the late 1980s, aiming to serve the customers in the electronic industry throughout the world. Gases selected several companies in the electronic industry to be their "global" customers, and employees working with those chosen companies were expected to share and exchange information and knowledge of those customers with their colleagues at different locations; that is, the employees had to work as a global team with a global business framework.

Since the establishment of Global Electronic Market Sector, BOC has won several important contracts in the industry. An article published in *BOC World*, an internal company magazine, claims:

> "The global electronics teams has won every major project on which it has bid over the past six months, achieving a hit rate of two major contracts a month. The value from these projects over their contract life is around $200m" (*BOC World*, August 1995, No4: 23).

The success in the Global Electronic Market Sector showed the Group that the reorganisation of market function to work around the globe could successfully pursue the company's interest and the customers' demands, and at the same time cause the "minimum disturbance" to the existing organisational settings. Minimum disturbance meant that the Gases wished to re-organise the current way of doing business but at the same time it had no wish to re-structure the current organisational settings.

---

[7] As it was stated in the company's 1992 annual report: "Manufacture of the latest generation of semiconductor devices requires process gases to be not only produced, but also delivered to the point of use, to outstanding levels of purity."

[8] This was mentioned many times in the interviews and annual reports.

The first thing that Gases noticed was that in order to deliver the growth and value for its customers, to just be cost competitive alone was not enough.

> "[...] innovate faster than its competitors, bring new ides to its customers in all countries as quickly as possible, and ensure that its operational effectiveness is unsurpassed" (Management Letter, February 1994, Issue 215).

In other words, everything Gases did needed to be targeted to achieve higher customer satisfaction. This Vision for BOC Gases, drafted in the summer 1993, made it clear to the whole BOC Group that:

> "BOC Gases will be recognised as the most customer-focused industrial gases company worldwide. We will achieve this Vision through innovation and service created by working together around the globe" (Management Letter, 9 February 1994, Issue 215).

To be customer focused and globally, effective, the newly appointed Chief Executive – Gases, and Group Operating Officer, Mr. Chow, and his management team proposed a reform of Gases' market function (1994). Their idea was to reorganise the market function around the customers and not by product. As a result six global market sectors were set up: Chemicals, Glass, Fabrication, Food, Electronics, Iron & Steel. Most customers were assigned to particular market sectors depending on their business. Each market sector was expected to work as a global team disregarding regions and countries. In doing so, consistent and standard services and interfaces within Gases and between Gases and the customers could be created.

Two support divisions were set up in the same year (1994) to look after the market function reform scheme: Marketing, and Process Development. The Group Manager – Marketing had to work with the market directors to develop the necessary marketing processes and skills in Gases. The Group Manager of Process Development was responsible to ensure that all market sectors were co-ordinated effectively, and that processes which span market sectors were supported appropriately. The employees who worked in the global market sectors were expected to work together at a global level, and the experts' knowledge, information, and experiences of dealing with particular customers, industries, or technical problems were also expected to be shared and exchanged.

In the following year (1995) the Group Manager of Marketing and his team began to look for a common platform in order to facilitate cooperation and exchange, and they came to the conclusion that Lotus Notes would be useful. They believed that Lotus

Notes could create consistent interfaces between BOC Gases' local and regional offices and support 'virtual global teams'. As a result, the Lotus Notes Project was set up to look after the technological support for market function reform.

The project

Lotus Notes project was initiated and launched by the market sector reform team to support the re-organisation of the marketing sector in Gases. At the beginning, Gases had Lotus Notes servers in the United State of America, Australia, Europe, and South Africa. The server at the centre in Guildford UK was responsible for managing the traffic between the servers in the other regions. About thirty 'region' databases were set up for Gases' global customers in Notes. These databases were quite basic, similar to discussion groups, so employees could discuss customer issues and share information within regions. There were also team reference databases for each global market sector which contained the support materials for the global teams, including customer contact details, and business reports. Information such as outlines of strategies for customers, and plans of developing the account, were stored in the Strategy and Plan databases. Individuals could retrieve information from the databases but at the same time they were expected to put information of what they do with particular customers, how they deal with problems, and the development of their projects with the customers, into those databases. At this stage, Notes did not function properly for various technical reasons and was not used in the way that the team expected it to be used. This will be discussed later in the chapter.

In 1995, Group Information Management Department (IM) took over the Lotus Notes project[9]. The Group IM is BOC Group's Information Management Department located at the headquarters in UK, and working with all of the BOC business including Gases, Health Care, Vacuum Technology, Distribution Services regardless of the regions and countries. Its central role was to set the standard and policies, and to provide global services and infrastructures such as e-mails, workgroup, documentation management,

[9] The reasons why the project was passed on to Group IM to manage it are not known. It could be the organisation of the market reform was discontinuous after Mr. Chow's departure (Section 5.3).

internal web, etc. to IM departments within all of BOC's overseas operation offices and business partners.

In early 1996, the Group IM initiated the "Notes 96 Project" to review the service and to ensure that the BOC built a firm platform for the next stage of development in terms of business and information technology. At a workshop for Notes 96 most IM personnel agreed that it had learnt a lot about Notes and was confident of making the system work properly the second time. A forty page long guidebook *'Getting Notes Right'* was published to guide Notes users to use the system effectively so they would find the system could help them to do their jobs.

Also, in the early 1996 the Group IM organised a workshop on Knowledge Management within BOC. At the end of this workshop a general feeling emerged that BOC should look out for opportunities to adopt the Internal Web in order to gain market competitiveness. In July 1996, a number of suppliers attended another Knowledge Management workshop, including Lotus, David Skyme, Verity, Documentum, Microsoft, Andersen Consulting, Unipower, and Ernst & Young. In the workshop the suppliers and management consultants showed Group IM the development of knowledge management in other organisations, and explained its importance to an organization.

In a further workshop held in December 1996 some technological issues of knowledge management were discussed as well as the primary aim of the 'knowledge management programme.' As they put it: *"Knowledge Management is about levering experience and expertise, so that knowledge gained in the one area can be used in other areas."*

Following these events in 1996, Group IM integrated the Internal WWW and Knowledge Management Programme into a single workshop, which took place at UK headquarters in mid 1997. This workshop attracted not only personnel from IMs but also people from the business divisions. In fact, several senior managers, one level below the Board of Directors' were among the delegates. A committee was set up as a result of the workshop and its duty was to report the progress of Knowledge Management Programme to the Board. By then the initial Notes project had faded away in the company.

5.2 ANALYSIS

The description given above suggests that the case can be analysed by viewing the project in three phases: new concept of working together, exploring the technology, extending and applying the skills. These three phases are not determined according to calendar year or clock time nor are they according to any schedule set up by the project team originally. Rather, they are divided according to significant changes in individuals' and group's attitudes towards the system. Each phase had a specific context in which individuals or groups formed their own interpretations and expectations of problems and technology. Drawing on the data various interest groups were identified as the project progressed forward. These groups played roles in the project, and some were more influential than others in the different stages.

The analysis is organised around the three phases of the project, and each phase will be discussed under the headings of context, content, and process.

5.2.1 Phase I: New concept of working together (late 1992 – 1994)

This period lasted from the early 1990s to 1994. In this period two major events took place in relation to the project: one was the reform of the marketing sector, and the other was the launch of the Lotus Notes project.

Context

According to the synthesised framework the context concerns two kinds: outer- and inner-context. The data suggests that the proposal on reform of marketing sector was largely influenced by external environments such as global economic environment and demands from customers. The Lotus Notes project was launched to support the reform and decisions made about the system were influenced by external factors such as the development of the software industry and by internal factors such as organisational settings and the IS environment.

Outer context

Global economic environment

In the late 1980s three large economies in the world namely US, Germany, and Japan did not do well in their external trade balance hence there was a fear that global

recession was on the way. For example, the US had the problem of the double deficit and a ballooning debt which left a narrow path between recession and inflationary growth; Japan experienced its domestic financial crisis and political problems; reunification costs in Germany placed severe constraints upon policy makers. In the meantime the political and economic reconstruction in the European Communist bloc increased uncertainty in both the world economy and politics (BOC Annual Report, 1992).

During this period BOC Gases experienced slow growth and even setbacks in sales and, concurrently, saw threats from their competitors' success. In 1992 the Group claimed that its turnover was less than 1 percent above that in 1991; excluding exchange rate movements there was an underlying growth of 2 percent compared to 5 percent in 1991, as reported in its 1992 business review (1992 Annual Report: 42).

Customer Demands

BOC's multinational customers demanded that BOC operate as a multinational as they preferred to deal with one multinational BOC rather than a number of different regional and local BOCs. This demand originally came from large multinational semi-conductor manufacturers who had plants all over the world, and put pressure on BOC to review its internal business operation between local and regional offices and also its external business contacts with customers. Such demands from the customers were important to BOC at that time because the global recession was on its way and there was a setback in the company's sales figures. To meet these existing customers' demands became ever so important at that time. Another reason that BOC responded to the demands from customers in the electronic industry was due to the fact that the semi-conductor industry was booming at a fast speed globally in the early 1990s. To meet the demands from the customers from this sector meant a chance to maintain steady sales figures for BOC.

The development of the software industry

The development of groupware in the software industry at this time is another contextual factor for which evidence was found. Articles published in newspapers such as *Financial Times* and *Times* between 1981 and 1995 were examined to find out the period when groupware and relating concepts emerged in the software industry and commercial areas. ABI on-line CD-Rom was also searched to confirm the findings of the newspaper survey. On-line databases were searched and the results of the search

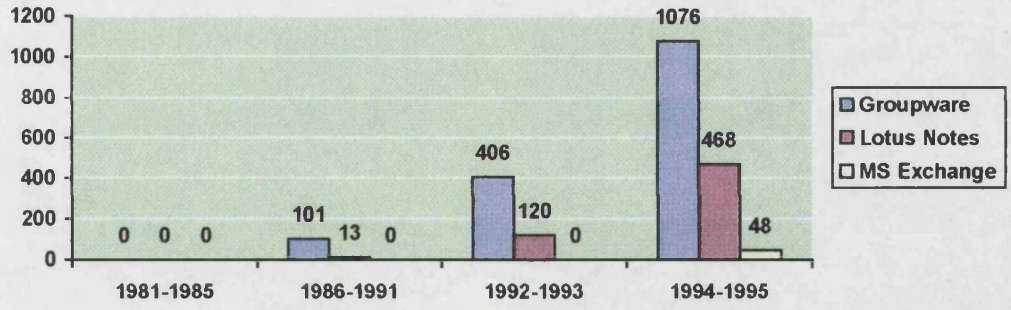
were used to support the argument. Generally speaking, the results reflected the trend which has been observed in recent years but it is worth noting that omissions could have potentially occurred due to different indexing systems. To establish the trend of growing attention to groupware keywords such as "groupware", "Lotus Notes", "Microsoft Exchange", "GroupWise", and "CSCW" were used to search the databases. However the relevant articles may be indexed under other keywords and therefore would not be retrieved by the search.

The results are presented in Table 5.3 and Figure 5.2. The results show that prior to 1986 no article about groupware was published in the newspapers or magazines, but that from 1986 onwards there was a significant increase in the number of articles published in this area.

Table 5.3: The rise of groupware

	1981-1985	1986-1991	1992-1993	1994-1995
Groupware	0	101	406	1076
Lotus Notes	0	13	120	468
MS Exchange	0	0	0	48

Figure 5.2: The rise of groupware



The increasing number of articles about groupware relates to two things. First is that the first official CSCW conference was held in 1986 just when the topic began to take off in the academic and software industry; and second, it is clear that articles increased dramatically at the time when Lotus Notes was first made available in the market (1987).

Lotus Notes was regarded by many as the first substantial groupware product in the market, and since then its name has become synonymous with groupware, particularly in corporate environments. For example, there were 51 articles published between 1992 and 1993 which concerned groupware and Lotus Notes at the same time; and in the period of 1994 and 1995 there were 216 articles discussing groupware and Lotus Notes compared with only 21 articles relating Microsoft Exchange with groupware. Because Notes was the first groupware on the market it gained the pre-eminent market share. Microsoft's Exchange and Novell's GroupWise entered the market later and could not shake the position held by Lotus Notes (interview with IM project manager).

Inner context

Organisational setting

Until the early 1990s BOC Gases had historically focused on its geographic strength, on building relationships in the countries that it served, and on local and regional management. Therefore, on most occasions its overseas operation offices and joint-venture companies around the world had discretion over business decisions; in consequence the market functions in BOC were decentralised. The result was that cross-region and country coordination or integration was weak. In fact, working together across regions and nations rarely happened within the company.

Also at this time, the marketing strategy was supply driven so the market function in BOC Gases was organised by the mode of supply such as 'cylinder', 'bulk', or 'pipeline'.

IS environment

IS environment refers to issues about software, hardware, organisation and management of IS operations, operations personnel within organisation, development methods, techniques, and so on.

Prior to the adoption of Notes, BOC had been using mainframes and stand alone PCs, and there was no global computer network to link offices around the world together. The lack of global computer networks within the company meant that all Notes servers were connected by modems, and data transmission was via ordinary telephone lines. A technical problem associated with such connection was the speed of transmission and replication which was slow when the traffic of transmission increased. This was

regarded as a setback as the slow data transmission and replication put people off from using the system. Project manager in Group IM said:

> "It was not rare that it took several hours to complete replications. In some cases the people could not even connect to the servers, and this really put people off" (The Project Manager).

Content

During this period of the time three sets of frames are derived: interpretation of problems, expectations of the technology, and understandings of the technology. Interpretation of problems in this phase associated with the way of doing business. Expectations of the technology refer to the expectations about the impact of the technology on the way of doing business and on working practice. Understandings of the technology refers to knowledge, experiences, and skills of the technology. The first set was held by the management group, while the second set was held by the marketing reform team, and the last set was held by the technologists.

The Management Group

Interpretations of problems

Historically, BOC's perception of doing business focused on products and of being a leading company within the industry that was cost effective and able to provide relatively cheaper products to its customers. Owing to global economic recession, the boom in the semi-conductor sector, the pressures from its multinational customers, and the setback in its sales figures, the management group's perceptions of how to maintain BOC's market share changed. As the group reviewed the company's business operation it realised that other things were equally or more important than just being cost and price competitive, such as having good relationships with its customers. The result of this changing perception was that the group decided to become more customer-focused.

By being customer-focused the management group meant that the company had to be familiar with its customers' business, the industries where the customers were located, and how the customers used BOC's products. Based on this understanding, together with the increasing pressures from its customers in the semi-conductor sector, by about 1991 the Global Electronic Market Sector was established with the express purpose to

serve those customers. In the following years this strategy won some large contracts for Gases.

The successful experience with the Global Electronic Market Sector highlighted and brought to the surface a problem which had not been noted before; the lack of knowledge of its customers and of the industries to which BOC sold most of its products. The realisation made some in the company uncomfortable. As the new development manager said in the interview:

> "[...] for example, most customers for the Orban products were in the steel industry, but Gases knew very little about the steel industry, the customers and how the Orban products were used."

Another problem which the management group perceived during this period was that BOC had not been seen as a multinational company but as an international group of BOCs. Such a perception came from the increasing demands from its customers to require BOC to be a multinational company to provide consistent and standard services access the globe. Through the eyes of its customers the management discovered that the Group did not have a single, consistent, and global business process and strategy and saw that to create a global business process was urgent (interview with the new development manager and project manager).

Within the current context, and building on the perceptions of current problems, the Managing Director (MD) of Gases drafted a Vision for the business in which he articulated two main directions that Gases should follow: **customer focused and being a global company.**

The Vision was supported by the Board level and was publicly endorsed as the Chief Executive made a statement in the 1994 Annual Report:

> "[...] we once thought in terms of 'cylinder', 'bulk' or 'pipeline' business, we are now organised into teams serving, for example, the electronics, chemicals, food, glass, metals, fabrication and other markets. [...] In the early 1980s – like many other UK business – it (BOC Group) lacked understanding of its core markets; it suffered from high costs; above all, it needed to transform itself and its culture from being a UK company with an export business to being a truly international player."

A similar statement was also made by the Managing Director of Gases in the same Annual Report:

> "It is our vision to be recognised as the most customer-focused industrial gases company in the world and we are building an organisation that is both locally competitive and globally effective. We are focusing ever more closely on the needs of our customers and responding swiftly and creatively to them" (Annual Report 1994).

An outcome of the perceptions of the problems and solutions for them was to reform the marketing sector in Gases. The marketing sector was now organised around the industries to which most of its products were sold and employees were asked to work together regardless of their locations when they served the same customers.

The Marketing Sector Reform Team

Expectations of the technology

Expectations of the technology such as expectations of impact of the technology on business operations and working practice were the primary reasons that the Lotus Notes project was initiated. It was noted that the expectations of the technology which became a force behind Notes project initiation and roll-out within BOC were held by the marketing sector reform team, especially by the manager of the team.

Mr. Sanderson, the manager of the team, had always worked in the business division and was regarded as a 'business man' in BOC, but he was described by the interviewees as the one who initiated the Lotus Notes Project. Sanderson explained that it was not by chance that he decided to adopt an office information system to assist the reform, rather, he had always believed in the role of IT/IS in today's organisations.

> "I have always considered information system and its associated tools an integral and essential part of modern management. [...] the awareness of Lotus Notes came from my interest in all things about information systems" (Interview with Mr. Sanderson)

The perceptions of the current problems derived by the management team provided an opportunity for Sanderson to "test" his assumptions of information systems by rolling out Lotus Notes project in BOC.

Sanderson's knowledge and understandings of Lotus Notes came from reading computer magazines and newspapers. When Mr. Sanderson and his team looked into possible information technology to support the marketing sector reform, they noted groupware as a potential solution for their problems, since in most magazines and newspaper articles Notes was synonymous with groupware and they "naturally" saw both are the same thing.

Mr. Sanderson read about groupware/Lotus Notes and learned that it provided a platform to enable teamwork. He matched the definition of Notes given by the software industry[10] and the media[11] with the aim of market reform (i.e. working together as a global team) in mind, and was convinced that the system would support the marketing sector reform by creating consistent interfaces, enabling all BOCs to work together, and by being customer-focused. Sanderson said in the interview that he and team did not spend much time on evaluating other groupware but chose Notes straightaway. Although the decision about Lotus Notes seemed not to be properly the project manager commented that the choice made was "the best at that time and even today[12]."

The Technologists

Understanding of the technology

Perceptions of problems were derived by the management, but expectations of the technology were formed by the marketing sector reform team. The former resulted in the decision about marketing sector reform and the latter, which was based on the former, lead to the initiation and roll-out of the Lotus Notes project. The decision of introducing Notes into the company raised doubts within the Group IM due to the fact that there was no knowledge base and no skills available in the Group IM to roll out Notes.

Current understanding of computer technology in BOC was associated with the mainframes and therefore PCs and networking were new things to many IM personnel. According to the interviewees, the lack of knowledge of Notes and of experience of dealing with network PCs caused a resistance to change within the Group IM especially from those who did not regard networked PCs as a real computing system.

A further impact of the lack of knowledge and skills of Notes led the technologists to make a decision about implementing the systems with a trial and error method which had implications in three areas: technical solutions, applications, and management. As

---

[10] Vendors' advertisements.

[11] Articles published by newspapers.

[12] "The best" in their own words.

mentioned earlier there was no global network within BOC at that time so setting up the linkages between Notes servers in different countries relied on modems and telephone lines. A consequence of this technical solution was that users were upset with the slow speed of data replications and transmissions.

The decision to implement Lotus Notes in BOC was taken by the marketing reform team (applications), but how actually the system could be used to support the reform was not defined. The first application that the technologists thought of and developed was on-line discussion groups which aimed to let users across national and regional boundaries talk and share information with others on-line. The aim was seen to inform the objective of the marketing sector reform. A number of discussion groups were set up within Notes for each market sector, and users were able to meet now colleagues on the other side the world, whom they might have never met before, and discuss business virtually.

However, because of the lack of knowledge of possible implications that groupware could have for working practice, and the absence of experience of managing similar information systems, the technologists left these discussion groups to users to self regulate; that is, no policy to control and manage the discussion groups was put in place. Moreover, because Notes was also new to the technologists and the decision to deploy the technology was top-down there was no implementation strategy, and no user training. For example, when interviewees were asked if they could talk about their implementation/roll-out strategies at that time, they all (i.e. the new development manager, project manager, and project infrastructure manager) replied that there was no such thing. In this sense, users were left alone to explore the system by themselves.

> "No, not for Lotus Notes, there is no implementation plans. Because what happened was that this person who started it said: OK, we want global team marketing and we want these people around the world involved, so we want their regions to put in Lotus Notes. That is how Lotus Notes server popped up. That was not really planned. It just happened." (The new development project manager)

Since there was no training on Lotus Notes available to users, many saw that Notes was no different from an e-mail system and they used both systems in more or less same way. For example, people used e-mail to carry out a small group discussion while they should have used discussion groups in Notes to do so. Consequently, the traffic in the e-mail system increased while discussion groups were left idle. In addition, an

unintended result of using an e-mail system to have small group discussion was that invisible boundaries between groups and the rest of the company were created as only participants involved in the group were acknowledged in the content of discussions.

This led to further consequences. First, due to the lack of formal regulations for discussion groups, discussion groups became a place where people met and chat sometimes. For example, the discussion groups began with focused topics relating to business operations but were then driven away from the agenda to social chats and sometimes the discussions never came back to discuss the initial topics. This irritated some users as they felt that some discussions started off with interesting topics but became inconclusive at the end.

> "Although discussions conducted within discussion groups took off slowly because of barriers between employees at the beginning, once the barriers start breaking down people then started getting 'friendly'. What happened was that the discussion groups all started from very business focused topics, but after two or three times met on-line people started talking about something else and discussions went off to completely different tangent. No body really took back that debate and concluded it and produces document on it. So people got very very frustrated especially they found there were some very very good debates going on but nothing would never happen." (project manager)

Second, many discussion groups were set up but were not updated and used on a frequent basis which only put people off from using the application even more. As project infrastructure manager pointed out in the interview:

> "People were enthusiastic about the application at the beginning especially those new to the company. But they soon found out that there was nothing happening in these discussion groups (e.g. no one used it or information was not updated) and they soon abandoned the idea of using them for their work."

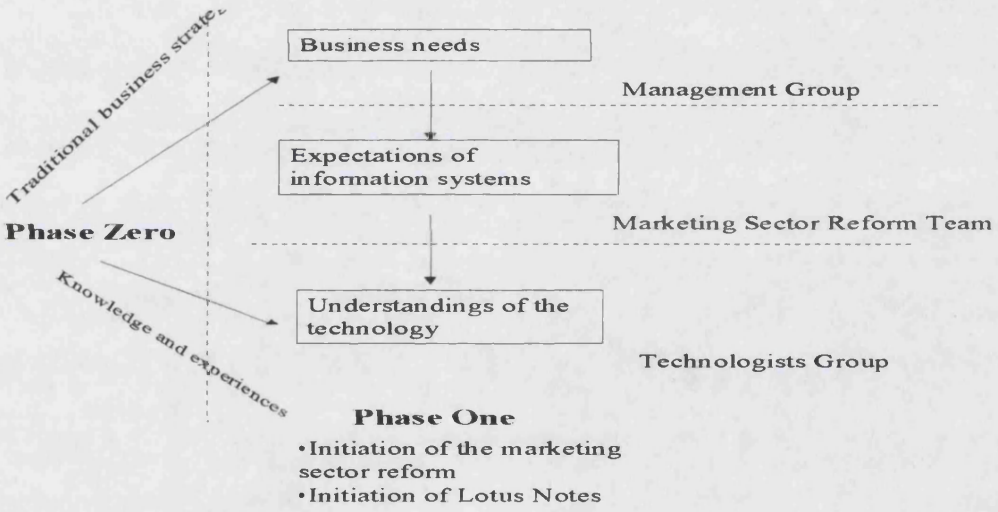
Not only did users feel frustrated with the discussion groups but so did the management group. The management group saw that the discussion groups had become social chat rooms and was not impressed by it. And, most important of all, the management group conceived that Notes was not professional enough for business. Lotus Notes image was damaged among the management group and one consequence was that the Managing Director of Health Care, having seen the example in Gases, refused to install Notes in his division.

Process

Initiation of the Lotus Notes came from the business needs; however, when considering the changes that needed to be made in the company, an information system was not on

the management group's mind. The decision about introducing the system came from personal expectations of the impact of information technology held by Mr. Sanderson. How Notes could help the company to pursue its new business and marketing interests was left to the technologists to decide. It is seen that the perceptions and interpretations of the problems were top-down: the management group to marketing sector reform group to technologists and then to user groups. Each group, due to their situations and immediate contexts held specific perceptions of problems which may or may not directly link to the initial ones derived by the management group. Figure 5.3 illustrates the relationship between issues that each group concerned.

Figure 5.3: Frames involved in Phase One



The three sets of frames were held by three different groups and there is little evidence to show interactions taking place when one set of ideas was passed down to another to initiate actions around it. Having said that, it is clear that group and individual expectations and understandings of the technology changed every time the new ideas were passed down from the top.

5.2.2 Phase II: Exploring the technology (mid 1995 – first half of 1996)

A significant feature of this phase is that both technologists and users were more experienced with Notes and that their conceptions of problems associated with the system had moved beyond some basic technical problems and begun to concern

organisational issues associated with the introductions of the system. Group IM took over the project in the early 1996 and thus marked a critical event which transferred the project to another phase.

Context

In this phase perception of current problems became focused on the system and its surrounding issues. The external business environment was seen as relatively insignificant compared with those internal. The discussion of contextual factors will concentrate on internal problems including the political climate and IS environment.

Political climate

At this phase, BOC Gases went through a major change in the senior management team. Mr Chow, who initiated the market sector reform in Gases, departed from BOC for GKN which is one of Britain's largest and most profitable engineering groups.

In 1996 Mr. Chow was approached by Heidrick & Struggles International, the London-based executive recruitment agency, and was offered a job of chief executive in GKN. In the same year, Mr. Chow left BOC Gases for the job. A number of industry observers claimed that Mr. Chow's departure had been expected ever since BOC promoted Mr. Rozenkranz from the Vacuum Technology Division to be the Group's Chief Executive (April 20 1996, *FT*). The industry analysts commented that his leaving for GKN was: "BOC's loss and GKN's gain." (Apirl 19 1996, *FT*)

An impact of Mr Chow's departure regarding Notes project was that the market sector reform scheme was left half finished and would probably never be finished as the new appointed chief executive had different ideas of how to run business (interview with New Development Manager).

An impact later reflected in the project was the absence of a global business process in BOC. Mr Chow was described as having ample knowledge of Gases business as he joined the company in 1976 and had a global view of running business. He had held several senior positions in Hong Kong, Australia, Japan and the UK (Annual Report 1993). In contrast, the new Chief Executive, Mr. Rosenranz, had relatively little knowledge of Gases business and weak international experience as he was promoted

from the Vacuum Technology Division and had less experiences with global business (interview with New Development Manager).

The management style of the new Chief Executive, Mr. Rosenkranz, was described as consultative and changes made within the company tended to be evolutionary rather than revolutionary. In an interview with *Financial Times* Mr. Rosenkranz said: "there is no 100-day plan, because I don't work like that" (January, *FT* 96). He articulated two business principles and stressed that business strategies and employees would be expected to follow these:

1. Business strategies and policies are best developed centrally and collectively by those who run the operations, with highly devolved management accountability to achieve effective 'local' implementation.

2. Quick and effective decision-making is best accomplished with the shortest possible lines of communication within a high calibre management team whose members understand the details of the business they are running and who can operate effectively across national and cultural boundaries (Annual Report 1996: 4).

Changes were made according to these principles in the Group. For example, the company established a management team namely Executive Management Board, which comprised fifteen business managers from around the world, to run and co-ordinate business globally. Also, in order to shorten the communication route and to closely monitor the gases business Mr. Rosekranz decided to run the Gases Division directly. Whereas other divisions in the Group were managed by Division Managing Directors who report to the Chief Executive (Figure 5.1).

IS Environment

At the end of the last phase a global PC network was in place in BOC hence some technical problems associated with the absence of network (e.g. slow speed of replication and data transmission) were gradually solved at this phase. Technically speaking, BOC could then concentrate on developing application within Notes.

Two substantial changes occurred during this period of the time in BOC's internal IS environment. First, Group IM made a decision about standardising and replacing

different office software packages used in the company with a Microsoft Office package. This decision had certain impact on how users perceived Lotus Notes and will be discussed in the following section. Second, the responsibility of the project was taken over by Group IM from the marketing sector reform team. Group IM was the central information management department of the company. Its main responsibility was to look after global information systems infrastructure within BOC. It was perceived and run as a service centre and funded by local IMs. Therefore, its role was to cooperate with and run services required by the local IMs while the latter had discretion of their own IS policies.

Content

It is noted that two sets of frames were important to this phase – the Group IM's and Users' – as a number of decisions were made around them. In this phase two dimensions of technological frames associating with Notes project that led to further decisions about re-launching Notes96 project are perceptions of problems that occurred in the past and present, and their understandings of Notes. User Group's perceptions of the technology, more or less, provided a framework with which users acted towards Notes.

Group IM

Perceptions of problems

Learning from experiences in the previous phase Group IM summarised several problematic areas which undermined benefits of Notes. Those areas include the radical change in the way of thinking of work, lack of proper introduction of Notes to the company, the absence of a global business process, a lack of regulation and control within the system, and a lack of user involvement.

Group IM believed that asking BOCs around the world to work as a global BOC was asking people to change their conceptions of their work radically. This is due to the fact that BOC was never a global company.

> "The work culture is that people did not like to put things into words, well initially they did not like to share information, and also they did not put words in the public so they were not very keen on contributing at all. Besides, they got no recognition from their boss or company to do it then why should they do it?" (new development manager)

> "BOC is a traditional company meaning that the hierarchical system was rigid in the company. There were some people felt, some of our junior people, uneasy when they talk to our colleagues on the other side of the world through electronic medium. Because they worried about some senior people could see what they said to others." (project manager).
>
> "Notes got to reflect the culture. What you can do with Notes is to reflect what the culture is because working globally was the fact that company did not do before. Lotus Notes can help you to explore local teamwork not global teamwork if you do not have that culture to support it. I think that the first applications we put in were really working to against the culture in the company and that is the reason that it did not work successfully. If they put Lotus Notes in for different reasons for example to support local teams, business unit, it might have succeeded." (project infrastructure manager)

Group IM saw that users misused Notes as another e-mail system and "irresponsible" behaviour (e.g. chatting) within discussion groups was due to the fact that they were not introduced to the concepts of groupware/Notes properly at the beginning and were left alone to explore the system.

The launch of Lotus Notes by the marketing sector reform team was to support the reform in order to become a global company and be customer-focused. However, the aims and objectives given by the management group in its statement of marketing sector reform were too general and vague when specific applications needed to be designed within the system to support them. Group IM saw the fundamental problem that Notes did not take off in the first place partly because of unclear objectives of the adoption and undefined role of the system.

The lack of regulation and control within the discussion groups was perceived as a cause of Notes' bad reputation within the company as well as a waste of resources. For example, when Group IM looked into global databases and discussion groups, it was found that many of them were created and disused although the company spent money to support and maintain them.

Another area which Group IM perceived as a problem was a lack of user involvement which result in a low system acceptance and little support from local or regional BOCs. The interviewee from Group IM explained that the initial decision about Notes was made in the headquarters by the marketing sector reform team and local and regional IMs were not consulted and involved in planning and developing applications in Notes. In other words, the decision was made and the system was pushed out centrally. Group IM saw that it was not right not to involve local or regional IMs; after all, they knew needs of their users' best.

> "[...] Notes implementation was done centrally. That did cause problems. Because from what I understand the market sector organisation itself was not effectively initially because it did not get right down to the local business. Although BOC tried to organised globally but it did not really affect locally. At the same really happened to notes implementation cause it was managed in the centre nothing was done with local IM people and help them to administer their servers properly" (infrastructure project manager).

Understandings of the technology

Based on their perceptions of the problems which were inherited from the previous phase, Group IM decided to re-launch Notes with an aim to introduce the system to users properly and to "getting Notes right" this time. A project team was set up for the launch. Group IM recruited new full time personnel to look after Notes infrastructure.

To tackle problematic areas the primary tasks of Notes96 project team were (1) to define the system clearly, (2) to define when and how the system should be used for what, and (3) to define rules in the system. These definitions were referenced to the ones given by the software industry as well as to BOC's own experiences with it.

To the Notes96 team Notes was perceived as groupware:

> "[...] it supports teams separated by time-zones and distance to help in sharing information in support of business processes such as Supply Management, Key Customer Development and Innovation" (*Getting Notes Right*, July 1996: 8)

Whereas e-mail was understood as the system that "supports communication between individuals and small groups on specific topics". By definition, the principal difference between Notes and e-mail was that the former enables multidimentional information sharing and the latter allows only one to one or one to many communications to take place. The project team saw that the discussion groups were more structured (i.e. grouped according to topics) and accommodated more participants than e-mail does. Table 5.6 summaries the comparisons between Notes and other existing systems within the company.

Table 5.4: Comparing Notes to other systems

	E-Mail MS Mail, cc:Mail, GEMS	**Teamworking (Groupware) Lotus Notes**	**Transaction Processing**	**Document Management**	**Internal WWW**
Purpose	One to one, few messaging	Managing business process, projects, problems	Commercial systems, eg SAP	Libraries, publishing	External libraries, external publishing
Usage	Group-wide	Cross regional, cross business	By business activity, local	By department / function, group-wide	Global

Content	Alphanumeric text	Text, graphics, spreadsheets	Alphanumeric databases	Text and graphics, spreadsheets	Text and graphics
End-to-end transmission	90% in 3 minutes	Fastest time of one hour	Real time	Likely to be similar to Lotus Notes	Unpredictable
Functionality	Directory synchronisation, external links	Interactive, index by field	Relational, extensive reporting	Reference index by document class	Reference index, variable quality
Application Examples	Information request and supply	Issue management, project / programme management, global supply management	Order processing, stock control, business activities	Standards manual, sales proposals, technical reports	Supplier directory, government policy, company advertising

Source: "Getting Notes Right", Version 1.0 July 1996

The Notes96 project team understood that to make Notes work effectively depended on not only technical solutions but also management. For example, disuse of global databases and discussion groups was partly because of the lack of ownership, with the result that data was not updated and discussion topics were not concluded. Together with the concern that databases and discussion groups should be established for business purposes the Notes96 project team decided to pass the responsibility of maintaining and managing the databases and discussion groups to individuals who created and initiated them. They defined these individuals as "owners' of databases and discussion groups and their responsibility was to maintain and ensure that the contents of the databases and discussion groups were updated and controlled. The responsibility that Group IM maintained with respect to databases was to monitor the usage of the databases. If Group IM found that the databases were not used for a period of the time it would inform the owners to act and if these owners did not respond to Group IM's request then Group IM had rights to delete the databases.

User Group

Perceptions of the technology

Users' perceptions of Notes were largely influenced by the self-perception which emerged from the earlier decision of standardising office software packages, and the problems that they encountered in the previous phase.

In that phase a decision about reducing the number of heterogeneous office software packages in BOC was made and Microsoft Office was chosen as the standard interface on staff desktops. One consequence of this decision was that there was a common self-perception held by individuals within the company that "BOC is a Microsoft company".

Such a self-perception had a direct impact on individuals' perception of Notes. According to the interviewee there was a general feeling that Notes did not belong there.

> "some individuals felt that Notes was out of the place within BOC since it was not Microsoft product but Lotus and some even felt that it was wrong to choose Lotus product" (interview with the Project Manager).

> "A couple years ago, everyone had his own technologies. We really push to standardise the technologies because heterogeneous technologies just wasted money. One thing we standardised on is MS products. So we all have MS Office package. We got rid of Lotus Smart Suit and the only thing we kept is Lotus Notes. People said that it is wrong you know, looking at Lotus Notes, you have Lotus mail attached to it, but we are using MS mail. People did not like it."

This did not help the introduction of Notes to the company at all.

> "[...] the strong preference for Microsoft packages not only prevent users from exploring Notes, but also as the base of the prejudice that Lotus Notes often got blame for all the communication problems between Microsoft and Notes platform" (interview with the Project Manager)

Apart from the self-perception which undermined the efforts of introducing Notes into the company, problems occurred at the beginning of the roll-out as Notes had already formed a certain image among the users: that for example, it was difficult to use (e.g. slow speed, unfriendly user-interface), unprofessional (e.g. led to social chatting in the discussion groups), and useless for their work (e.g. contents in the databases and discussion groups were out of date in most cases). The new development manager said: "some people just did not want to know about the project, and some did not even want to hear the word 'Notes'".

Perceptions of the work

One area that the market sector reform project wanted to change in Gases was to encourage collaboration between different offices around the world. This was why Mr. Sanderson saw that Notes could support the project. But the concept of working together, regardless of national and regional boundaries, was alien to most people in BOC, let alone sharing information with "unknown" colleagues on the other side of the world.

According to the interviewees the unwillingness of staff to share information and collaborate with unknown colleagues was partly because of the absence of a global business process.

> "Problem was that, I think, to put Notes in to support these teams but BOC did not really have any business processes to actually require to use Notes. It was just put in as a communication tool so people in different regions could talk to each other. Really, there was no process to support ... so they did not need to communicate or collaborate really, applications were not used that much." (infrastructure project manager)

Also, the absence of an incentive scheme in the company to encourage people to share their information was a reason why the system was not used often.

> "People cannot not see the point of sharing information because there was no need of doing so since there is never a global business process to require people to work together. The absence of an incentive scheme was also a problem. For example, in general our British colleagues are good at planning strategies and working behind the screen while our American colleagues are good at selling products to the customers. Since the incentive scheme that we have is to reward those who sell products rather than those who plan the strategies, our British colleagues felt very negative about collaboration. They don't feel that they are appreciated." (the project manager)

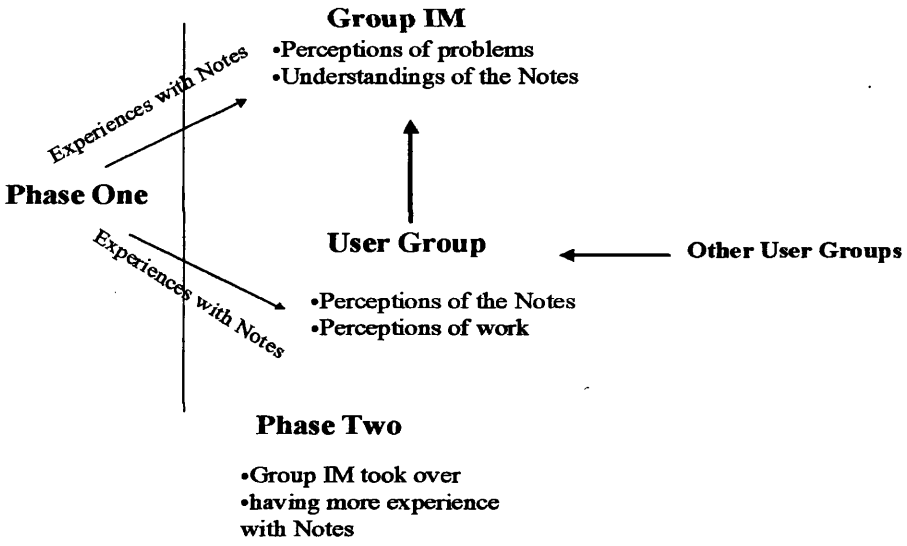
In addition to the lack of good reason for people to share information and collaborate across boundaries, the wish to remain autonomous and discreet over decision making could also be a reason why people felt hesitant to share information. For example, the IM manager in Taiwan said that the senior managers in Taiwan regularly reviewed and filtered communications that IM put up on Notes because they did not want to put everything in the network to share with others within the company and wanted to remain discreet.

Process

As the political environment changed within BOC the ownership of the Lotus Notes project also changed. When Group IM took over the responsibility of Notes from the market sector reform team it also took over the problems associated with Notes. Group IM reviewed and re-examined the problems (which discourage people to use the system) and came to the decision to re-launch Notes. The objectives of the Notes96 project were derived from the problems inherited from the original previous phase. A fundamental problem which the Notes96 project perceived was that the purpose of having Notes was not clear to most employees in the company, and therefore the principal task of the team was to redefine and to make it clear to users when and how to use Notes and for what. But when examining user group's frames it was noted that the reasons for not using Notes was rooted more in organisational issues. In other words, users did not use Notes simply because they did not like it or did not understand it, but

rather because their attitudes towards the technology were affected by other attitudes they held and by actions taken by the organisation (Figure 5.4).

Figure 5.4: Frames involved in Phase Two



5.2.3 Phase III: Extending and applying the skills (the second half of 1996 –)

A milestone which marked this phase and made it differs from the previous one is the shift in the interests from Lotus Notes to Internal Web accompanied by the Knowledge Management Program. It seemed that the Group IM's interest in Notes gradually faded away while the Knowledge Management Program and the development of the Internal Web was gaining attention and support from the senior management in the company.

Context

The shift in BOC's interest from groupware to Internal Web could be said to be influenced by the development in computer technology and the dominant management theme at that time externally, and by the appointment of a new Group IM Director.

Outer Context

The development of Information technology

The popularity of the Internet in recent years has more or less changed individuals' conceptions of computer technology. The development of the Internet technology, together with the commercial sector's and IT industry's interest in some of the concepts

behind groupware, led to the concept of an 'Intranet' being formed. The IT industry took this concept further and developed computer interfaces for Intranet building. It is evident that during this phase there was an increasing number of newspaper articles discussing the concept, and technologies for it. For example, searching the key word 'intranet' on *The Financial Times* CD-rom there was no article mentioning 'intranet' in 1995 but in 1996 the term began to appear and even became the headline of the IT section. 89 articles were published in this area in 1996.

Many of these articles drew general pictures of the Intranet by describing and listing potential benefits of the technology, which would occur if it was adopted. For example, the Intranet was perceived as a means to allow companies to "streamline their internal communication and productivity" as it enables "people to find information easily, work together and share the results of their work." Even more, Rod Newing (April 1997, *FT*) claimed that the Intranet is the technology that organisations should consider in the 21st century and that they should forget about groupware since it is "dead".

The dominant management theme

Around the time that the idea of exploring Internet technology and combining it with the principles of groupware (e.g. teamwork, information sharing, etc.) becoming popular, a parallel theme in organisational management was arising: knowledge management. Like Business Process Reengineering (BPR) and workflow systems earlier in the decade and teamwork and groupware previously, the notion of Knowledge Management also sees computer based information systems such as Intranet as a means to help organisations to capture, store and retrieve valuable organisational knowledge. In 1997 there were twenty articles published on the topic of knowledge management whereas prior to that year there was none.

Inner Context

New Group IM Director

In the past, Group IM Director was not invited to attend meetings at the Board level but the situation changed after the new Group IM Director took on the job in 1996. BOC is an industrial manufacturing company and most of its senior managers joined the company as engineers and their success within the company was due to their knowledge and skills in the field rather than their computing literacy. Also, according to the project manager of Notes96 the company could be described as a traditional manufacturer, as

cost control was the main concern in terms of accounting, so high costs of computing equipment was not an accounting department's favourite (interview with the Project Manager). Computer based information technology was paid little attention to and not perceived as a strategic tool to accompany the business strategy.

The new Director, Jennifer Allerton, tried to change such perceptions of computers and introduced concepts relating to IT strategy to the company. As she said in her presentation "BOC IM strategy"

> "to gain sustainable competitive advantage through Information Management we must continue to invest – but in a more imaginative and synchronised way." (May 1996)

The Director's efforts to attract the Board of Director's attentions to IT strategy along-side business strategy seemed to pay off as the New Development Manager pointed out "the Director can now represent us and speak for us in the Board level meetings."

Content

In this phase, Group IM still attempted on the one hand to fix problems with Notes, and on the other hand initiate another IS project accompanied by another management concept. Group IM's technological frames were important to the IS development within BOC at that time.

Group IM

Reviewing Notes

In spite of efforts to re-launch Notes in BOC Group IM did not go very far with the project. It received a clear message from users that they disliked Notes interface and felt that it was user unfriendly. At that time the standard interface in Notes was menu driven rather than button driven which meant that users needed to get familiar with the commands in order to use the system more effectively. It was all right for people who used the system often because they could pick up the commands but for those who only used it from time to time it meant extra work for them to learn. In addition to intrinsic technical problems within Notes, Notes' bad reputation had planted certain images (i.e. unprofessional, out-of-date, useless, etc) in the management and user groups' mind. One consequence was that some people did not even want to have anything to do with Notes.

"Nah, no Notes please. That's people's reaction to the system in BOC." (new development manager).

"Notes got bad name because of what happened in the initial stage. It is very clear that Notes will never be able to effective as be as tool for communication, since the board has the idea of that people using Notes to chat. Although people now talking about communication and virtual teams, in fact Notes isn not going to succeed, you almost have to start all over again. You have to give to people something which does not look like Notes." (new development manager)

Group IM came to a conclusion that the only way that people would use Notes was if they did not know that they were using it.

During the same period, Lotus introduced Domino which has a Web like user interface – point and click; Group IM looked at the software and thought that it could be a solution for users' complaints about Notes' interface. Also, it saw that having the Domino interfaces in front and putting Notes behind the 'screen' would give Notes a new identity.

"In the future we don't say Notes' interface, we will not keep that a lot people do not like it anyway because they think that it is too tacky. And people get used to browser interface. We think that majority of people will access to Notes databases via Domino without knowing that they are using Notes databases." (new development manager)

The solution of putting Notes behind the interface of Domino seemed to work in the company. According to the New Development Manager there was an increasing number of people using Notes databases via Domino interfaces, and many people expressed their interest in the *new* system, including the Managing Director of the Health Care Division who had previously banned Notes from his division.

Expectations of the technology

Around this time both concepts of the Intranet and knowledge management were popular in the IT industry and commercial sectors. With its experiences with Notes and other technologies available in BOC, Group IM was confident that it could take advantage of the latest technology and implement the idea of knowledge management. In addition to this experience changes in the organisational culture also conditioned Group IM's confidence with the Intranet:

"When Lotus Notes was set up, it was a new concept that people work together as a global team, well, now people are in the global teams, people are sending e-mail all over the place. Everyone is used to talk to others in the same company in different regions which certainly was not case before." (new development project manager)

Group IM launched a new project named "Internal Web" which aimed to leverage knowledge within BOC. Workshops were organised to discuss the project. A general expectation of the Internal Web project held by Group IM was that it would encourage people to share and exchange information and that human resources with such expertise, experiences, and knowledge could be leveraged within BOC. Another expectation of the Internal Web was that it could give BOC competitiveness within the industry. In the workshop of knowledge management it was once mentioned: "it would be BOC's loss if the company failed to adopt the technology and the concept".

The first knowledge management and Internal Web workshop was held in December 1996; in this workshop objectives, software packages, and technical infrastructure were decided. An important workshop took place in July 1997. In this workshop Group IM publicly expressed their expectations of the Internal Web projects to a number of senior managers who were among the delegates. Group IM saw that the project would have impact on technology and individuals. In terms of technology they expected that the Internal Web would bring benefits in the following areas:

- Seamless access through PC to a wide variety of information sources which was easy to use/search and which helped people to informed decisions
- Easy route for contribution of knowledge and expertise to the rest of BOC
- IM infrastructure that is easily supportable and provides access throughout the organisation
- Common structure and data attributes

In terms of its impact on individuals Group IM expected that the Internal Web would make differences in

- Culture change to sharing / "stealing with glee"
- Better informed decision makers, with reduced information overload
- Common understanding of critical processes, and
- Self service ethos (*Workshop Minutes*).

Group IM believed that the lack of management supports for Notes was part of the reason that Notes did not take off in the company, and it took its opportunity (i.e. the presence of the senior managers) to explain the reasons why the BOC had to move to the Internal Web. These reasons were as follows:

A slow decline in BOC performance, resulting from an inability to maintain a top class organisation and loss of customers by migration.

Possibility of severe competitive disadvantage due to inflexibility and ability of centralised competitors to react faster. The Internet technology may force the breakdown of the regionalised structure of business.

Fragmented systems approach will continue, with multiple and different instances of objects – leading to incomplete and ineffective global systems, unnecessary costs and negative impact on other BOC continuous improvement initiatives

BOC is unlikely to attempt such an initiative again for another decade and there will continued internalisation. Technological change will eventually be forced upon BOC by competitors, suppliers or customers.

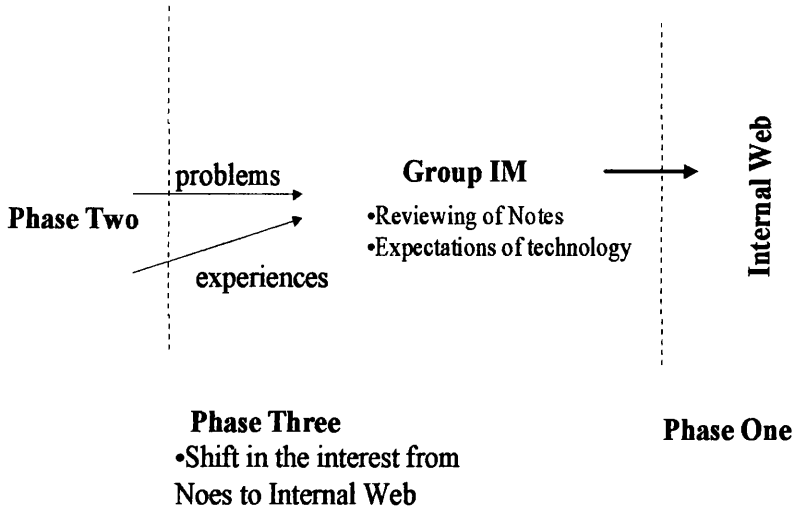
The Knowledge Management Programme and the idea of Internal Web were widely supported by the senior managers this time. The pilot system of Internal Web was up and running in the summer of 1997. (Workshop minutes)

Group IM's strategy seemed to work as the project was widely supported by the senior mangers this time, and the pilot system of Internal Web was up and running in the summer of 1997.

Process

Although Group IM re-launched Notes once it took over the project, it later found that damage had been done and it was difficult to make people change their minds about Notes. Group IM realised that the only way to make things work was to give users something which does not look like Notes. IBM introduced Domino to the market in time to solve Group IM's problem. Domino's Internet like interfaces gave Notes a new face, and inspired Group IM to initiate a new project: Internal Web accompanied by knowledge management. And both concepts of Internal Web (known to many as Intranet) and knowledge management were current themes in the industries. Under close scrutiny it was interesting to find that objectives of the Internal Web project and the expectations that Group IM had for the project evolved from those of Notes.

Figure 5.5: Frames involved in Phase Three



5.3 FINDINGS

Several issues emerged from the previous discussion including the lack of management commitment, course of action, interdependence of frames, industrial vision, and vertical and horizontal analysis. Each of these issues is addressed and elaborated in this section.

The lack of management commitment

It was noted that support from management group was not there; indeed, to some extent, there was resistance to the system within it.

An across countries survey suggests that management commitment is on the top of a list of software project risks (Keil, et al., 1998), in fact the lack of top management commitment is seen as a risk that overshadows all others. Walsham (1993) notes that "a major element of the social context for the design and development activity for any computer-based IS of organisational significance can be thought of as senior *management attitude*" (p198). Similarly, Markus (1990) argues that a certain degree of management mandate is critical to mass deployment of innovation in organisations especially when there are substitutes for it such as telephone and facsimile machines to e-mail system.

Notes project was initiated and rolled out by the marketing sector reform team which was established purposely to look after the marketing sector reform scheme proposed by the Managing Director of Gases. Drawing from the data gathered it was not clear whether the roll-out of the Notes project was proved and supported by the Managing Director initially, but it was clear that Notes itself was not popular among the management group (Section 5.2.1) and received minimum support from the management group.

Or the surface, the technology seemed to be the one to be blamed as it did not integrate well into the existing systems; it allowed people to perform "unprofessional" tasks; and it was least useful in terms of supporting people to do their jobs. But under close scrutiny, the problem of not being able to roll out Notes in the company successfully was in part due to the lack of a strong management commitment to the change not just due to the technology per se.

The Managing Director wished to reform the marketing sector to serve BOC's customers better but the organisational structure and internal cultures did not support the reform. Although it was evident that the concept of being a customer-focused global company was recognised by the Board level, it was also evident that the company did not commit itself to more changes in the company in order to support the scheme. In fact, to avoid any radical changes within the company the Managing Director only reorganised the marketing sector around the existing structure and did not make other changes. Another impact of the lack of the management full commitment to the changes was that global teamwork never took off within the company as most employees saw no reason for doing so.

This led to a further consequence: a lack of support from the local and regional offices/business partners, and from employees. Without a global business process in place the concept of working together became a vague and even ideal concept to many, and the local and regional offices/business partners could not see the need for collaboration; most of them wanted to remained discrete. Another impact of the lack of full management commitment to the changes was that global teamwork never took off within the company as most employees saw no reason for doing so.

Course of action

The above phenomenon is likely to lead to a concern that individuals would have a "wait and see" attitude instead of taking any initiative to use the system. This was discussed in Chapter Three, for when individuals encounter a new technology they not only "consult" their technological frames but also observe others' attitudes and actions towards it; then they confirm, modify and reform their frames and then decide their actions. The Managing Director of Health Division's attitude towards Notes can be given as an example. The Managing Director waited and observed phenomena around the use of Notes in Gases and formed an impression that Notes was bad news because it allowed people to chat about things irrelevant to their profession. His technological frames associated with Notes in particular were negative and later he came to the conclusion to ban the system from his division. The Managing Director's impression of the system was largely built upon individuals' behaviours in discussion groups.

Individuals' experiences with Notes were various. But their views and patterns of using Notes were strongly dependent on how others used the system. The project infrastructure manager once put it:

> "when new people come into the company they see a long list of databases which they can access, they go into two or three of them and found out that there is nothing happening... so they would think that it is just waste of time and do not bother to go in again."

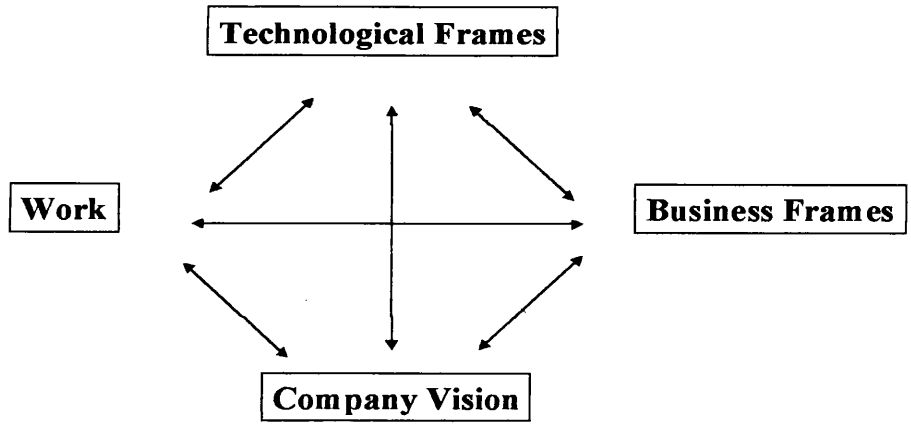
Interdependence of users' using systems has always been an issue in groupware (Grudin, 1988; Markus and Connolly, 1990). Markus (Markus, 1990; Markus and Connolly, 1990) argues that the success of any groupware relies on the number of users who participate in the system; this is what she called "critical mass". She observes that patterns of using groupware to perform teamwork or to share information are similar to those of using communication means such as telephone. To illustrate her point Markus uses a telephone conversation as an example and argues that in order to make conversation successful both ends have to be willing to initiate and engage in the conversation. Similarly, the success of groupware also relies on individuals' motivations and initiatives to take and engage in actions. In this sense, it becomes apparent why Notes was not frequently used in BOC. It is in part because individuals were waiting for others to take initiatives in order to organise their own actions towards them.

Interactions with other frames

Orlikowski and Gash's technological frames analysis concerns only technological dimensions as if others are less significant. The story told here illustrates that the technology is not the only concern when an IS project is initiated especially when it is organised for business needs. Equally, the outcomes of technology adoption depend not only on knowledge and experiences with the technology but also on other aspects such as business frames, perceptions of work, company vision. Because other frames are involved in the process of technology adoption, each stage of the process is pulled into different directions, as a result the outcomes become difficult to be anticipated and predicted. This is what others have called emerging (Orlikowski, 1996b), drifting (Ciborra, 1996a), and evolving (Rogers, 1994). In the present case study it has been shown the project began with the company's business needs but later became technology driven as the principal focuses moved to how to make the technology work and to persuade staff to use it, and then another project was organised to serve a similar interest (i.e. sharing information). .

According to Orlikowski and Gash the drifting or emerging effects can be minimised if individuals' technological frames are changed. The BOC story, however, demonstrates that the above assertion presents only a partial view. The case study suggests that in order to make the project work changes in other frames needed to be made too. This would not only have involved changes in the context (i.e. organisational structure) in which the project took place but would also have involved changes in individuals' business frames, perceptions of their work, and company's vision. In this sense, even if the Managing Director of Gases had restructured and created a global business process and set up an incentive scheme in Gases there would be no guarantee that staff would have changed their attitudes towards Notes. This provides a reason why the headquarters in the UK sold the idea of being a customer-focused and global company successfully to the local and regional offices/business partners, but permitted these offices/business to remain autonomous. Therefore, the story suggests that it would only be possible to take advantage of the functions offered by the technology when individuals' perceptions of their work, business frames, and company's vision have changed. This is shown in the diagram below.

Figure 5.6: Interdependence of frames



The diagram shows that frames, which are involved in business operations frequently, are highly interdependent. It is not possible to make one area successful without changes elsewhere. For example, in order to change individuals' technological frames, organisations also need to consider making changes in their perceptions of work (Section 2.3). But, to convince people to change their perceptions of how to perform their work, changes in company vision as well as understandings of business operations within the company will also have to be made. This highly interdependent relationship between different frames suggests that organisations should recognise that to convince individuals to use a piece of technology requires more than changing their perceptions of the technology, as Orlikowski and Gash have suggested. Indeed, other areas of thinking should be considered too.

Incongruence of frames

An interesting phenomenon was discovered in this case study: that is, that various interest groups were involved in the project but that an across group shared frames was not there to bridge the gaps between each other's understandings of the situations and technology. In fact, it was found that frames held by each interest group were rather discrete. So, in this instance, there were the problems perceived by the management group, expectations of technology formed by the marketing sector reform team, and understandings of technology held by the technologists; in other words, these discrete perceptions even more, at a later stage there were technological frames of Group IM's and those of the User Group and these two sets of frames did not exactly match each other. It was at that time, when the Group IM discovered the gaps between these two understandings of the technology that efforts were put into building a shared

understanding of Notes (Section 5.2.2). The efforts included standardising definitions of Notes and e-mails and setting up the rules within Notes with an aim to eliminate misunderstanding and to build a shared understanding of the technology. Moreover, Group IM began to communicate with local IMs and users with a hope to understand the technology and problems from their views. But the shared frames were created too late; individuals already had their mind made up regarding the nature of the technology and this determined their actions towards it.

Industrial vision

Examining the factors which influenced the organisation's decisions about implementing particular management concepts (i.e. customer-focused, teamwork, knowledge management) and information systems (e.g. Notes, Intranet), it was found that industrial vision of management themes and technology was among others regarded as an influential driving force (Swanson and Ramiller, 1997).

It is worth noting that the timing of BOC introducing the ideas of being customer-focused, being global and working as a global team was within the same period when other companies in many sectors were interested in the same management practice (Bikson, 1996; Ciborra, 1996b; Failla, 1996). The action taken in order to keep up with the fashion with others was also observed in the choice that the project team undertook to adopt Notes. Results of a survey of newspaper and magazine articles published between 1981 and 1995 shows that the number of articles talking about groupware grew over the period; by the time when Lotus Notes was introduced in BOC the number of articles published was around 1076 (1994-1995) compared with 406 (1992-1993) and 101 (1986-1991). In most articles groupware was treated as synonymous with Lotus Notes. This trend certainly had its impact on the marketing sector reform team's choice of Notes. As Mr. Sanderson admitted, he and the team did not look into other potential products simply because they believed that groupware was Notes, and vice versa. Similarly, Group IM's decision and choice about promoting Intranet and knowledge management seemed to be another effort put in to keep up with the rest of industry.

Vertical and horizontal analysis

Although the initial decisions about both projects at BOC seemed to be driven by external forces, it was found that the forces did not consistently affect subsequent decisions made about the projects and the directions of the projects. It was also noted that once the projects were initiated and internalised, the external forces became less influential compared with the internal ones as the latter became the major force to push the project forward. These internal forces included consequences of actions, changes made around the technology, changes in organisation, and so on. It is interesting to note that these inner forces observed in the later stages of the project were mainly effects or consequences of actions taken previously. That is, there is a strong interlinking between actions taken and the consequences of the actions. In other words, what happened in the past becomes important to the present since it forms part of the current context and decisions made in the present are more or less on the basis of the past (Section 3.2).

This finding provides a dynamic view of contextual factors (Pettigrew, 1987). At the horizontal level it is found that most contextual factors are sequentially interconnected, and at vertical level they are interactive (Section 3.2). This finding informs the arguments made in the contextualist approach and notices the weakness of other research which treats contextual factors as independent entities no past and future.

5.4 SUMMARY

This chapter has presented the case study carried out in the BOC Group. The process of BOC' s adoption of groupware – Notes – has been described and discussed together with the findings of the study. The story told here shows how an IS project was initiated with no well-defined objectives but gradually developed through exploration and then turned into another direction. This presents a process of an IS deployment through use of technology, reflection on use, and realignment of use, which is rather different from the conventional and traditional rational managerial model of IS deployment through analysis, formal design and accepting, and implementation. In the study it is observed that individuals accumulated information in the form of knowledge and skills through exploration and were then been able to make decisions with respect to the design or use of the system. This is in part the phenomenon of organisational learning as we see that people's frames are created, recreated, modified, and changed

through their experiences with the technology. It is learned from the study that the deployment of the technology needs to be viewed and analysed in a temporal and continuous mode, as decisions taken are not just influenced by current situations but also by history.

CHAPTER 6

BANK FOR INTERNATIONAL SETTLEMENTS

This chapter presents the second main case study, carried out in the Bank for International Settlements (BIS). In 1995 BIS launched the WORKGROUP Project within the Bank to replace its old electronic mail system. The result was claimed by the project team to be the most successful IS project in the Bank's history. This case study then tells a story which is quite different from that at BOC, and yet, when it is explored in more detail, a complex and quite subtle process of managing expectations and matching organisational norms is revealed.

BIS was chosen as a case study for this research for two reasons. First, an offer was made by the General Manager of Information Systems Services (ISS), the Bank's IS department, to study a recently completed project in the Bank. The project, WORKGROUP, was said to be the most successful ISS project in the Bank's IS history. This claim engaged particular interest because the experience offered a dimension of IS projects which differed significantly from the story told by the BOC case study and much of the CSCW literature; and there would be research interest in finding out how BIS managed to achieve their success. Second, BIS and BOC operate in different sectors and provided different service to different types of customers, these differences provide an opportunity to study the extent to which issues arising during the initiating of an IS project would also be different.

As in the BOC study, various data collection techniques were employed in this case study. The primary source was semi-structured interviews of between one hour and two hours in length. All interviews were tape recorded and transcribed for subsequent analysis. Table 6.1 shows the time and date of the main interviews undertaken. Four

interviews were with members of the WORKGROUP project team including the project manager, project co-ordinator (i.e. the person with the role of co-ordinating between the ISS personnel and the User Group), the training officer, and a member of the User Group. One interview was with the General Manager of ISS and another one was with a member of the ISS staff but in a different division within the ISS.

Table 6.1: Number of interviews

Date	Time	Title
September, 1997	1 hr	Information Systems Manager
September, 1997	1 hr	Project Co-ordinator
October, 1997	1 hr	Project Manager
October, 1997	2 hrs	Training Officer
October, 1997	1 hr	Information Systems Service
October, 1997	2 hrs	Training Officer
October, 1997	2 hrs	User Group

Interviewees answered all types of questions which were related to the project, but when the answers involved the Bank's internal politics they would almost always shift the direction and sometimes change topic. For example, more than one interviewee mentioned that it took six months to get approval of the WORKGROUP project from the Executive Committee (ExCo) and that this was due to politics within the Bank, but none of them was willing to explore the matter further. Because interviewees were extremely careful with their statements, it was difficult to collect 'unofficial' data, and this could be said to be a weakness of this case study. On the other hand, in developing and presenting the account here, have been retained the unanswered questions of the closed off routes of enquiry, and used as evidence themselves for processes and activities around the project.

Lunch in the canteen at the Bank provided another research opportunity, to meet and talk to other members of the staff. It was natural that people were more relaxed in the

canteen than in the meeting room[13], and observations were made of conversations between colleagues. In addition, after the case study period, some follow up questions were sent to the interviewees through e-mail after returning to UK.

Formal documentation was also an important source of data in this case study (Table 6.2 and 6.3). Since the project had been completed a year before this case study was carried out, some details of the project might not be recalled although participants were interviewed. The documents, therefore, became useful sources to fill in contemporary detail since they recorded details of the project that were not mentioned or recalled by the interviewees. In undertaking this kind of case study there is, of course, as much interest in recollections, opinions and attitudes (technological frames), as in the 'facts'.

Table 6.2: Titles of principal documents consulted

Date	Document
February 1994	User Survey of the current e-mail services
March 1994	Evaluation Criteria
October 1994	Management Diary System: Requirement & Design Document
December 1994	WorkGroup Specification
April 1995	Project Summary (AUTOFAX)
July 1995	Management Absences System: Conversion to GroupWise
July 1995	ExCo Summary
November 1995	Mission Statement Project GS01 – Development of Communication Tools, Workgroup Implementation Project, submission of the project to ExCo (revision 1.4)
February 1996	Guidelines for Electronic Mail & Telefax users
October 1996	Notes on information Classification Categories

[13] The General Manager of ISS arranged a meeting room for the author to conduct interviews and use it as a study room during the stay at the Bank.

Table 6.3: Numbers of documents viewed

Year	Memorandum	Documented e-mail messages	User Group Minutes
1993	2		
1994	3	2	
1995	14	52	
1996	40	33	3
1997	3		
			Total: 152

The next section provides an overview of BIS and an outline of the project history, and the section of analysis follows this. The section of analysis (Section 6.2) is organised in accordance with the synthesised framework and has three sub-sections: context, content, and process. Section 6.3 then presents the findings learned from the case study, and the chapter ends with a summary.

6.1 BANK FOR INTERNATIONAL SETTLEMENTS

6.1.1 About the Bank

The Bank for International Settlements (BIS) was established in 1930 and is located in Basle Switzerland. The BIS is owned and controlled by its member countries' central banks, and provides some specialised services to these central banks. The Hague Agreements (1930) established the BIS as an international organisation governed by international law with the privileges and immunities necessary for the performance of its functions. The BIS is subject neither to the Swiss Federal Law concerning Banks and Saving Banks nor to the provisions of Swiss Company Law as it is an international institution.

The Bank has the legal structure of a limited company with an issued share capital. In all, some 86% of the Bank's issued share capital is registered in the names of member countries' central banks, the remaining 14% being held by private shareholders. While all shares carry equal rights with respect to the annual dividend, all rights of voting and representation are reserved for the central banks of the member countries. Up to 1994 the member countries were those (eleven countries) who comprise the Group of Ten namely Belgium, Canada, France, Germany, Italy, Japan, the Netherlands, Sweden, Switzerland, the United Kingdom, and the United States of America. In 1996 / 97 an

additional nine central banks in Europe, Asia, Latin America, and the Middle East were admitted to membership[14].

The Bank is managed by three senior administrative bodies: the General Meeting, the Board of Directors, and the Senior Management Team. The General Meeting takes place annually and only 41 shareholding central banks have rights to attend and vote in the Meeting. The Board of Directors is made up of representatives from eleven countries (Belgium, Canada, France, Germany, Italy, Japan, the Netherlands, Sweden, Switzerland, the United Kingdom and the United States of America). The Board of Directors elects a Chairman from among its members and appoints the President of the Bank; it also appoints the General Manager, and the other members of the Management Team.

Since its creation the BIS has been a central banking institution with its principal object to promote co-operation between central banks. In the eyes of its employees and the central banks, which use BIS services, the BIS is a forum for international monetary co-operation, a bank for central banks, a centre for monetary and economic research, and an agent or trustee.

As well as hosting meetings for the Governors and other officials of the shareholding central banks, the BIS is also a more general meeting place for many other countries' central banks around the world. The purpose of these meetings is to achieve a high degree of mutual understanding of monetary and economic questions and to facilitate international co-operation in areas of common interests. In the recent years, BIS has increasingly invited central bank officials from the emerging market economies to participate in discussions held at the Bank. Various countries' central banks or official monetary institutions throughout the world regularly attend and contribute to the Annual General Meeting of the BIS held in June each year.

The Bank has two principal operating areas represented by two key departments. The Monetary and Economic Department conducts research into monetary and financial issues that interest central banks. The research and statistics are published in various

---

[14] Information is collected from BIS web site: http://www.BIS.org.

Economic Papers, Working Papers and Policy Papers, as well as in the Bank's Annual Report. The Bank's publications are considered to be a good source of broad-ranging reviews of international economic and financial developments.

The Banking Department of BIS provides a wide range of banking services to assist central banks with the management of their external reserves. Currently, around 120 central banks and international financial institutions around the globe place deposits with the Bank. The BIS held US$113.1 billion deposits at the end of March 1997, representing around 7% of world foreign exchange reserves. The Bank carries out a wide range of banking operations, which derive in the main from its ability to assist central banks in managing and investing some of their monetary reserves. The substantial size of the Bank's balance sheet reflects the importance of the functions of BIS as a bank for central banks. BIS also acts as Agent or Trustee in connection with various international financial agreements.

6.1.2 Background of the WORKGROUP project

The WORKGROUP project was initiated with the aim to replace the Bank's old workgroup (email) package, Higgins. Higgins had been in use in BIS since 1988 up to the date that the WORKGROUP project was organised. It had been first set up within the trading room for internal communication, but was made available to the whole Bank later. The old system potentially provided several functions including construction/editing facilities, electronic exchange of text, time marking and time keeping, and general office tools. Each function provided services as follows (Bullen and Bennett, 1991):

> *Construction/editing facilities* allow text creation and editing facilities.
>
> *Electronic exchange of text* includes electronic mail and conferencing, gateways to other systems, document transfer.
>
> *Directory* provides a name and electronic address file to support data exchange by users of the system.
>
> *Time marking and time keeping* provides a facility for recording events scheduled for a particular date.
>
> *General tools* supports work in financial an budgeting areas and some project tracking capability.

Despite Higgins providing various functions, people in the Bank used Higgins mainly for sending and receiving e-mails. Indeed, many did not know it could do more.

In the early 1990s Higgins' incompatibility with the Bank's standard desktop operating system for office automation applications (Windows 3.1) and its network operating system (Novell NetWare), together with some intrinsic technical problems and growing demands from users, drove ISS to review the system[15]. As a result, in October 1993, the Dealing and Office Information Systems (DOIS) division in ISS initiated the WORKGROUP project with the aim to develop and improve the workgroup software, and to provide enhanced user facilities such as a common, intuitive user interface, multi-tasking, data integration and better system efficiency and security[16]. Table 6.4 shows the basic timeline of the project development.

Table 6.4: Project timetable

Time	Events
Phase I	
End of October, 1993	DOIS began to initiate The WORKGROUP project
November 1993	User Group established
Mid December, 1993	First User Group meeting First draft of system specification
January, 1994	Survey to collect user opinions of Higgins and their wish list was drafted by the User Group and distributed to users
Mid-March, 1994	Final version of specification for new system
18 March, 1994	Sent out invitations and system specifications to the selected vendors (14 companies) and expected the responses by 12th April
May to Early June, 1994	Suppliers invited to the Bank to give presentations
5 July, 1994	The project team withdrew Microsoft Mail from the list
July, 1994	The remaining three companies were asked to demonstrate their products including cc:Mail, Beyond Mail, and GroupWise.
25 July, 1994	The project team withdrew cc:Mail
Phase II	

[15] The reasons will be discussed in detail in the next section.

[16] Document: "Invitation to Tender for Electronic Mail and Workgroup Software Package" 17th March 1994

Time	Events
End August, 1994	User Group and DOIS project team had a provisional training on both Beyond Mail and GroupWise
30 August, 1994	No decision was made by the User Group
End of November and early December, 1994	Additional technical tests were carried out on both products by DOIS project team
22 December, 1994	Technical Report was completed and distributed to the User Group
Between December 1994 and July 1995	Changes made in the senior management in the Bank the project was withheld for 6 months
13 July, 1995	The project team proposed to the ExCo.
23 October, 1995	ITTC approved and support the project
Mid-March to Early August, 1996	The project team rolled out GroupWise
Late-June to late October, 1996	Training on GroupWise
Phase III	
After October	Discussions of possible applications which could be developed within GroupWise

The WORKGROUP Project had three phases defined by the project team and each of these phases had specific tasks and goals to achieve. The first phase was the project's initiation stage in which a user group was set up and specifications of new system were investigated, invitations to tender were prepared and sent out to potential system suppliers, and a review of various products made.

Invitations to potential system vendors were drafted and sent out to fourteen companies, see table 6.5. Eight companies replied to the invitation and four were selected by DOIS for further investigation: Lotus cc:Mail™ direct from Lotus Switzerland, Beyond Mail™ from European Software Publishing, Microsoft Mail™ from local Swiss suppliers SYSG, and Novell WordPerfect GroupWise™ from another local supplier ComicroNetsys[17].

[17] Memorandum: WORKGROUP project, product recommendation, 19th January 1995.

Table 6.5: The potential vendors

Vendors	Short List
European Software Publishing	√
Braid Systems Ltd	
Lotus Development (UK) Ltd.	
Lotus Development (CH) AG	√
COMICRO-NETSYS AG	
Novell (CH)	√
Da Vinci	
DATAWARE AG	
Fisher International	
Enable Software Inc.	
Microsoft	√
Soft Switch Ltd.	
TimSystem Schweiz	
WordPerfect	

In May and early June these four suppliers were invited to BIS to give a presentation on their products. Microsoft Mail failed to fulfil a number of basic requirements defined in the specifications and was withdrawn from the short list[18], and the remainders on the list were CC: Mail, Beyond Mail, and GroupWise. During the second half of July, the three remaining companies were requested to demonstrate their products live to the project team. Following this Lotus cc:Mail was withdrawn from the list as it would allow users to 'do things that they should not do'[19], and besides, the two remaining products (i.e. Beyond Mail and GroupWise) were judged as relatively superior.

---

[18] This comment on MS Mail was made in official documents, but the detail of why it was rejected was not mentioned. A member of User Group, an interviewee, did not know the reason and others in technical team did not give the author an answer either.

[19] This statement was made by members of the technical team from DOIS. There was no document to triangulate the statement. Again, the member of User Group did not know anything about cc:Mail and what things the technical members referred to, since User Group was not involved in the selection process at that point of time.

Phase Two was about selecting a system, obtaining support from the ExCo, rolling out the system, and providing training on the new system. This phase was organised into three stages. The first stage involved a process of choosing and making a decision of a future software system based on the final shortlist; the second stage involved preparation of a proposal to the Bank's Executive Committee (ExCo) in order to get approval from the General Manager; and the third stage involved planning a system roll-out. At the end of this phase the project team expected to come up with a recommendation report on which products to implement and with details of migration and training plans.

In August 1994 the project team, including User Group members (UG) had an opportunity to try out both Beyond Mail and GroupWise and to evaluate them via hands-on experience. Although the user group representatives preferred Beyond Mail to GroupWise, when it came to finalise the decision GroupWise was chosen by the ISS to be the Bank's new workgroup software. Once this decision was made DOIS began to prepare itself for proposing the WORKGROUP project in its final form to the Executive Committee (ExCo). The official proposal was submitted to ExCo in July 1995 and did not get approval until six months later due to changes in management in BIS, and some political issues[20]. Quite what these 'politics' were is not perhaps so important, but what is interesting is the strong sense that interviewees had that these decisions were enmeshed in the broader power struggles of the bank, and not just in a rational and technological domain, and that they choose *not* to talk to a researcher about them

The project team rolled out GroupWise in three stages. Stage one aimed to transfer the current Higgins users (about 300 people) to GroupWise; stage two targeted those who were non Higgins users but were users of office information systems (about 150); and stage three focused on the rest of the employees who were not put on GroupWise in stage one and two. One day of training on GroupWise was provided and it was compulsory.

---

[20] All the interview participants refused to talk about the 'politics' which sometime slipped into our conversations. Usually, they noticed that the interviews or conversation was heading to the direction, and they normally changed the subject very quickly.

The project was considered completed by the end of Phase Two. Phase Three was an enhancement phase which gave DOIS an opportunity to explore GroupWise beyond basic e-mail functions and to develop applications. The objective of this phase was stated in the memorandum[21] as that it aimed to "introduce workgroup concepts into the BIS by implementing the enhanced features of GroupWise" (p2). The project team identified six areas where they believed GroupWise could be beneficial to the Bank. These areas included shared diary and calendar functions, share task management, bulletin boards, form creation and circulation, MAPI interface, and Workflow methodology. Among these six areas only shared diary and calendar functions[22] and bulletin boards were developed and implemented. This phase was signed off with an end of project report and a user survey undertaken in 1996[23].

6.2 ANALYSIS

The organisation of this section follows the structure of the framework developed in Chapter Three and has three main parts: (1) content, (2) context, and (3) process. Content is the phenomenon that we are interested in which in this study is referred to as the roll-out of an e-mail system to replace the existing one. Context refers to the environment in which the phenomenon is studied. Contextual factors are both external (outside the organisation) and internal (within the company) and those that condition, constitute, or are shaped by the phenomenon will be considered. Process is to reveal dynamics of the phenomenon under investigation. In this case study the process is about how the project team went about their task from initiating the project and selecting a system, to rolling out the system. The process is examined and discussed in relation to the concepts developed in the technological frames analysis. Thus, the analysis will focus on those individuals' technological frames that influenced individuals' attitudes and actions towards technologies in particular, and how they changed (or not) over time during the project.

---

[21] Memorandum: WorkGroup project meeting, 15th July 1996

[22] It was developed to schedule meetings and also known as meeting room booking system.

[23] Memorandum: GroupWise Questionnaire, 1996.

The Table 6.6 summarises content, context, and process discussed in this section.

Table 6.6: Content, context, and process

Content
The roll-out of an e-mail system to replace the current one – Higgins.
Context
Outer context: – Market force – The development of IT industry Inner context: – Character of the organisation – IS management environment – Desktop working environment
Process
The process of the roll-out of GroupWise from the initiation to the roll-out.

6.2.1 Context

As mentioned earlier, the WORKGROUP project was organised into three phases: project preparation, product selection and roll-out, and development of workgroup concepts in the Bank. There was a specific timetable defined by the project team at the beginning of the project to help the team to monitor progress of the project and while the timetable was not stuck to, there was a clear sense of progression along a planned path. This reliance on and adherence to a timetable differs from what was described in the BOC case study, which was determined along the way by critical events and by significant changes in contexts. Here there is a need to explore the overall context for the project in the Bank, and thus discussion of contextual factors in this study is not organised around the phases of the project, as was done in the previous chapter, but organised in two general categories: outer and inner. That is, discussion relates to the context of the Bank itself in its environment and to the Bank as an established organisation with a distinctive attitude to change, technology and innovation.

Outer context

In order to discuss the outer context the concept is divided into two broad themes. Consideration is given first to the bank as a business and to exploration of the market forces that shape its responses to business process innovation and technology; and then,

second, consideration is given explicitly to the history of the IT industry and the role and position of the history in the Bank's IT structures.

Market forces

Unlike organisations in the commercial sectors, BIS does not need to worry too much about market competition in the usual sense due to its special organisational status. As an organisation BIS is unique in the world, providing banking and other financial services only to central banks around the world with its major 'clients' also its major shareholders. In this sense, there is no market competition which BIS needs to worry about and therefore BIS' internal structure and business activities have rarely changed in its 60 year history. Nevertheless, in recent years, a number of the emerging economies' central banks in South East Asia established an organisation to serve their local interests and to provide a forum for these central banks to discuss and exchange their monetary policies. This movement alarmed the management in BIS who saw this as a potential threat to their uniqueness in the market. Subsequently it reviewed BIS membership policies and decided to increase the number of memberships to include some emerging economies' central banks.

Another external force which has had direct impact on BIS decision making and internal activities has been the member countries' domestic economies and politics. BIS' annual budget comes from the money that member central banks pool together. If the central banks face any domestic financial crisis, and are short of money themselves, BIS may also face budget cuts that year. This has happened in recent years[24] when member countries' central banks themselves faced budget cuts domestically and subsequently BIS faced budget cuts too. If and when this does happen, then information systems as a 'none core' activity of the bank (see discussion below) may very well be more threatened than other areas of the bank.

The development of IT industry

Another significant contextual factor for the bank as it considers IS issues must be the developments in the global IT industry. In this case, relating to desktop technology and office communications, the key issues that emerged were those that related to emerging

---

[24] The interviewees pointed out the cut back in the budget began around two years ago but did not give a definite date; therefore we assumed that it was around 1995 onwards.

standards and expectation in user interfaces, operating systems and networking, and groupware.

In 1981 Microsoft introduced their first version of the DOS operating system for IBM personal computers and in the next year the company licensed MS DOS to some other PC manufacturers around the world. With this the MS DOS era started. A quite long period of operating software stability ensued, with attention focused on hardware advances and applications software development, as well as rudimentary local area networking based on separate network operating systems. When in 1990 Windows 3.0 was introduced as a general purpose graphical user interface, and in 1992 Windows 3.1 became available in the market, many organisations had to reconsider many issues of current and future software plans for what had become known as the users 'desktop'. Both Windows 3.0 and 3.1 were extensions to DOS and needed the support of DOS, however the operating system allowed people to develop a new relationship with their PCs, to view and use more than one software package at the same time and to experience a common and consistent interface to software.

Applications developed for Windows 3.0 and 3.1 quickly seized the software market, since compared to DOS based applications their interfaces were user friendly and many software systems became significantly easier to use[25]. In addition software was increasingly developed to utilise a networked environment, and operating systems (such as DOS/Windows), and network operating systems such as NetWare, Vines or LAN Manger, became increasingly intertwined. In summary, in the late 1980s and early 1990s standard operation systems changed from MS-DOS to Windows based, and user interfaces also changed from command oriented to graphic oriented, while network aware software became the expectation of users.

This trend was certainly observed in the Bank's IS working environment and the standard desktop operation system and most office applications were Windows based at the time of the start of the WORKGROUP project. Indeed, the MS-DOS based Higgins, running in a DOS Box on Windows, was clearly out of context and represented an earlier era of computing. DOIS could have upgraded Higgins to a Windows version

---

[25] Source: http://www.microsoft.com

if Enable Software, which developed Higgins, had taken advantage of graphic interfaces and followed the trend of Windows. But they did not, developing rather a different product. People in the Bank, both ISS and users, became increasingly impatient with Higgins' incompatibility to other systems. New recruits to the Bank would often question the out-of-date workgroup system they saw, and this reinforced the thoughts of replacing Higgins with another product.

Inner Context

In the section above it is suggested that the market forces were noted as having relatively little influence on the decisions about information systems in the Bank, or the initiation of this project. In contrast the developments of the software industry and the way in which they were taken up in the bank, and reflected into the bank from outside by new recruits, seems certainly to have acted as a trigger for change. As will be shown later, these contextual factors can be seen as either essentially technological, setting new standards for how technical things are done, or more broadly as working through organisational expectations and norms, how work is done. Nonetheless, the forces that can be identified that pushed the WORKGROUP project through seem to be rather more internal. In other words, the project was initiated and sustained essentially as a result of demand push and technology pull *within* the Bank. To explore this inner context three principal inner contextual arenas were identified: the character of the organisation itself, its established IS management structures, and the operational environment for email and desktop computing. Each will be discussed.

Character of the Organisation

As mentioned earlier, BIS' annual budget comes from money clubbed together by the member countries' central banks, described as an 'old boy's club'. With such a unique organisational background the Bank needed not to worry too much about the sources of money for most projects.

> "... because it is an organisation which represents many other organisations, its service provided by the central banks themselves and to themselves, previously there is no real financial drive that you have to make profits and you have to be cost effective. In the past if you want some, here is some money. Or if you need some more money, here is some more money" (Training Officer).

> "The money was never a worry to the employees in the Bank, because the central banks of the member countries always provides sufficient money for most projects" (ISS personnel).

By law BIS is an international company, and there are at least twenty seven different nationalities among its five hundred employees. Nevertheless, BIS is also rather 'local' because most of its activities take place within the BIS Building in Basel Switzerland. Also, it does not have any overseas branches nor any expertise dispersed around the world, and its members of staff do not need to travel often either. Any contacts with the world outside the building can be done via communication means such as surface mail, e-mail, fax machine, telephone, telegraph, etc. This is why its employees call the building "the tower" not only because it is a twelve floor high round building but also because people inside have little contact with the world outside.

Another distinctive feature of BIS is its highly bureaucratic style in terms of dealing with paper. This is in part because its origins are found in the pre-war years when different styles of operation were found in public bodies. It is also perhaps because shareholders are central banks and the sensitive and confidential services it provides to them are often in the form of documents, circulated inside and sent out of the Tower, and undertaken with great caution. For example, all documents which are meant to be sent out of the building need to be sent to a central fax room first and are reviewed by staff there; all outgoing mails are unsealed and sent to a mailing room to be checked before being then sent off. Similarly, all incoming mail needs to be registered by the mailroom first and only after that are items distributed to addressees. Almost all paper documents within the Bank need various signatures from authorities before they can be sent out or distributed within the organisation. It is not uncommon that a one page document could take up to a month to be distributed to employees.

This distinctive and 'un-reformed' paper driven and control oriented working environment had significant consequences for the WORKGROUP project and many other IS systems in the Bank. Not least because it would be clear to many parties that groupware and network technologies could potentially present a challenge to the Bank's work culture and management structures. It is quite easy to see just how alien the standard notions of groupware (information sharing, flattening hierarchy, supporting team work etc.) would be in an organisation such as this, but equally just how enticing they might be too. People in ISS, in the senior management and in the user communities would need to find a way to respond to this challenge, either directly by taking it up (but who would dare?), or by diverting it into a safer domain (say a technological one).

IS management environment

This question then leads to the second contextual element we focus on here, that of the Information Systems Services Department (ISS) and the Banks IS culture. ISS provides the Bank with all IT services from a central department. It consists of four divisions with 75 staff in total to serve 500 people in the Bank. These divisions are: Dealing and Office Information Systems (DOIS), Monetary, Economics and General Secretariat (MEGS), Banking, Accounting, Fund Transferring (BAFT), and Central Computer Services (CCS). Each division has its own division manager and looks after different needs in the Bank, and in all these divisions report to a General Manger. MEGS provides a wide range of information services; BAFT looks after the systems related to the Bank's financial activities such as accountancy and dealing; CCS is responsible for the mainframe; and DOIS provides office automation generic applications such as word-processing packages, spreadsheet, electronic mail systems, etc.

Collaboration between divisions is often required, but conflicts/rivalry between divisions also exist due to the fact that each of them pursues its own interests and sometimes needs to 'fight' over control of common resources[26]. Although it was mentioned earlier that ISS in general need not worry about its budget, it was none the less the case that having two major IS projects running at the same time rarely happened in the Bank. The careful and controlled management of IS that the Bank undertook led to a conservative policy of systems development.

In addition to fights for limited or common resources, a conflict between the divisions of ISS was explained by interviewees as being a result of divisions avoiding responsibility. There was a tendency that divisions would blame each other for any system failure and user complaints. The following quotation was a description given by one interviewee about how the divisions would react when problems arise:

> "BAFT may say "Oh, we have not managed to achieve this because we have not got support from DOIS", or DOIS may say "yes, we would have done such and such if MEGS has done XYZ" (Roll-out and Training).

---

[26] Interviews with ISS personal and Training Officer.

A consequence of the tendency of avoiding responsibility and playing off against each other was to re-enforce the conflicts and, more significantly, users' dissatisfaction and cynicism about ISS.

More generally computing technologies and office information systems have been traditionally regarded as not so important to the business activities within the Bank for a number of reasons. First, the member countries' central banks are less interested in technology and see BIS as having a low profile in this area. Rather, they paid more attention to financial, monetary and economic issues, and the quality of BIS services. Second, computers and office information systems have always been regarded as and used as tools to support people to do their jobs. People in the Bank use computers to process and generate data but do not emphasise their importance to their work.

A third reason for the low status of ISS and their poor position in the Bank's 'pecking order' that we can detect, is that for the mainstream BIS employees ISS has always been thought of as a money spender, yet as never being able to provide the services that Bank people required (interview with a member of the User Group). Under questioning, interviewees traced this feeling towards ISS back to some early IS projects in the Bank. For example, it was explained that in 1979 (a full 17 years before the interviews for this case study) the Bank put in the first IBM mainframe and ISS developed the first system for Banking and Accounting but Banking rejected the system in the end and said:

> "thank you very much, that was a every interesting lesson but "No" we won't take it" (a member of the User Group).

One reason that the Banking department rejected the system was because the system required a lot of resources to run and therefore was slow. However, the most important reason, it was hinted, was the internal politics between the Banking and Monetary Economic Department (MED) since part of the resources required to run the system needed to be shared between the two departments. MED was happy with the system but Banking was not. Although later ISS had another project with the Banking department, and the resulting system ran quite successfully, the feeling that ISS did not do anything for them was still there. This image of ISS stayed within BIS up to the date of this

study, and it was not uncommon to hear people make comments about ISS and say: "ISS *never* delivers services that we want."[27]

Desktop working environment

As mentioned earlier, the current operating system that the Bank has is MS Windows™, though of course there are other financial systems which run on different environments, but most offices operate within a Windows environment networked using Novell NetWare. Before the WORKGROUP project was started, Higgins 2.401 was BIS e-mail system, and had been chosen around the same time that Novell NetWare network operating system was put in as a first attempt at modernisation of the office automation platform in the Bank in 1988.

Higgins was originally installed in the Dealing Room for departmental communication, and was later made available to other departments. By 1994 more than 425 users were registered in Higgins' directory, and about 300 people were active users[28].

As an MS-DOS application, Higgins' in many ways was incompatible to the Windows working environment, which also meant that some functions in the system were not available in the Windows environment. These included the mail and appointment call function (i.e. notification of mail delivery and warning of approaching meetings), and printing. Higgins could not even make available the electronic mail service as a means of transport directly from a Windows application, whether a standard package (Word, Excel, etc.) or an in-house development.

Also, there was a lack of good quality management and reporting tools, particularly in areas of mail flow control and central database management within Higgins. There were no facilities for selective archiving and deletions, traffic statistics, extensive log or message tracing, and so on. Because of a lack of management and reporting, tools operation such as moving users from one workgroup[29] to another required skilled

---

[27] Interview with the member of the User Group

[28] Interview with the project co-ordinator.

[29] Users were organised into six workgroups and each workgroup was assigned to a specific server.

technical control and intervention which increased pressure on DOIS[30]. Furthermore, Higgins did not have an automated function for filtering, filing and archiving incoming mails, and since most users did not file their mails into private directories, the central database easily became overloaded.

Security and reliability issues raised concerns too. Regarding the issue of reliability, the users experienced regular database corruption and loss of mail. Unauthorised data access and service unavailability was evident too, partly because the system database could not be properly protected at the network operating level. In terms of security, Higgins' user identifications (ID) and passwords (directory) were totally independent of those of the Novell NetWare network operating system. As a consequence, DOIS had to run a restricted secure service as well, which required double user administration with the corresponding risks.

All the above problems, especially incompatibility of the operating environment, increasing traffic in the system, and overloaded central databases, made Higgins less stable and reliable and it kept 'falling over'. According to all interviewees, it was not uncommon that ISS needed to spend an average of one working day per week to maintain and fix problems which added an extra burden on ISS or DOIS normal working loads.

To the users, command driven software such as Higgins was not intuitive and did not attract them to explore the system further than the basic functions, such as sending and receiving e-mails. Many system users after several years experience with Higgins knew only how to read and send messages. The filing function was thought to be difficult to use; one interviewee described the complicated filing system in Higgins during the interview.

> "users needed to file messages under key words set by themselves, and in order to retrieve these messages from the system they had to remember all the keywords and which message is stored under which key word. What happened normally was that people could not remember those keywords subsequently they could not find the messages" (member of the User Group)

---

[30] Memorandum: WORKGROUP project description, 13th May 1993. And Mission Statement Project GS01 – Development of Communication Tools, Workgroup Implementation Project, submission of the project to ExCo (revision 1.4), 6th November 1995. Memorandum: WORKGROUP project description, 13th May 1993.

Many users found that it was easier if they simply printed out important messages and files, and filed them manually. Indeed, such an approach was quite compatible with the Bank's traditional working practices.

Prior to the WORKGROUP project, when new recruits arrived in the Bank they were often surprised by the existence of Higgins, as to them the system was utterly out-of-date, a throw back to an earlier era. Some made comments such as "*What is this? The E-mail system where I was before could do this and that...* " The reaction that ISS had to instability and unreliability of Higgins in its later days in the Bank was shared by users, who also felt increasingly frustrated and demand for a new e-mail system to replace Higgins built up among users.

6.2.2 Process

The process of the roll-out the new e-mail system is examined and explored through the perspectives of interactions between three identified interest groups (stakeholders) derived from the case study and through a consideration of their technological frames: DOIS project team (DOIS), User Group (UG) and General Management (GM). In many ways the dominant group among the three was DOIS and their technological frames were the main references for most decisions made about the project. Thus, despite the fact that there was a User Group set up to represent users in the departments and to help the project team to select the right product, it was evident that the DOIS project team was in a strong position to control the direction of the project. And yet, as will be shown, other groups provided their own endorsement or acquiescence to the project at key points, and in so doing drew on rather different technological frames.

DOIS

The DOIS' technological frames (i.e. understandings of problems and expectations of this new system) can be examined in three dimensions: issues around initiation, criteria of success, and issues around roll-out (section 3.1.3). According to Orlikowski and Gash definition of the initiation dimension includes knowledge and experiences involved in the initiation stage of an IS project and embraces background, participants, approaches to feasibility assessment, and perceptions of the technology's objectives, utility, and importance. At initiation stage the DOIS was concerned about the scope of

the project and use of the technology, and the character of the technology. The dimension of criteria of success involves exploring beliefs about how success of the technology is being, is expected to be, or should be assessed. The criteria of success in this case study refers to the rules that the DOIS believed should be followed if the project was to be successful such as establishing a user group, and providing a training program on the new technology. Finally, issues around implementation mean the knowledge and experiences of implementation processes involving issues such as background, participants, stages, design issues, and support from various groups. As regards DOIS to avoid interrupting the Bank's preparation for the annual report, issues around training program, and rules for the use of e-mail were the main concerns. Table 6.7.

Table 6.7: Technological Frames of the DOIS

Issues around initiation
– Scope of the project and the use of the technology
– Character of the technology
Criteria of success
– To set up a user group
– To provide training program on the new technology
Issues around the roll-out
– To avoid interrupting the normal business operation (when to roll out)
– Issues around training program (how to provide training program)
– To set up the rules of the use of the e-mail.

Issues around initiation

Establishing the project scope and system specification

The WORKGROUP project can be seen as initiated as a result of the demand from both users and from ISS to replace Higgins. This was demand push, but at the same time there existed technology pull because the project was driven by a technological force (i.e. the developments of the software industry). The primary problem that DOIS conceived was that Higgins was insufficiently *robust* to perform the job. By 'robust' DOIS meant system stability and reliability. DOIS was upset with the situation in which users complained to them all the time and which required them to spend much time on repeatedly fixing the same problems.

> "It could just about manage the internal e-mail requirements all the time. It was just running the DOS Box within the Windows, it was not stable enough. I had to spend half

> day to a day a week to keep the system active. And you could not put external mail on it because of the large number of users and traffic would break down the system. So we realised that Higgins was not robust enough to meet the requirements of today's situation." (Project Co-ordinator)

The WORKGROUP project was then organised by DOIS to discuss possible solutions for the problem. Because Higgins was primarily used as an e-mail system, DOIS decided to address the problem as a technological issue, and its solution for the problem was to have new e-mail software better integrated into the technology platform.

E-mail, as DOIS understood, was a means of office communication that was equivalent to telephone, pagers, or internal mail[31], as the team defined:

> "Electronic mail is appropriately viewed as a store-and-forward transport for electronic objects across a heterogeneous environment, among people, among people and applications and among applications[32]," (p14).

The above overtly technological definition, together with their keen sensitivity to the problems of Higgins, led the project team to define the scope of the WORKGROUP project, as follows:

- To overcome current weaknesses of the existing mail system in the areas of availability and security
- To provide a robust platform for future development;
- To simplify and automate the administration and maintenance of the system
- To provide a proper integration with the Windows environment in order to take full advantage of the data interchange and link with other applications.
- To simplify the use of overall package (electronic mail messaging, filing, diary, to-do list, etc.)[33]

But, despite this very narrow definition of scope, the project manager saw e-mail systems differently from the rest of the team, and his personal scope of the project differed from that that the team defined and placed on paper. For the project manager,

---

[31] Memorandum: WORKGROUP project description, 13th May 1993, p3.

[32] WorkGroup Specification

[33] Memorandum: WORKGROUP project description, 13th May 1993.

e-mail was groupware. It was a means to enable people to exchange and seek information more efficiently. By 'information exchange' the project manager meant sending and receiving files from colleagues, an activity that was supported in the Bank at that time, but by other means. Thus many employees in the Bank would pass diskettes around. As he said of the Bank in interview:

> "it has most essential office information systems and sophisticated banking systems but it does not have a system which enables people to work together."

Based on his definition of e-mail (i.e. as groupware) and problem definition (i.e. the Bank needs a means to let people work together 'groupware'), the project manager formulated his own expectations of the new system and concluded that the project should aim to roll out a groupware like system[34]. The project manager presented this view in his presentation to employees in the Bank:

> "...improving the efficiency of a group of people working together by automating organisation and coordination tasks within this group"
>
> "... enhancing, simplifying and automating the flow and availability of the information within this group and with other groups inside or outside the institution."[35]

And while this view was not reflected in the formal scope above, it was reflected in the specification of the new system sent out to vendors, an activity which enabled him to operationalize his technological frame more easily:

- Messaging
- Scheduling of meetings
- Electronic data interchange (EDI)
- Editable document exchange
- Electronic report distribution
- Network library and archive systems
- Forms routing
- Workflow[36]

---

[34] Interview with the project manager.

[35] The presentation slides provided by the project manager.

[36] WORKGROUP Project: Invitation to Tender for Electronic Mail and WORKGROUP Software Packages, 17th March 1994.

It is thus evident that there was a gap between the project manager's and the rest of the team's scopes of the project at this early stage, since the former saw the project as about groupware while the latter saw the project as about replacing an old e-mail system.

Selecting products

Once the DOIS team decided on the specifications for the new system they sent out their invitations to potential vendors to invite bids for the new system. Two products were left on the list at the end of the selection process: Beyond Mail and GroupWise. Each of these two products had strong support both from within the user group and DOIS. DOIS therefore carried additional technical tests based on the system specifications. A number of areas were examined including technologies, service suppliers, software companies, and costs of products. Speaking from a technical point of view, DOIS argued that GroupWise was relatively easier to maintain and administer, and its diary/scheduler function was better.

In terms of service suppliers and software companies, DOIS evaluated the products using the criteria of whether technical support could be provided locally, as well as the market reputation and market share of the software companies. Having technical support locally was seen as important to the team to avoid difficulty in the future if the system went wrong. In respect of, having technical support from a local company, GroupWise had a Swiss based software company, ComicroNetsys, to provide technical support, while Beyond Mail's technical support was based in the UK and provided by European Software. In terms of manufacturer's market share the team's concern was how well the system was doing in the current market and whether it had room to be expanded in the future. Their survey showed that GroupWise had 24 per cent, and Beyond Mail together with other systems had 20 per cent of market shares (Figure 6.1).

In terms of the costs of the two systems, including the initial charges and annual recurrent costs, the team believed that GroupWise was relatively cheaper then Beyond Mail. Table 6.8 displays a summary of the contents and results of the above criteria.

Figure 6.1: Manufacturers' Market Shares

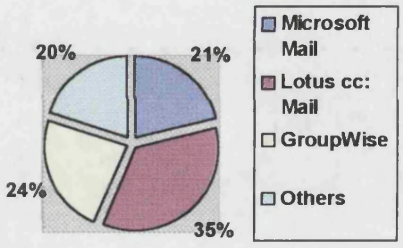


Table 6.8: Summary of evaluation elements[37]

Technical
- Installation of a customised Beyond Mail was in three parts whereas GroupWise can be installed in a single stage - The configuration of Beyond Mail had to be performed separately but GroupWise configuration allows the administrator to configure all Post Offices from the single domain messaging file server - The Maintenance and Administration tools of GroupWise are superior - There was no mechanism for secretary/boss working relationship, task requests, etc in Beyond Mail but GroupWise fulfilled all of them. The diary/scheduler function of GroupWise completely outclassed the On-time application
Suppliers (Reputation)
European Software Publishing (Beyond Mail) is a software house based in UK and has a staff of 45 people and its turnover of £3 million. Comicro-Netsys (GroupWise) is based in Wangen Switzerland has staff of 40 people and its turnover of Sw.fr. 160 million.
Manufacturers (Market shares)
Microsoft Mail (21%); Lotus cc:Mail (35%); GroupWise (24%); Others (20%)
Cost
One-off cost (purchase, installation, consulting, user training, contingency): Beyond Mail: Sw.fr 809,600; GroupWise Sw.fr. 708,400 Yearly recurrent cost (software maintenance, system maintenance and administration, user administration, on-going user training): Beyond Mail: Sw.fr.203,700; GroupWise: Sw.fr.174,050

[37] Memorandum: WORKGROUP project, product recommendation, 19th January 1995.

Based on the above evaluation results, the DOIS team came to a conclusion and a decision at the same time, that the Bank should select GroupWise.

Criteria of success

Another dimension that the DOIS project team considered during the initiation of the WORKGROUP project was the criteria that were established to measure the success of the project. The DOIS team believed in a set of rules that they needed to follow if they were to make the project work. These rules included involving the user group through the entire project, providing training courses on the new system, having the management's public endorsement, and choosing the right name for the project.

Setting up the user group

The reasons for involving a user group, according to DOIS, were no different from the ones given in the textbooks, the primary reason being the objective of reducing resistance to the system. It was also the case that, in the Bank the establishment of such a group was a part of the procedure needed if any IS project required management group approval and budget.

The user group of this project consisted of representatives from all the main user department; it had 10 members[38] as shown in Table 6.9. Its role, as understood by DOIS was to act as a bridge between the DOIS team and the wider community of users. As DOIS defined the user group's role:

> "[...] This group will be actively involved in the preparation of the functional specifications, in the different evaluation phases, and in the user acceptance of the product." (Memorandum, 13 May 1993:4)

Table 6.9: Member department of the User Group

Department and/or section
Banking department
Monetary and Economic Department
General Managers Office
Maintenance, Supplies and Equipment
Personnel
Accounting, Budgetary Control
Electronic Communication
Internal Audit
Typing Pool

[38] Memorandum: To the members of the Executive Committee, 10th July 1995.

Department and/or section
Information Systems Services
Legal Service

The group was involved in making final choice of the new system for the Bank and as will be discussed in more detail later to a limited degree developing the roll-out plan. What can be said here is that the notion of 'active involvement' was not in any leadership role, but rather more in the 'hostage' mode.

Training Courses

Providing formal training courses on GroupWise was taken as a critical factor contributing to a successful system roll-out. This positive attitude towards providing formal training to users was partly due to the beliefs of the Training Officer (DOIS) and his experience with training programs. As the training officer stated in interview, he had always believed that training leads to good practice with software systems. Despite the new system 'just' replacing Higgins as an e-mail system, and despite many employees knowing how to read and send mails, DOIS still believed a general training course should be provided because GroupWise was Windows based and the jargon used within it and the functions it supported might be new to users.

> "Higgins and GroupWise are different products which means that different skills and working concepts were required to use GroupWise." (The training officer)

Other than the concern about skills and knowledge acquired to use GroupWise, DOIS project participants explained that providing a training program was an important opportunity to prevent people from making mistakes and doing things which they are not supposed to do by educating and introducing ground rules during the training. Training to them, thus, was not an open invitation to come to know the product and explore its potential, but rather an opportunity for giving explicit directions as to what should and should not be done with it. This perception had a history in past experiences in the Bank, and is discussed in the next section (issues around implementation).

A public endorsement from the management

DOIS had a strong belief that visible management support was more important than any other criteria in contributing to a successful project, especially in an institution like BIS where computers and office information systems were not regarded as critical to the

business. This belief was always made clear to the team, including the user group, from the beginning of the project:

> "any project which hopes to introduce changes to organisation wide working practices must gain the active involvement and support management[39] ."

It is worth exploring the meaning of "changes" used in the above statement. Here it does not mean organisational changes introduced by the new system; rather, it refers to the narrow changes in the e-mail working environment (i.e. from MS-DOS mode to Windows environment) and assigning new users to the new system[40]. This narrow understanding of introducing changes to the organisation was carefully adhered to throughout the project, notwithstanding the project manager's wider ambitions noted earlier.

Through the management's public endorsement DOIS hoped that more users would be encouraged to use GroupWise, especially people in senior positions[41]. Such senior managers are relatively old and their success and reputation in BIS was not because of their ability in using computers but because of their expertise in economics, finance, banking, and policy. To encourage senior bankers and managers to use e-mail to communicate, DOIS understood that to introduce some top down pressure was necessary. It was important to DOIS to convince these senior bankers and managers to use the system because the team saw that once they used the system their subordinates would be likely to use it too.

> "this organisation (BIS) is not particularly comfortable with information technology. Senior bankers and managers although they use information generated by information systems themselves rarely use the systems." (a member of UG)

> "[...] it has to come from the top down in order to get everyone to use it. [...] the management has to publicly stand up and whether themselves use it or not they must endorse it because people below them have to use it." (the training officer)

Above all, the most important reason that DOIS wanted to make sure that they had public endorsement from the management was to support the roll-out plan which the

---

[39] End of project report (Draft 2.0), 21st August 1996

[40] Currently, not everyone in the Bank had access rights to Higgins.

[41] Interview with the training officer.

team had in mind. This was to be a synchronised roll-out approach which was to install GroupWise on staff desktops when they were away from their desk for their training course. The team knew that this approach was, as they put it, "doing things behind people's back" and would provoke strong reactions among users if they were not careful. DOIS saw that if the project could have the management's public endorsement, then the approach would become more or less acceptable.

To have a strong public endorsement from the management group the project manager believed that they had to choose the right name for the project. By having the right name the manager referred to one which would convince the management group of the importance of the project and entice them into providing an endorsement. The name WORKGROUP was chosen with certain ideas in mind:

> "the word "work" means enhancing, simplifying and automating the flow of information and its availability between a group of people inside the institution and other groups inside or outside the institution. "Group" is about improving efficiency of a group of people working together by automating organisation and co-ordination tasks within this group." (the project manager)

According to the project manager this term was one of the most popular themes in the software industry at the time, as well as in the commercial sector. This was a name that could give an impression that the project was about group/team work. This was the impression that the manager wanted the management group to have and reflected, as we have seen the project manager's own ideas, but it was by no means the essential purpose of the project to actively foster team/group work as understood by the CSCW literature.

> "the notion of "working together" may be considered in DOIS' next IS project but it was definitely not a part of the WORKGROUP project." (the Project Manager)

But by adopting this name the manager said that it would be easier to gain support and funding from the senior management.

Issues around roll-out

A number of aspects were addressed by the DOIS team as they developed when it a system roll-out plan. The planning had two parts: when and how to roll out GroupWise, and how to organise and deliver the training to the users. Each part involved various issues.

The first thing that the team thought of was the Bank's internal calendar. There was an unspoken rule that any activities carried out in the Bank must not be allowed to interrupt

the Bank's preparation of its annual report. BIS annual reports differ in many ways from reports prepared by the average commercial company. For example, the annual report serves public interest (i.e. to report its activities, to reveal its balance sheets to the general shareholders and potential shareholders), but it also focuses on discussing various monetary, financial, and economic issues. The Monetary and Economic Department conducts research particularly into monetary, financial, and economic questions which directly serve the member central banks' interests. The research results are partly published in the BIS annual report. Thus, the organisation of the annual report differs from the average annual report, and below is an example of a table of contents of a recent annual report (1999)

It is evident that the focus of the Bank's annual report is on discussion of market phenomena and, unlike other annual reports, that BIS begins its annual report with a series of research data and discussion instead of with its business activities in the past year. Because the Bank sees the annual report as a key part of its service to central banks, it is important that nothing should disturb or delay the publishing schedule.

In this context, the DOIS team has to check the calendar of annual report preparation and make sure that the system roll-out would not interfere. Other than not to interrupt the preparation of the annual report, the team also needed to be careful not to disturb the Bank's daily business operation. These factors led to a decision not to adopt a 'big bang' approach as it could cause interruption if they were not careful and would be unacceptable in the Bank. An alternative, namely an *incremental roll-out* approach, was chosen.

In terms of thinking about how long the system roll-out should take, especially the period of changeover which would lead to some instability in this most stable and bureaucratic of organisations, the team had a strong belief that a compact approach was necessary. This view was reasons were mainly based on past experiences with other IS projects in the Bank. First, it is expensive to keep two systems running at the same time. Second, if the roll-out period lasts too long people who cannot have access to the system are likely to lose their enthusiasm which was a lesson learned from the Bank's earlier project to put PCs on staff desks. Lastly, the team felt that the sooner the roll-out could be finished, the less likely it was to interrupt business operations. Or put another way, the sooner they could retreat back into their technological role.

The next issue that the team needed to consider was how exactly to put GroupWise physically on staff desktops. The team first thought about putting it on during the weekend, but usually CCS worked on system maintenance at that time, which meant that the team would need to negotiate with CCS. As noted earlier, such negotiations and relationships had a history of disputes. The team was also concerned about the gap between having GroupWise on staff desktops and having staff on training courses. If the gap is too long, people tend to forget what they learn from the training course by the time they are able to have access to the system, or people tend to lose interest in using the system. A similar situation, it was explained, had happened in the past when ISS rolled out PCs. ISS provided training to the employees *before* PCs were put in place, but by the actual time PCs were on people's desk many had forgotten the contents of the training and some lost their initial enthusiasm. Keeping these issues in mind, the team decided to roll-out the system when individuals were away for their training course. The team believed, in particular, that this could maximise benefits of the training; as the training officer put it:

> "The effectiveness of any training is severely undermined if the product is not made available to delegate *immediately* following training."

Issues around training

Training was regarded as an important element contributing to a successful system roll-out and the person who was responsible for planning and organising it (the Training Officer) had a strong belief in the impact of training on roll-out. Thus, the means of providing training was taken into consideration from several perspectives. Issues such as who should receive the training, where the training should take place, how long the

training should be, who would provide the training, and what would be taught, were all considered.

The DOIS team considered two main ways to provide the training to users. One approach was to train representatives of each department, namely super users, and through them the knowledge and skills learned in the training could be passed to the rest of the users: this is known as a cascade approach. The other approach was to provide training to everyone in the Bank. The former is relatively cheaper than the latter, but in terms of risk the former was higher than the latter. The risks that concerned the team were that there was no guarantee that super users would be able to pass everything that they learned to the rest of the departments that they come from.

Once the team had decided to put everyone on the training course they then had to consider how to provide such a quantity of training but, at the same time, not affect the Bank's normal business activities. To achieve this DOIS organised users into groups and assigned to each of these groups specific time slots. One or two people from the same department would be assigned to a specific group and time slot to receive the training. DOIS limited the number of users from the same department to attend the same group and time slot because it tried not to "empty" the department and thereby affect the prepare performance of ongoing business activities.

According to the team's experience, users' computer literacy was another area that they needed to take into account when organising the training. In the past, people had often complained about "mixed level" training courses because they could appear to be too basic or too advanced depending on participants' knowledge of computing. It would be ideal, the training officer said, if the training could have been provided on the basis of the level of people's knowledge and their skill in computing. But in practice, taking cost and time into account, providing tailored training courses to meet individuals' needs was not possible. Hence, despite the team being aware of users' complaints, and knowing that users would be better off if tailored training sections could have been provided, it discarded this option and chose to provide a standard day of training to everyone.

Since the training was to be provided to everyone in the Bank and would not be tailored to meet individual needs, the content of the training on GroupWise focused on basic

functions such as sending and reading mails in GroupWise. The more advanced features within the system were then left for more competent users to explore by themselves, or if users were interested in learning about them they were invited to attend special workshops.

Once this training strategy was chosen and the content decided, the next thing that the team was concerned with was who would provide the training. BIS traditionally had minimal commitment to any in-house computing training, and there were no in-house professional trainers in ISS. Therefore outsourcing the training seemed to be the only way. But before deciding on outsourcing the DOIS team had to decide in what language the training would be provided. In section 6.1.1 it was mentioned that BIS has about five hundred employees with twenty seven different nationalities, and because the Bank is situated in Switzerland, all the documents circulating in the Bank are in four official languages: English, German, French, and Italian. German is the local language in Basel but not all employees speak German, instead most employees speak English. Indeed, English is the Bank's unofficial "official" language among employees. In this context the training section decided instruction should be provided in English. This led to another issue: where to find a software training company that could provide training in English. Mr Ward came to the UK to look for a suitable company rather than recruit in Switzerland. He explained:

> "To some employees it was not an easy task to learn a new software in the language that is not their mother tongue, so whoever was going to provide the training section should be able to speak English without any difficult accent. That was why we did not go for a local company as we were afraid people may have strong German, French, or Italian accents when they spoke English."

And the team chose a provider based in Essex UK.

Rules of using e-mail

Another issue that concerned the team was establishing etiquette for email. In the past people had used Higgins to distribute business irrelevant messages to the entire Bank and this had upset and frustrated recipients, especially since it was difficult for people to switch between Higgins and other applications. Those who worked in the trading room suffered most from such unnecessary interruption, and in the end they switched off Higgins when they were making transactions.

In the survey[42] carried out to collect users' expectations of the new system at the beginning of the project (discussed below), a user made a comment on this issue and said:

> "private messages should not be allowed, unless on a person-to-person basis."

In order to prevent users from "abusing" the new e-mail system, the team decided to set up various 'discussion groups' which would allow people to post general messages. The idea was to provide an electronic space where people could post general announcements such as information on selling and buying household equipment, sports events, etc. Only users who subscribed to the discussion groups would automatically get the message. By doing so the team expected to reduce the number of general or private messages distributed in the Bank.

User Group

The User Group attitudes towards the project and new system were based on the expectations which they had for the new system; these expectations were mainly generated from the users' experiences with Higgins. Involving not only technological frames the User Group also referenced their knowledge of organisational issues when it came to implementing applications based on the office tools provided by GroupWise. Table 6.10 presents two sets of technological frames held by the User Group. The rest of this section discusses each of these sets.

Table 6.10 : Technological frames of the User Group's

Expectations of the new system
– With a replace of a better and more user-friendly system.
Issues around implementation
– Organisational issue

[42] Survey of the Current E-mail Service, February 1994.

Expectations of the new system

The User Group was set up to assist the DOIS team to select an appropriate workgroup product for the Bank, to understand user expectations, and to report the progress of the project to the user departments.

For most users their expectations of the WORKGROUP project was to replace Higgins with a Windows based (modern) and reliable e-mail system. Whether the system was cc:Mail, MS Mail, Beyond Mail, or GroupWise was not so important to them. Despite the user group knowing the general feeling about Higgins in the user departments, it still carried out a survey in user departments with the aim to identify problem areas of Higgins and expectations of a new system more specifically. Two hundred and fifty copies were prepared and distributed to the current Higgins users and one hundred and fifty seven people replied (60%). The survey questions revolved around functions that were expected by users but were not provided by Higgins, and their expectations of the new system. The results showed that the majority of users felt that Higgings needed to be improved or even be replaced (see Table 6.11 for an extract of the survey). Moreover, the mail function was used by most people and other functions such as Diary, To-Do-List, and the Meeting Scheduler were not used or even known about by many.

Table 6.11: Current e-mail service

	Excellent	Need improvement	Satisfied	Don't know
Easy to use and understand	14.4	56.8	28.1	0.7
User directory easy to use, contain all the people I wish to send to	22.3	50.4	20.9	6.5
Password protection, normal mail and private mail	12.2	46.8	21.6	19.4
Answer mail service	13.7	58.3	21.6	6.5
Re-route mail service	7.9	44.6	20.9	26.4
Group membership and private list	7.2	30.2	33.1	29.5
Transfer of document	11.5	34.5	42.4	11.5
Transfer of messages or documents to your local hard disks	9.4	36.7	36.7	17.3
Storage and retrieved of messages in correspondences	7.2	23.7	39.6	29.5
Message received and/or viewed feature	7.9	66.9	18.7	6.5
Indication of type of message	5	55.4	17.3	22.3

Source: Survey of the Current e-mail services.

The user group summarised the survey and highlighted the areas that they considered the DOIS team needed to address in the WORKGROUP project, as follows:

- e-mail is only another tool to help them to do their jobs
- Higgins is not user friendly
- Users expected to receive a replacement soon and they also expect that the new system would be easy enough for them to pick up without investing time or effort
- Users feel strongly about having as minimum training on the new system as possible because they have "real" work to do[43].

In the light of the above, when the user group had a chance to select between two products – Beyond Mail and GroupWise – it chose the user friendly Beyond Mail after it had experiences with both systems. But the user group's preference for Beyond Mail was later changed as the result of a comparison between the two products made by DOIS, and the user group then agreed with the DOIS to opt for GroupWise. Another reason for agreeing with DOIS' choice was that the user group felt less confident with its own choice and believed that DOIS was in a position to know what technology was good better than the user group did.

> "a reason that the Group gave in in the end was that members did not know very much of computers so they relied on DOIS' technical knowledge... they knew what they were doing and we trusted their technological expertise" (member of UG).

This is an interesting situation and would seem to show that the users, while attempting to exercise their own initiative in the project and represent their constituencies, very rapidly acquiesced to the dominant technological frames of the DOIS. It is as though they almost wanted to be over ruled!

---

[43] Survey of the Current E-mail Service, February 1994.

Issues around the implementation

Phase Three of the project was intended to discuss the possibility of taking advantage of the advanced features that GroupWise offered. At the time DOIS was interested in document automation, intending to transform hard copy documents to electronic form in order to speed up document circulation within BIS. But the user group saw document automation required not only additional software to run it, but also some radical changes within the organisation. As mentioned earlier (Section 6.2: organisational context) all documents circulating within or sent outside BIS were treated with caution, and many of them required signatures from various authorities before they could be sent off or distributed. Document automation could thus mean two things: that the Bank replaced hard copy documents with digital format including signature or that the Bank changed its current practice to adapt to the new system. The user group saw neither of these two would work in the Bank; the technique of digital signature was not mature at that time and it would be difficult to convince the management and central banks to accept it. Also, the user group felt that it was not the WORKGROUP project's aim to make radical changes in the Bank and about this point the DOIS team shared the same view. Therefore both the user group and DOIS team decided to dismiss the idea. We could say that neither of these groups had technological frame that admitted directly addressing organisational change.

The management group

The management group involved in this project in particular consisted of the steering committee and project sponsor, Executive Committee (ExCo.), and a General Manager of the Bank. Usually, when an IS project is initiated in the Bank, the project needs to find itself sponsors from managerial level. If the project affects only one department, then it needs a manager from that particular department to sponsor and support the project, if the project involves more than one department; the sponsors then should come from the departments which are involved. This is the steering committee and project sponsor. Once the project has sponsors it needs to propose and report to ExCo in order to be allocated have necessary budget. ExCo was made up of managers from the higher managerial level in the Bank to assess the necessity of projects. In general, the management group was concerned about the questions such as costs and necessity of the project, the benefits of the project, and risks and sensitivities. Above all, the

management group was also interested in seeing the new e-mail system become a formal means of communication at the Bank[44]. So the identified dimensions of the management group's technological frames were issues around initiation and implementation. Table 6.12 summarises the technological frames involved.

Table 6.12: The technological frames of the management group

Issues around initiation
– Scope and effect on the organisation
– Necessity of the project
– Benefits and costs
– Risks and sensitivities
Issues around implementation
– Changes in the new e-mail working environment
– Expectations of the use of e-mail

Issues around initiation

After six month delay the project team finally came to propose the project plan to ExCo. in July 1995. During the meeting the ExCo demanded to know more about issues regarding project initiation – for example, it wished to know how necessary the project was to the Bank, the benefits in relation to the costs, effects on the organisation, and risks and sensitivities[45]. Above all the ExCo was concerned for cost. They wanted to see separate cost implementation for (1) simple replacement operation for Higgins & (2) taking full advantage of the new functionality that new programs could offer with a clear appraisal of operational benefits. Simple replacement meant only replacement of basic functions within the e-mail.

Issues around implementation

Another area that the ExCo demanded more details about was the changes that would accompany the installation of the new system. For example, the ExCo wanted to know "what enhanced facilities will be made available in various phases, i.e. phases 1, 2 and 3? Do these include access to external electronic mail?[46]" "How will the old mail stored

---

[44] Memorandum: WORKGROUP Implementation Project, outcome of the submission to ExCo, 3rd November 1995.

[45] Memorandum: WORKGROUP implementation project, answers to comments received to date (revision 1.1), 20th October 1995.

[46] Currently there was a limited number of people could access to external e-mail via Higgins.

in Higgins be made available in GroupWise?" "Better qualification of the saving realised with the introduction of GroupWise?" "Clarification of the differences between the workgroup function available in Higgins and those available in GroupWise"

Answers to these questions were prepared by the team after the meeting and the ExCo. agreed to fund the project. In fact, the ExCo not only agreed to fund the project but also showed strong support for the project.

> "ExCo endorses the project and accepts the recommendation to proceed with all three phases. Furthermore, ExCo endorses electronic mail as a formal means of communication at the Bank."[47]

The pubic endorsement from the ExCo was said to come from the newly appointed General Manager (GM) of the Bank, who personally was keen on making e-mail become an official communication medium in BIS. This interest was interpreted by others as due to the fact that he was an American.

> "He is an American and he must have been using e-mail to communicate and appreciates the technology. This differs from his European peers as they often see that using e-mail to communicate as an alien idea." (the member of UG)

In order to show his full support and interest to get GroupWise used as a communication medium, the GM distributed a formal note in the Bank to announce that e-mail would in future be an official communication channel in BIS once it was rolled out. His message clearly indicated his interest and expectation of how the technology should be used in BIS:

> "Electronic mail (e-mail) is an essential means of efficient communication, both within an organisation and, increasingly, on a global scale... I expect e-mail to become the normal form of communication in the Bank for short notes and memos."

The GM also addressed possible misuse of e-mail in the organisation such as the distribution of private announcements and pointed out that the behaviour was not allowed:

> "e-mail should no longer be used to send private announcements to large lists of recipients. Instead, a new bulletin-board facility (discussion groups) will be introduced for this purpose".

---

[47] Memorandum: WORKGROUP Implementation Project, outcome of the submission to ExCo, 3rd November 1995.

Although the GM supported the project on the basis of his experiences with the technology and own interest, the support incidentally matched what the project team perceived to be a criterion for a successful IS project.

6.2.3 Interactions between contexts and the Bank and between interest groups

This section bring together contextual factors identified earlier and the technological frames of the three interest groups in order to examine the impacts of these contextual factors on the development of the project and on individual technological frames, as well as the impact on the project of interactions between the three interest groups.

When Higgins was chosen (in 1988), the standard operating system in the software industry was DOS, but when the Windows operation system and Windows based office tools came to the Bank then Higgins could no longer meet user's requirements, not least due to the users' technological frames shifting from a DOS oriented view to one oriented to Windows and GUI. DOS based Higgins seemed to users as an *out of date* system and was unacceptable. We have also seen that DOIS was not happy with Higgins either, since the system increasingly failed to integrate into the Bank's IS working environment and caused technical problems (i.e. system crashes) which increased DOIS' workload in terms of maintaining the system.

The scope of the WORKGROUP project was fairly clearly defined, even if there remained a distinct divide between the project manager and the rest of DOIS and the user group as to what was expected of the project in terms of work practices. Based on their interpretations of the problem, their sense of knowledge and skill, and their relationship with the user group, the DOIS project team was confident in what they were doing and what they wanted to achieve. In this context, together with no critical events occurring to change or transform the project, the perceptions and expectations of the project and system were fairly consistent throughout.

Still, we must acknowledge that during the product selection there was a conflict between DOIS and the user group in terms of preferred product, yet the former managed to convince the latter that one product was better than the other from various aspects. Again, the DOIS perception of the new system was not influenced by the user group's

choice, instead through social interactions (e.g. conducting an evaluation, lobbying) DOIS successfully changed or nullified the user group's preference for Beyond Mail.

DOIS' expectation was to make GroupWise become one of the Bank's main internal communication mediums, but still in very technical terms:

> "the new workgroup package will be a key component of the information system architecture of the Bank. It will become the standard user front-end for electronic mail facilities and workgroup tools and a key mechanism for transporting a large number of electronic items between users, but also between applications. The new workgroup system will provide the basic components to support a number of new facilities such as facility booking, bulletin board, facsimile, forms routing, work flow management, access to wide area mail networks, remote access, voice and telephony integration, etc."[48]

This idea was at one level very consistent with those of the newly appointed GM, though as we have seen the GM's idea of communications was rather different. Even so, and while these are not identical ideas, the GM's support for the idea was not limited only to allocating necessary resources to the project for he also made it clear to the rest of the Bank that that was what he would like to see happen.

We have seen that the DOIS team did not have an ambition to change the culture of the Bank and indeed did not see this as part of their role. Even so, after the GroupWise roll-out it did observe some emerging changes in the Bank. First, there was an increasing number of people using e-mail compared with the number before, and people were sending e-mail messages more rather than passing memos or internal mails. Second, the communication routes had been shortened by the system. People started to send e-mails to their superiors directly, instead of going through their direct boss. Still people were hesitant about acknowledging the meaning of such consequences. The project manager said in interview that this phenomenon should not be explained as a 'breakdown of the hierarchy' because there was no change made in the organisation's structure but only in communication patterns.

For example, a significant change could be said to be the abandonment of the messenger system in BIS. Traditionally, there was a messenger system in BIS. People put internal and external mail in the outgoing tray on their desks and the messengers allocated to each floor would come to collect them at certain times, or if the messages were urgent

---

[48] Memorandum: WORKGROUP project, product recommendation, 19th January 1995, p.5.

then people could ring a bell on their desks to call a messenger in to collect the mails. Although messengers still came to deliver mail and collect outgoing mail, shortly after GroupWise was in place the system was no longer used to deliver internal memos. This was in part the result of a budget cut but it was also acknowledged as because internal memos could be sent via e-mail and e-mail messages had become as legitimate as hard copy memos. This reduced services in the messenger system and also reinforced peoples' reliance on e-mail for sending internal messages.

6.3 FINDINGS

Several interesting issues emerged from the analysis. These include congruence in technological frames, personal trait, and communication as a forum to achieve congruence or shared technological frames, expectations, and vertical and horizontal analysis. These issues cannot all be elaborated further on the basis of the ideas discussed in Chapter Three, and hence this section will discuss only the elements that can be developed further with the resource framework (Chapter Three). Elements in the analysis that need more investigation will be discussed in Chapter Eight – possible further research.

Congruence or shared technological frames?

The WORKGROUP project might be seen as a typical technology pull project as it was organised and driven forward by the DOIS team, but user push played a part too, at least in legitimising and prioritising the project. Nevertheless, the necessity of the project was agreed and accepted at all levels of the organisation. This could be interpreted as a result of congruence in technological frames across groups which enabled people to come to the same conclusion about replacing Higgins. Yet, it is not sufficient to argue that the congruence in technological frames enabled people to understand and interpret the problems in the same way. The analysis suggests otherwise. It was noted that there was a general agreement to replace the system but there was no congruence of technological frames between the three interest groups.

The key elements or categories of technological frames held by the groups differed. To begin with the understandings of problem, the three groups understood problems slightly differently on the basis of their experiences with the system. Technologists

understood the problems with a technological mindset so words like: 'not robust enough', 'incompatible', 'fall apart' were used to describe the problems of Higgins. Users on the other hand understood the problems with concerns of their own job performance, for instance they preferred not to be interrupted during the serious working hours (e.g. trading hours) and also preferred to retrieve and read message in their own time. Users felt that the instability of Higgins hampered their performance. The General Manager's understanding of problems was neither technological nor operational but more organisational in that e-mail should be an official communication channel to replace some internal memos in the Bank.

Differences were also observed in the process of selecting the product. The management group worried about costs and benefit; the User Group was concerned about ease of use; and technologists assessed the system with concern about the existing information system infrastructure. Therefore the User Group chose Beyond Mail and DOIS chose GroupWise. The final decision was made on the basis of the technological consideration. Users reflected their unhappiness with the technologists' criteria of choosing the system and made some comments relating to the decision. For example, the internal Audit Department made commented on DOIS' choice and observed "the technical issues seemed to outweigh user issues." Another member from the Banking Department said "our proposal and requirements were not listened to". In addition to the comments made in the survey an interviewee from a different division of the ISS expressed a personal view and said:

> "Some people felt the selection of GroupWise was orchestrated by DOIS. The impression exists in the Bank that DOIS has exhibited preferences for certain vendors and products in circumstances where it was not all clear why they should."

In terms of expectations, the DOIS specified and embedded their expectations of the new system in the requirements of the new system (Section 6.2.2: DOIS) which were technological oriented. The users' expectation of the new system was simple and clear that they wanted a new system which was more user friendly and easier to operate. The management group's expectation was to make the new e-mail system a communication channel in the Bank. Table 6.13 compares the key elements of technological frames held by the three interest groups during the project initiation.

Table 6.13: Key element of technological frames

	DOIS	User Group	Management Group
Understanding of problems	Technological	Operational	Organisational
Selecting product	Fit in the current infrastructure	Easy of use	Cost effective
Expectations of the new system	Technological	User friendly and easy of use	A new communicational channel

What synthesised these different sets of technological frames so the groups could come to achieve a consensus (to replace Higgins in the Bank) was 'needs'. The 'needs' did not stem from business operation but from individuals' frustration of having to deal often with crashes and interruptions. In the other words, the needs were, to an extent, emotional. It is interesting to note that although practically different groups had different reasons for welcoming a new system, emotionally they seemed to share a similar feeling. And this is that it was emotional needs which drove different parties to come to agreement.

Numerous studies have been undertaken to examine reasons for why and why not users adopt particular information technologies (Section 2.3). Most of those studies concentrate on rational reasons such as ease of use, usefulness (Adams, et al., 1992; Davis, 1989), peer pressure, management support (Karahanna, et al., 1999) and so forth, and emotional factors are hardly touched upon. Compeau *et al* (Compeau, et al., 1999) studied users' reaction to computer technology and includes an emotional factor – anxiety – and argue that users' capability of self-efficacy strongly influences users' personal feelings towards the computer technology. They illustrate several items associated with anxiety, as follows:

i. I feel apprehensive about using computers

ii. It scares me to think that I could cause the computer to destroy a large amount of information by hitting the wrong key

iii. I hesitate to use a computer for fear of making mistakes I cannot correct

iv. Computers are somewhat intimidating to me

These items were ad hoc and influenced by capability of self-efficacy. The emotional element – needs – is somehow stronger and instead of being influenced by other

elements it influenced the Bank's initial decision concerning the technology adoption. What the finding suggests is that at the operational level individual are likely to have different understandings of the technology and use it differently due to the fact they have different interests to pursue. At an emotional level similar anxieties that individuals have may lead to similar actions despite the fact that the rational and practical reasons for using or not using the technology are different.

Personal trait

Another important finding, which is in, more or less, the same dimension as the needs mentioned above, is personal trait. This element was not included in the initial technological frames analysis; in fact it was ignored and as a result of the analysis considers only those that have a rational dimension. It is believed that individuals' personality characteristics influence the way that they predispose themselves to seek and filter information from the environment, and make certain decisions (Martin, 1998). Personal trait, on a number of occasions showed a strong influence on individuals' behaviours, perceptions, and the way that they dealt with things in the case study.

Among the various numbers of people involved in the project, the project manager's personal trait is said to have had significant influence on the direction of the project. In the eyes of some the project manager was a dominant, self-conscious, arrogant person, and impossible to work with because he did not listen to others and usually wanted his own way of doing things. This was also observed in some e-mail messages that the project manager sent to others. The strong personality and personal preference for Novell products was criticised, because it seemed that the whole project was a reflection of the project manager's self ego and prejudice for a particular system:

> "Chris, the project manger, is known as "Novell" man which means that he is in favour of any products related or developed by Novell. GroupWise was better than other products because it is Novell's product".

> "...the project manager has been described as arrogant about the suggestions of others concerning infrastructure facilities and means of service provision. Many people felt the selection of GroupWise reflected this perceived arrogance." (the member of ISS)

Despite the comments made by employees, some within the DOIS believed that Chris' personal characteristics in fact helped the project to go forward. One team member said:

> "the quality like this (strong personality and dominant attitude) is necessary in some circumstances if you want things to be done." (the training officer)

A strong personality was indeed a strength to push the project forward and keep it going in the pre-defined direction without any unanticipated drift.

Not only did the project manager show his strong personality during the process of the project development but so did the DOIS team members. They also were described by others as arrogant, and ignorant, as they often ignored users' feedback and opinions[49]. The following conversation between two DOIS members and a user from the Internal Auditing Department took place in the staff canteen:

> Eric (Internal Auditing): Why don't we have Lotus Notes in the Bank?
>
> Ken & Collin (DOIS): why do you want to use Lotus Notes for? It is crap!
>
> Eric: ??? (looking very puzzled by what Ken and Collin just said)
>
> Key & Collin were trying to explain some technical problems associated with Notes and said that the system was not compatible to the current network infrastructure. In their explanation, Ken and Collin used a lot of technical jargons.
>
> Eric (was now getting upset): I am only a user and just interested in knowing why we don't use Lotus Notes. I don't understand and don't want to know the technical jargon which you are using, so can you just explain the situation to me in plain English?

The above personality characteristics might given a negative impression that it can only hamper the "democracy" of the project, but it was found that personality characteristics can also have positive impact; for example, the General Manager's background of being an American. Being American here means being exposed to computer technology and used to using e-mail to communicate. Martin (1998) writes: "working with someone from another culture is a useful way of experiencing the scope of a value system on person perception."

Social interactions – the shifting sharing and shaping of technological frames

Orlikowski (1992) argues that in order to alter individuals' impressions and perceptions of the technology communicating ideas through informing and training is essential. This was described and believed as a milestone of BIS' success with the project. It was

---

[49] It was observed from the GroupWise Questionnaire.

evident that communication occurred between the DOIS project team and users via the User Group, but a close examination told a slightly different story.

Although the User Group was set up to act as a bridge to help communication between users and the project team, it was, in fact, a hostage of the DOIS team and used as a broadcasting channel to inform the rest of the organisation about the progress of the project. Differently put, so called communication was a one-way message broadcasting from the DOIS to the Bank, for the function of the User Group was (1) to obtain financial support, and (2) to direct the project in the DOIS' own way with the false sign of democracy. It is not true that users' voices were not heard by the project team as users claimed, rather, they were heard but ignored, as the project team determined to have their own way.

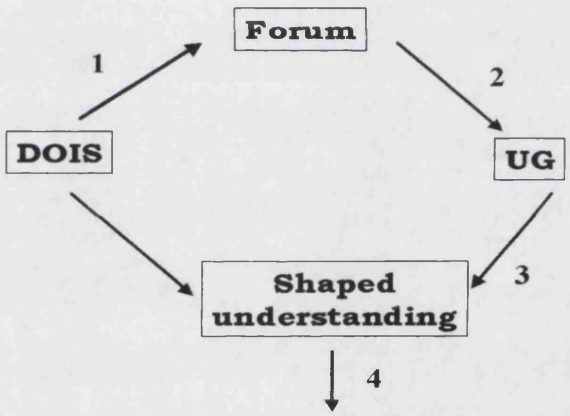
The DOIS team not only used the User Group to talk to users (one way communication really) but also tried to shape people's perceptions of the technology through social interaction by manipulating the situation. As mentioned earlier, most members of the User Group preferred Beyond Mail to GroupWise mainly for the reason of ease of use. Since the DOIS team wanted to have GroupWise instead, the team began intensive lobbying among the User Group. To rationalise the lobby the team first had to create a "forum" to discuss the "matter". The "matter" refers to differences between Beyond Mail and GroupWise and why the latter should be chosen as such. The language used in this forum was not standard English, German, Italian, or French but computer jargon. This led the User Group to believe that the project team was more competent than they were in terms of choosing suitable system for the Bank.

The forum also served as a carefully constructed common ground that people referred to so as to believe that they were making decision rationally. For example, several items that the DOIS team used to compare the two products either had little to do with the project's principal aim or were not mentioned again later in the project roll-out. It seemed that these items were there in the template to serve the purpose of making GroupWise look better than Beyond Mail. Using the Calendar function as an example, the team used this to reject MS Mail, cc:Mail and, similarly, Beyond Mail. But during the interviews with DOIS members all said that the project did not attempt to promote the Calendar function in the Bank and were generally of the opinion that they would be happy if staff used e-mail related function only. Through the above efforts the project

team seemed to shape staff perception of the technology, rather than create a shared understanding of why GroupWise was chosen by the Bank. Figure 6.2 illustrates the social interactions undertaken by the DOIS to shape the User Group's technological frames.

The diagram shows that DOIS first created a forum to allow itself and UG to have public discussion of whether to have Beyond Mail or GroupWise (1). Through manipulating the forum by using technical jargon DOIS successfully shaped the original understanding of the technology that the UG had to be inclined to its own frames (3). On the basis of the shaped understanding the decision was then made about the new system (4).

Figure 6.2: Creating a shaped understanding through social interaction



Control over the translation process

The findings also suggest that the project was successful because of realistic expectations of the technology. This supports other researchers' findings that, if the purposes of adopting information systems are well defined, the likelihood of having a successful system development is greater (Bullen and Bennett, 1991, Caroll and Perin, 1988, Ginzberg, 1981). In this study one saw that the scope of the project was extremely narrow: to replace an old e-mail system. Besides, the project team claimed that it did not want to change anything other than the old e-mail system and it did as it promised[50].

---

[50] Here, we mean intended changes not unintended ones (i.e. changed communication patterns in the

But reading between the lines another version of the story emerged. This version of the story tells that the real reason that the scope of the project was narrow was not because individuals were being rational but rather that the process of translating the project into something else was tightly controlled by the team (including UG). The project team constantly pursued frames of how things should be done and thought about, and gave a clear guideline and direction to the project. Any expectation which diverted from the initial one was rejected with "reasonable" reasons (i.e. the creation of the forum). The tight control over the process of the project development ensured that there was little chance that the purpose of the project could be interpreted otherwise. A possible reason for doing thus could be that DOIS could obtain power over other departments including other divisions within the ISS.

The power of direction (of that is what DOIS sought) was denied from the DOIS expertise of managing the office system, which others did not really want to challenge. This attitude from other departments might be because of the culture of the Bank and individuals' perceptions of information technology and system. As mentioned earlier, to most people in the Bank "only banking and finance is real work", activities which were not directly involved in these two areas were not paid much attention or valued highly. One consequence was that as long as the ISS could provide services which the users required and not making any changes which would change or threaten their current working practice or jobs people would not be over concerned with other details. This is also because individuals perceived that information technologies and systems were merely tools to support them doing their work. Since the ISS was given limited power in the Bank, the DOIS made sure that within the limited power range everything was under the control and eliminated any possibility of losing the control.

Although it was suggested earlier that the UG was a hostage of the DOIS, nevertheless it did once voice concern about the direction of the project, in that DOIS would like to present further development of applications within GroupWise. For example, DOIS prepared to automate the current manual documents circulation by using GroupWise, but the UG objected to the idea and argued that the goal was too ambitious and, above

---

Bank, speed up the process to get rid of the messenger system).

all, involved radical changes in the Bank. Therefore, although the proposal was mentioned and discussed, it was stopped at that point.

The above discussion reveals a tightly controlled translation process in which the technology can only be translated one way and in a context of not intentionally trying to change organisational settings.

Vertical and horizontal analysis

Having a unique background and mission, BIS was not as much exposed to external forces as other commercial organisations. Usually, on-going IS projects came from the needs within the Bank and these needs were not necessarily generated from outside pressure. Moreover, to member countries' central banks whether the Bank was technology sophisticated or not was not an issue as long as it provides services which met their requirements. In this context, IS projects could be developed slowly and deliberately in a fairly steady environment and the direction of any development would not be subject to the external environment.

The concept of time in this case study is seen as a mechanism to connect the past and present, but if one uses it to examine changes in individuals' technological frames in the Bank then time seems to be "moving" but at the same time it seems to be "still". It is motionless because technologists' and users' technological frames remained more or less the same throughout time; for example, the technologists' preferences for certain products did not change much over time and the users' feelings towards the ISS departments and information technologies/systems were not very different at the end of the project from what they were is the past. Nevertheless, time does show motion in individuals' technological frames. It was mentioned by the interviewees that users' feeling about the ISS department did not change in nature but was re-enhanced and became stronger in degree. For example, the projects undertaken two decades ago still had influence on how people thought about the ISS department, in fact, together with other projects undertaken during the past decade the negative impressions that people have about ISS had become stronger. A puzzle may come into one's mind that employees come and go, so that what happened two decades ago should not be remembered and still influence how people think about the ISS. It has been a norm, however, that most employees stay with the Bank until their retirement, and thus the

technological frames seem to span across a much longer time line than one would expect and would take longer and require much effort if any changes are to be made.

6.4 SUMMARY

In this case study it is shown how the initiation of a project was organised and pushed forward by DOIS as the necessity of the project was agreed and accepted at all levels of the organisation. Most decisions and choices related to the project and product were based on a single technological frame, which was exemplified by the team's preference for a particular vendor and product. In contrast, some of the decisions made about roll-out and training scheme took far more notice of organisational and social contexts for even then in a defensive manner, but in general the project was dominated by pre-defined and strong technical oriented frames held by the technical team.

This is different from many other case studies in the literature from which one can often learn about so-called emerging or drifting phenomena taking place during the decision making process or shortly after the implementation. This case study also reveals an interesting situation where there was a distinct distance between the users' and the technical team's perception of a suitable product, and between the real aim and the 'cosmetic aim' of the project (i.e. the one the project team intend to which and the ones proposed to the ExCo.).

This case study tells a rather different story from the one found at BOC. First, the project was "technology pull" and not "business push". Second, the project was carried out according to the DOIS team's technological frames and developed in a steady pace and experienced very little diversion from the initial plan. Third, the team's technological frames were not changed during and after the project; indeed, the team managed to make its frames relating to e-mail become part of the organisation's own frames as the 'most successful' tag that led us to the project in the first place indicates.

CHAPTER 7

DISCUSSION

This chapter brings together the findings from the case studies. Discussion of the findings is based on the ideas developed in Chapter Three with further elaboration derived from the analyses of the case studies in Chapters Five and Six. The chapter begins (Section 7.1) with a re-examination of the findings from the case studies and provides a re-interpretation which is related to other IS research. The second part of the chapter (Section 7.2) is dedicated to discussion of the findings which emerged from the studies and which are further developed. This is followed by a conclusion (Section 7.3).

7.1 RE-INTERPRETATION OF THE CASE STUDY FINDINGS

Before discussing the re-interpretation of the findings it is useful to revisit the argument made so far. Based on the observations made in the preliminary case study and the literature review of CSCW research, this study discovered (with surprise) that little attention has been paid to the investigation of processes and activities undertaken between problem identification and the post-implementation period (Section 2.1), and the consequences of these processes and activities on the subsequent direction of a project. This thesis focuses special interest on *how the perception and expectation of individuals influence the decisions taken with regard to the initiation and acquisition of a specific information system.* The findings from the preliminary case study suggested that choices and decisions about particular systems, and steps of an IS project, do not necessarily reflect the interests of the organisation as a whole. Instead, they were much influenced and determined by how individuals perceived the problems, how much they understood the technology, and what expectations they had for the technology. It was

also noted that perceptions, understandings, and expectations changed over time especially as individuals' circumstances changed and as individuals engaged in social interaction.

Bearing the above observations in mind the technological frames analysis and contextualist approach were chosen to pursue the research interest further. Building on both approaches, the arguments and assumptions of this study were then refined, as follows:

- Individuals' choices and decisions about IS projects, including detailed plans of the projects and new systems, are heavily influenced and determined by individuals' technological frames rather than by an externally driven process of rational assessment of alternatives.

- Individuals take actions towards the meanings that the technology has for them and these meanings derive partly from individuals' technological frames. Since a set of technological frames are unique to the individuals who own them, different meanings for the same technology must be expected.

- Individuals in the same interest group are inclined to interpret technology in a similar manner since their shared group technological frames enable them to do so.

- Individuals' technological frames are time and context specific so individuals' interpretations change through time and so does their behaviour towards an IS.

- IS projects are ongoing processes with continuously reciprocal interactions in their environment. Choices and decisions are not snapshots of historical processes, isolated from other activities, and their consequences have continuous impact on subsequent behaviour.

The specific findings of each research case studies have been discussed separately in Chapter Five and Six and they broadly support the arguments listed above. This section aims to bring together and re-interpret the findings of the three case studies, including the one conducted in JF Taiwan, and by doing so to provide an interpretation of the findings in a broader context and to relate this study to others. The discussion in this

section focuses on three issues: (1) ontological perspectives on technology, (2) epistemological perspectives on decisions; and (3) situated plans.

7.1.1 Ontological perspectives on technology

Both case studies have shown that decisions are influenced by individuals' knowledge and understanding of the technology, that is, their technological frames. Orlikowski and Gash (1991) identified seven domains of technological frames in their early study and argued that individuals consider these issues when they come in contact with the technology. Later Orlikowski and Gash (1994) derived another three domains which were believed to be significant as most conflicts arise from individuals' disagreement over them. This study has found its own account of the domains and issues that individuals are likely to take into account, depending on their assumptions about technology in general and their experience. In other words, individual response depends on an ontological view of technology.

As discussed in Chapter Four, the ontological perspective is concerned with exploring the question of whether reality exists dependently or independently from an individual's consciousness and appreciation. Hence, the ontological perspective on technology concerns the relation between technology, organisation, and user. Four dominant IS schools of thought including technological determinism, organisational imperativism, socio-technological, and structurationism provide different ontological assumptions of this relation (Orlikowski, 1991).

Technological determinism suggests that technology is an exogenous force (and perhaps intrinsically good) thus individuals' reasons for initiating an IS project and choosing a particular system are self-explanatory (Greenberg, 1991; Johnson, 1988; Opper and Fersko-Weiss, 1992; St John Bate and Travell, 1994). Organisational imperativism assumes that technology creates links between a business environment and a business itself, and its IS/IT strategies are simply business driven (Cross, et al., 1997; Earl and Feeny, 1996; Rockart, et al., 1997). Both of these schools have a strong belief in the *impact* of technology on organisational and human behaviour, but one (technological determinism) assumes technological superiority while the other (organisational imperativism) plays to business orientation.

In contrast, socio-technical interactionism argues that, although technology has the capability to change organisational properties, so too can organisational and social structures change (or shape) understanding of technology (Hirschheim, 1985; Lin and Cornford, 2000; Kensing and Blomberg, 1998; Mumford, 1999; O'Day, et al., 1998). The primary intention of technology adoption is then to enable socially desirable business changes through technology but, unlike technological determinism socio-technical interactionism is aware of (or pursues) changes in the technology reflecting social movements. As to structurationism, technology is seen as created and changed by people (human agents), not as an exogenous forces but rather as interpretively flexible, its use depending on how people look at it, and the role of technology becomes subject to individuals' views (Barley, 1986; Jones, 1999; Orlikowski, 1991; Riley, 1983). Both of these schools of thought are interested in individuals and their attitudes and behaviour, although socio-technical interactionism is more technological oriented and offers new opportunities for planned change, while structurationism is inclined to be socio-organisational oriented.

Since each school of thought has its ontological position regarding to technology and its relation with organisation and individuals, individuals are seen to associate with particular positions (when they are in contact with technology) and will naturally be concerned about certain issues. Table 7.1 summarises some possible issues taken into account by each school of thought in different dimensions. This synthesis of ontological views of technology held by different schools, and the issues that concern them in different dimensions, allows individuals' technological frames to be examined at the level that some behaviour or reactions towards technology can be *anticipated* if individuals are assumed to hold particular views of technology.

Table 7.1: Ontological perspective of technological frames

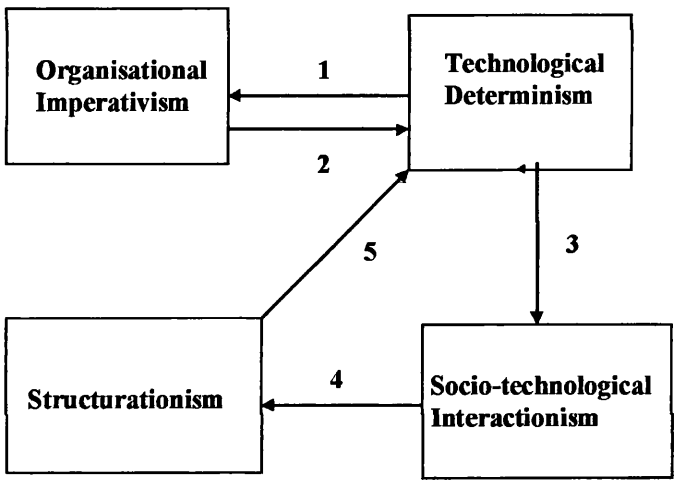
Dimension	**Technological determinism**	**Organisational imperativism**	**Socio-technical Interactionism**	**Structurationism**
Issues around initiation	Advance through technology	Successfully identifying business needs and links it to choice of technology in theory, Competitiveness through technology adoption;	Re-design organisations or work around technology, user requirements	Long term effects of technology in organisations: structural changes

Dimension	Technological determinism	Organisational imperativism	Socio-technical Interactionism	Structurationism
Issues around implementation	System installation, acceptance testing, conversion technical training	Strategic fit, management commitment, how to link business strategy to technology in practice	To optimise social and technical factors of jobs, to automate or to informate work, participation.	To harness changes made in organisational and technological properties, be aware of emerging, anticipated, opportunist changes
Issues around use	Correctly use of technology, technical supports, integrity	Effectiveness, productivity, competitiveness	User satisfaction, customisation, usefulness, social cohesion	Interaction between users and technology, customisation, dynamic organisational change.
Criteria of success	Compatibility, speed, stability	Market position, competitions	Social and technological factors are optimised, acceptance, appropriation	Achieve anticipated changes and be able to manage unintended and opportunist changes
Concepts of Impact	Efficiency	Organisational position in the industry, efficiency	Changes in organisational and social properties	Organisational changes made through interactions between technology and organisation

An emphasis on the underlying ontology of technology highlights as well as helps to appreciate individuals' *tacit* background (i.e. education, experiences, preferences) and assists in making sense of the reasons behind particular decisions and choices about the technology in a way that traditional rational decision making models cannot. For example, the ontological view of technology that the MD at JF Taiwan had could be said to be inclined to technological determinism as the MD had a strong belief in the technology's ability to solve the problems. In BIS, it is this strong belief that drove the initiation of the project; and despite the fact that the intrinsic technological problems of the existing system created demand for a new system, decisions about the project reflected the DOIS team's technological determinist position. Also, in BOC, Lotus Notes was initiated, as the manger's personal belief in information systems together with business needs.

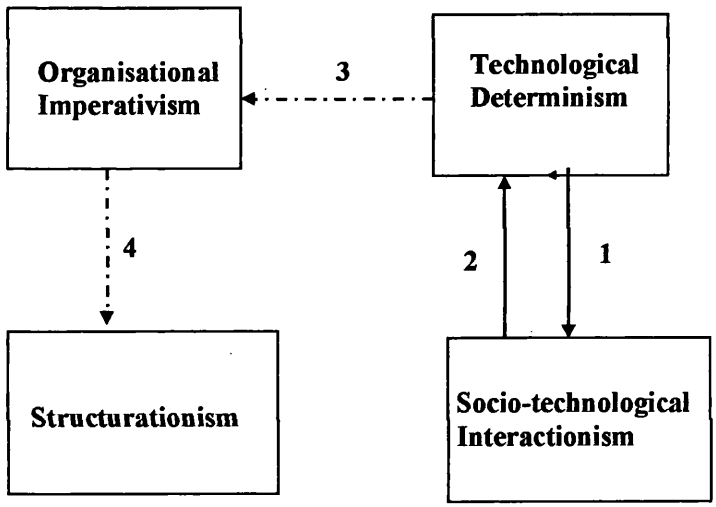
We have also noted that individuals' ontological assumptions of technology do not remain static, but shift dimensions according to the context in which individuals from themselves and experiences and knowledge that individuals accumulate. In BOC, the project was initiated on the basis of personal belief in information technology align to organisational needs (Arrow 1); and the choice of Notes was based on the match between the understanding of the system and business needs (Arrow 2). Experience with user resistance to the system led Group IM to see that technology in itself was not the fundamental cause of the resistance, but rather it was the conflicts between current and new working practice (i.e. being a global team). It was noted that Group IM's decisions made about the project shifted towards the socio-technical dimension (Arrow 3), and subsequently the decision about a re-launch of Notes in BOC was made. In BOC, Group IM realised that only when there was a global business process in place and certain changes were made in organisational structures and business operation, would users attitudes towards Notes change. Group IM's understanding of technology finally moved from the socio-technical dimension into a structurationalist view, as reflected in the statements about the Internal Web (Arrow 4). There they emphasised that, in order to make the Internal Web project successful, BOC has to make certain changes in organisational structures as well as prepare for possible organisational changes made by the introduction of the project. Nevertheless, the technological determinism still largely dominated the project (Arrow 5). Figure 7.1 describes the movement of Group IM's ontological views of technology in the context of Notes in BOC.

Figure 7.1: BOC's ontological assumption of technology and direction of the project



In contrast to BOC, DOIS' ontological assumption of information technology and the direction of the project remained far more stable throughout the project. Although the proposal to the ExCo. addressed the project as pursuing strategic issues (organisational imperativism) and a user group was set up to assist it to choose and roll out GroupWise (socio-technical interactionisim) the movements from technological determinism to socio-technical interactionism (Arrow 1) and then to organisational imperativism (Arrow3). The dotted line represents that the movement was more a tactic employed by DOIS to obtain support from the management group than the actual shift in their thinking of technology. For themselves, DOIS stuck firmly to its initial technological oriented plan. It was also noted that the introduction of GroupWise has initiated some changes in communication patterns and use of the system in BIS, despite DOIS trying to play down these structural phenomena (Arrow 4). Figure 7.2 shows the movement of BIS's ontological assumption and direction of the project.

Figure 7.2: BIS' ontological assumption of technology and direction of the project



While ontological assumptions of technology represented in the earlier literature surveyed in Chapter Two seems to be assumed as static and rigid, the above finding has demonstrated that they are better seen as dynamic and flexible. The issues that individuals consider during a project will be different at each stage since the problems that individuals face are different. Moreover, the experiences obtained during the project allow/drive individuals to modify their assumptions, and which in turn change their attitudes towards the technology, consequently a project may be driven into a different direction.

7.1.2 Epistemological perspectives on decisions

Highlighting the ontological assumption of technology behind individuals' perception and expectation of technological solutions leads to the issue of epistemology of decision about technology, which privileges individual or group knowledge of the situation over some general (public) definitions of the technology which are time and context insensitive; that is, decisions should be understood through participants' knowledge of situations rather than procedures which offer global organising visions of technology. An organising vision refers to a set of focal community ideas for particular information system, application or technology in organisation (Swanson and Ramiller, 1997).

Organising visions certainly form a part of the cognitive structure (technological frames) and directly shape and constrain individuals' perception of problems and choice of technology (Scott, 1995; Swanson and Ramiller, 1997). A pervasive organising vision of groupware is that the system has capability to (i) provide a common platform to support groupwork, (ii) enable communication and (iii) facilitate information sharing, and (iv) remove time and place constraints. In this work it was noted that organising visions, on one hand, function as references to assist people to make sense of technology, and on the other hand limit people's understanding of the technology in such a way that the technology itself may be undermined. For example, the business manager in BOC matched the concept of "global team" raised in the reform scheme with an organising vision of teamwork and was prejudiced to believe that only Lotus Notes could provide solution. Similarly, in JF Taiwan the project manager's understanding of groupware (Lotus Notes) was constrained by the buzzword "group-ware" and Notes was thought to be able to serve small groupwork only.

Two of the case studies (JF Taiwan and BOC) have demonstrated that an organising vision serves as a reference to facilitate decision about technology adoption and has impacts on individuals' choice about technology, however, Ciborra (1999: 84) argues that "choice is intrinsically subjective and transient". Developing from the phenomenological perspective of choice, Ciborra (1999) distinguishes two types of actions: "in order to" and "because of". The notion "in order to" refers to the idea of individuals carrying out actions following the meaning embedded in the projects and in its constituent elements (i.e. plans, goals, means, etc.). In IS research "in order to" motives often relate to "the special object of the analysis and design of rational decision

making processes in the field" (p.84). In contrast, the notion of "because of" emphasises individuals' personal experiences of the past in the current situations. Ciborra writes:

> "... there are the actor's past experiences selectively evoked according to the existential circumstances at the moment of making the decision. Such deeper and wide ranging motives are called the "because of" components of the action. They convey the ultimate meaning and thrust to the devising and performance of the action" (1999: 84).

The concept of "because of" reflects a notion of epistemology of decision which emphasises that choices and decisions cannot be examined without focusing on individuals, for it is people who make decisions and people have a background and intentions.

Building upon the notions of "in order to" and "because of" *appropriation* of technology then can be explained as a process in which people transform actions of "in order to" into actions of "because of". In this context, the phenomena observed in the JF and BOC case studies can, therefore, be interpreted as the result of absence of such a process of appropriation. That is, the participants in both companies simply followed the meaning embedded in an organising vision of groupware which is agreed by the community (in order to) and failed to transform the public meaning according to their situations (because of). But, it was also observed in the case studies that the ability to appropriate technology (to transform "in order to" into "because of") depends on experiences that individuals or companies have with the technology.

Experience with technology has been argued to provide individuals or companies with a base of knowledge for guiding current actions (Caron, et al., 1994; Orlikowski, 1992; Robey and Newman, 1996; Robey, et al., 2000; Yetton, et al., 1994). According to a technological frames analysis, individuals are likely to reference their historic experiences that are similar to those currently being considered/adopted (Martins and Kambil, 1999; Robey, et al., 2000). As a consequence of the lack of experience of managing groupware and client-server computers, the project teams in JF Taiwan and BOC did not have the ability to transform the public meanings of Lotus Notes into meanings of their own. Even more, the project teams sought to make the companies adapt to the public vision. Nevertheless, it was observed in BOC that once staff became familiar and had some experiences with the system, they were then able to re-

interpret the organising vision of groupware and appropriate technology to meet their own needs.

On various accounts, BIS appeared to be more organised than JF Taiwan and BOC were, and the project team seemed to rigidly follow the planned procedures throughout the project. On the surface, DOIS' behaviour can be interpreted as following pre-defined procedure embedded in the projects and in its constituent elements (i.e. plans, goals, and means), that is, taking actions and making decisions according to "in order to" principles. However, under a close scrutiny the procedures and actions undertaken indeed derived from BIS' and DOIS' past experiences with other information systems/technologies. That is, behind every "in order to" action there is a history (i.e. because of), which refers to experiences.

The above discussion has sought to demonstrate that individuals' knowledge and experiences of technology has direct impact on the expectations for and decisions made about technology. The evidence shows that lack of knowledge and experience force people to depend on the organising visions of technology without interpreting the vision and appropriating technologies according to the circumstances. As a consequence technology adoption may not reflect and support actual needs or organisations' situations. Knowledge of particular technology may be obtained externally (i.e. through an organising vision), but it presents what the technology is supposed to be in an ideal world and does not represent the situation. In contrast, knowledge obtained through experience with technology reflects not only the current but also the historical situation, and it supports people in making sense of technology and decisions in context.

7.1.3 Situated plan

It was suggested in the previous chapters (Chapter Five and Six), and earlier in this section, that a rigorous project plan may derive from an organisation's understanding and knowledge of both situation and technology; but a different interpretation can also be offered. An alternative interpretation will emphasise the origin of the impetus for technology acquisition. Grudin and Markus (1997) argue that where the impetus for a technology acquisition comes from may be able to explain different attitudes to a project plan. According to Grudin and Markus (1997: 1463-1464), when the driving force behind the project initiation and acquisition comes from powerful organisational

decision-makers, then the project is unlikely to be subjected to rigorous justification, review and approval, because the initiators are more likely to have access to the resources required. In contrast, when the impetus for technology acquisition comes from less powerful work groups in an organisation, then the initiators are required to prepare and go through a formal procedure to sell their ideas to decision makers. According to Grudin and Markus, without a formal project plan "there is no guarantee that the technology will address real organisational needs, fit the organisation's preferred ways of working, and actually be used" (1997: 1464). In other word, a more "strategic" approach may be less successful. The data collected from the fieldwork supports this observation. This can, in part, explain the absence of a formal process of review before the decision was made to adopt Notes and the lack of documentation of a project plan in JF Taiwan and BOC. In each case the origin of impetus for Lotus Notes acquisition came from the senior managers . In contrast, DOIS had to follow the formal procedure (i.e. preparing a feasibility study, sending invitations to potential vendors, project plan) to propose (to sell the project to) the ExCo. in order to obtain necessary resources.

However one must also recognise that much research evidence shows that the direction of a project may not necessarily follow the way it was portrayed in the project plan (Ciborra, 1996; Gallivan, et al., 1994; Jackson, 1995; Orlikowski, 1996); hence the question of whether a rigorous plan is needed must be asked. Traditional system development lifecycle models assume that development is a sequential process so the actions and decisions can be articulated in advance and outside "time" (Avison and Fitzgerald, 1999: 273-276; Iivari and Lyytinen, 1999: 63-68). These models also assume that planned decisions and actions will lead to anticipated or intended consequences. But a growing body of research demonstrates that planned decisions and actions can equally lead to unanticipated and unintended consequences; even more, individuals are required to respond to contingencies during the development and after implementation (Harper, et al., 1991; Nardi, 1996; Orlikowski, 1991; Orlikowski, 1996a; Randall, et al., 1995; Rouncefield, et al., 1994; Suchman, 1987).

A popular contemporary account of this phenomenon is the "emergent and drifting" school, which argues that the direction of an IS development cannot be fully controlled and anticipated since not all actions guarantee intended consequences. Building on this

approach, this thesis sees IS development as a continuously situated process and argues that participants in development need to deal with contingencies constantly as it is difficult to maintain planned actions as each breakdown (unanticipated event or consequence) shifts development to further deviations from what was planned, expected, or intended (Latour's "translation loss" see Appendix I for more details).

The notion of situated actions emphasises "the emergent, contingent nature of human activities, the way activity grows directly out of the particularities of a given situation" (Nardi, 1996: 71). Hutchins (quoted in Orlikowski, 1996a: 66) writes about situated changes made in organisations and argues that "several important aspects of new organisations are achieved not by conscious reflection but by local adaptations". Orlikowski (Orlikowski, 1996a: 66) argues:

> "each variation of a given form is not an abrupt or discrete event, neither is it, by itself, discontinuous. Rather, through a series of ongoing and situated accommodations, adaptations, and alternations (that draw on previous variations and mediate future ones), sufficient modifications may be enacted over time that fundamental changes are achieve... Each shift in practice creates the conditions for further breakdowns, unanticipated outcomes, and innovations, which in their turn are responded to with more variations. And such variations are ongoing; there is no beginning or end point in this change process."

The idea of situated change is apposite to the present argument and similar ideas were found in the research case studies. It was observed in the case studies that individuals needed to modify their plan from time to time in order to respond to unanticipated consequences of their decisions and actions, current situation, as well as to reflect or respond to the current state of technological frames. In general, an IS project within a commercial organisation is exposed frequently to the uncertainty of the environment (both internal and external) and in turn the direction of the project requires constant monitoring and modification to reflect the changes in the environment. In JF Taiwan and BOC, market competition drove the managers to re-examine the companies' current practice and the projects were initiated to support and respond to the market. However, internal uncertainty such as resistance to learning (JF Taiwan) or to use the system (BOC), and changes in management group (Mr. Chow's departure), forced the project teams to review the projects regularly. It was observed that the situated actions and decisions undertaken during the projects shifted the direction of the project away from the initial idea. The project in BIS, on the contrary, was initiated in a relatively stable environment in which market competition and uncertainty about the organisational

structure were almost non-existent. The only major uncertainty that the project team faced was their low status and the appointment of a new General Manager of the Bank, but although this delayed the project for about six months, the content and direction of the project remained unchanged. In this context, the project was not affected by its environment and team did not need to review and modify its project plan.

Despite the above finding suggesting that a project plan and direction of a project may shift due to uncertainty in the environment, which leads to local contingency or breakdown, the case studies also show, to some extent, that a project having clearly defined aims and objectives operates better compared with one without such support. Participants involved in the project at BOC worked with a general and less-defined business objective (being a global company); hence they not only had to make sense of the project but also had to respond to the subsequent (and broadly unanticipated) consequences of their actions. Even more, there was no plan to guide their actions and monitor the direction of the project, so the project team had little idea whether or not or how far the direction of the project had deviated from the initial idea. In contrast, in BIS the project team had a rigorous plan and followed this plan throughout the project most of the time. It was observed that with a plan the project team in BIS seemed to be able to cope with unanticipated events better than the team in BOC. Indeed, in the case of BOC each breakdown seemed to drive the project further away from the initial idea of the system.

The above discussion highlights the relation between plan, local contingency (situation), and experience. It is evident that the uncertainty of the environment not only makes it difficult to execute actions and tasks articulated in the project plan, but also requires people to take situated actions to respond to it. In order to respond to the situation effectively *experience* is required to serve and construct basic knowledge of how situations should be dealt with. So, what marks the difference between BOC and BIS was not just that the former had no project plan in place while the latter had, rather it was that the former was relatively less experienced with the technology and had to deal with new business ideas compared with the latter. Indeed, Ciborra's (1996) "taking care of", Orlikowski's (1996b) "opportunistic", and Rogers' (1994) "evolution" all build on the principle that individuals are experienced enough to take advantage of the situation, within the situation and make the situation work for them.

This section has presented a re-interpretation of the findings from the research case studies introduced earlier in this thesis. Three themes have emerged and been discussed – ontology of technology, epistemology of decision, and situated plan. The first two themes stress the issues of knowledge and experience of technology and their importance to an IS project. This re-interpretation of the findings, and organising them into broader themes, allows one to go beyond the framework of technological frames to examine other cognitive elements which contribute to IS projects. The third theme of situated plan brings together the first two themes as well as taking into account the situation in which individuals are situated, technology is perceived, and decisions are made. These three themes are elements of the research framework developed in Chapter Three, but provide an expanded analytical view so they can be employed to investigate similar issues in different domains. The above discussion has, however, left one critical element of the synthesised research framework untouched – the element of time. The evidence collected from the case studies suggests that this element deserves lengthy discussion and therefore the following section will be dedicated to the issue of time.

7.2 FURTHER FINDINGS: CONCEPTS OF TIME

This section is dedicated to a discussion of various concepts of time, revealed in the cases and already identified as a component of the synthesised research framework developed in Chapter Three. *Time* has always been a concern to systems design (e.g. processing time, transaction time) and to system development (e.g. lifecycle, deadlines). Even if it is not discussed explicitly, *time* is also often seen as a reason for adopting information technology; for example, information technology is regarded as being able to increase efficiency and effectiveness (i.e. reducing transaction time and increasing productivity), to compress time and alters the rhythm of work, to enable asynchronous and synchronous communications (i.e. removing time and space constraints). Time, in this context, can be seen as a metric a measurement to evaluate whether the technology is "value for money" (i.e. investment returns equals to reduced production time and increased productivity) discounted in an NPV calculation. It is evident that much modern business practice, as well as management studies, simply assume that time is quantitative by nature. That is, they take for granted that "time is a quantity which can be measured [by clock and other instruments] allocated and cut in a controlled,

structured and planned fashion" (Ciborra, 1999: 86). Time is treated as an entity which can be manipulated by various quantitative methods (i.e. BPR, just-in-time approach). These views of time are, however, "limited in scope and superficial in depth" (Lee, 1999:16), and fail to recognise that time is equally a relative and subjective concept and can only be explained and meaningful through events and personal experience. In other words, time is not an external entity existing outside the person, context or object, but built-in with events and consciousness.

The initial awareness of time in the present study came from the case study of JF Taiwan. It was firstly noted that individuals' technological frames changed when the circumstances changed. It was then noted that the IT history in the company, and past performances of the IS department, contributed significantly to how people perceived the problems and formed expectations of the new technology. These two observations were the simple and perhaps uncontroversial understandings of time that this study had at the beginning, and from which the decision to adopt a contextual approach was made. Developing the following case studies it became apparent that time was a more substantial issue, with a more complex and subtle character. Thus, the initial understanding of time needed to be extended and elaborated to reflect what has been discovered in the case studies. The rest of this section will, therefore, discuss various concepts of time that emerged from these case studies. Table 7.2 summarises these concepts.

Table 7.2: The notions of time

Concepts of time	Issues concerned
Time as a research component	- Chronological analysis - Time-series analysis - Contextual analysis
Time-place/space	- Local time vs. global time
Equilibrium of time	- Stability and discontinuity
Time and change	- Change involves time, and vice versa
Being-in and time	- Time is context which conditions and constitute activities and events - Timing

7.2.1 Time as a component of research design

Markus (2000) points out that IS research faces a serious problem which needs to be brought to the surface and to be dealt with: the time boundedness of research findings.

Markus argues that most empirical findings of IS research have built-in expiration dates, and writes:

> "almost any research study is at best a snapshot of a moving target, and our specific findings are almost certainly likely to hold only for short periods of time" (Markus, 2000: 45).

One way to deal with the problem is to ensure that the element of time is taken into account when it comes to research design such as when the research is conducted, how long the study is carried out, what is the history of the subject under examination. Treatment of time in research design not only has impact on *expiration dates* (Markus, 2000: 45) but also on accuracy of the research findings. In practice the element of time in research design has usually been taken for granted and is seldom touched upon in IS research. Indeed, all frequently employed research methods in IS come with built-in principles regarding time. For example, time series analysis requires data to be collected over a defined period of time; historical studies require correct chronological ordering of time; longitudinal studies require data collected cover a long period; and ethnographical study require researchers to stay on sites for a longer period of time.

The case study method as used here, like other methods, has its in-built assumptions of time, but unlike other methods the element of time is not discussed much by scholars in their research design. Yin (1994:113) suggests that the case study research method has an ability to trace changes over time and is not subject to the limitation of cross-sectional or static assessments of a particular situation. Hartely (1994) makes a similar comment about such an ability to track time:

> "Case study analysis has allowed the tracking of change over time, as a response both to historical forces, contextual pressures and the dynamics of various stakeholder groups in proposing or opposing change" (p. 211).

Hartely concludes that this ability allows those that are interested in organisational change in particular to be able to reveal the dynamics of process of change which other methods such as a survey cannot achieve:

> "Case studies can be useful in capturing the emergent and immanent properties of life in organisations. A survey may be too static to capture the ebb and flow of organisational activity, especially where it is changing very fast" (Hartely, 1994: 213).

But the experience that this research had with the case study method demonstrates that the method in itself does not have the ability of directly tracking time and changes;

rather, the ability comes from careful research design which intentionally includes the element of time. The present thesis considers time as a contextual factor, which not only needs to be analysed alone but also needs to be analysed together with other factors. Thus, different analytical strategies were adopted: chronological, time-series, contextual analysis, to deal with the issue of time differently.

Chronological analysis was employed to illuminate a sequence of events in the organisations, as it has an ability to expose potential causal relationships between events over time (Miles and Huberman, 1994; Yin, 1994). Miles and Huberman (1994) argues that chronological analysis helps to "display data by time and sequence, preserving the historical chronological flow and permitting a good look at what led to what, and when" (p. 110). Such an ability is important to the present study in particular as the study tries to establish what and when events happened, and which in turn lead to what.

The chronological method was particularly useful to the BOC case study in terms of displaying, describing, and analysing the data. The data and the analysis of the BOC case study was organised into three phases which follow neither the calendar time nor the project plan but the development of the project and individuals' experiences and attitudes towards the technology. Through the chronological data arrangement we were able to show the salience or significance of preceding events for subsequent events and establish the direct and explicit links between them. Moreover, through the chronological analysis some time-specific contextual factors were identified and then actions can be explained on accounts of these factors.

Although the chronological analysis made significant contributions to the data arrangement and analysis in the BOC case study, its significance was not found in the BIS case study when came to analyse the case. It was noted that in BIS it was the events and the quality of the events which were more important to individuals' decisions about the project, not when (context) the events happened. We see the connections between events during the WorkGroup project as weak and the timeframes of each phase of the project development was planned and pre-defined by the project team before the project started. Therefore, the time or chronological orders of the events became less significant than the events themselves. In this context, a contextualist approach was thought to be more appropriate in terms of data arrangement and analysis than the chronology (see below).

Chapter Two also reviewed CSCW literature in a chronological order with an aim to establish a research trend and trajectory of development in the field. It was then observed that there is a linkage between technology development in the IT/IS industry and development of a research agenda, as well as the trend of business practice for example, workflow systems and business process reengineering, groupware and teamwork, IS and knowledge management, web technology and e-commerce, and so on. Through the chronological analysis it was observed in BOC that the development and trend in the IT/IS industry and commerce might have influenced the company's choice and decisions about Lotus Notes adoption and later, the Internal Web project. However, this observation alone was not enough as evidence for a claim for such a relationship, a time-series analysis was, therefore, deployed to establish the trend within the IT industry and commerce. The result of the analysis strongly supported the observation made earlier, and additionally it provided an explanation for the choice of Lotus Notes made by the project team in BOC and for the decision about the project name (e.g. WorkGroup) made by the project manager in BIS.

Contextual analysis is not the same as chronology, but rather emphasises the temporality of a course of action, and the historical linkages between each course of action and its context. This was presented as part of the conceptual framework (Chapter Three) developed and used to analyse the empirical data (Chapter Five and Six). The approach provides an analytical tool to reveal a continuum between "now" and the "already been", and even more between "now" and the "future" (Ciborra, 1999: 86). In other words, the concept of a continuum of time emphasises the temporal character of an event which allows one to track the origins of actions and examines the continuance of actions. Because the contextualist approach also has the ability to link context, content and process together, the observations made through the chronological analysis and data collected through the time-series analysis can be put within a broader picture and be examined in a broader context. Hence, we have observed that all participants and their choices and decisions made about the project and technology in JF Taiwan, BOC, and BIS were influenced by IT/IS history in the organisations. The observation supports the notion of "path-dependence" (Markus, 2000) which argues that all current decisions about information systems are in part the result of past decisions about information systems, infrastructure, and so on in organisations. As Markus argues:

> "... there is a high degree of 'path-dependence' in organisations uses of information technology. The problems they are trying to solve with technology today are not merely a function of currently available technologies and immediate business challenges and opportunities. They are also a function of the organisations' long past decisions about IT management, IT spending, and IT infrastructure" (Markus, 2000: 45).

Similarly, in the analysis of a GIS implementation project in an Indian State government, Sahay (1998) notes that the past experiences with technology transfer projects remain vivid in the institution and influenced its new experience with a GIS project. He writes

> "these past experiences contribute significantly to shape expectations of actors in new projects. Attitudes to documentation and formalisation of knowledge reflect a perspective of apparent indifference towards history, and of preserving social records over time" (Sahay, 1998: 180).

It was also observed in the three case studies that current movements in the IT industry and commerce created a context to adopt particular technology (here it was groupware, and more specifically it was Lotus Notes in two case studies). By using other research design a similar observation might be made, but the analysis which takes time into account tends to be more sympathetic to particular choices and decisions about the technology and a project made by the organisations within a certain timeframe (Section 7.2.4).

In summary, Markus' concern about boundedness of time of research findings is indeed the issue of dealing with the research findings as representations of the relation between contextual factors, which are bounded by and sensitive to time. Incorporating time in a research design to reveal the *boundary of time* is the first step towards the problem of boundedness of findings of IS research, and the following sub-sections will demonstrate how the element of time can be examined and interpreted in such a way as to assist analysis to be explicit about this boundedness.

7.2.2 Time-place/space

Time and place have been linked together as a concept in which neither term is dispensable from the other, and, more importantly one in which the relation has been regarded as a fundamental issue in understanding human activity. The concept is indeed at the centre of groupware and information communication technologies (ICTs) development and adoption, as the technologies aim to stretch the spectrum of time and place. In this sense, various functions have been developed within groupware and ICTs

to enable communication in, at least, four modes: same time and same place, same time and different place, different time and same place, and different time and different place (Johnson, 1988). The four communication modes emphasise the technology's ability to remove obstacles during a communication process caused by the physical boundary by providing a virtual space.

It is important to note the different concepts that the terms 'place' and 'space' pursue. Giddens (1997) explains that *place* refers to physical settings of social activities, so the geographical boundary is real and visible and often links to other concepts such as presence and absence. Space, on the other hand, is less attached to physical settings and is the linkage of two sets of factors – "those allowing for the representation of space without reference to a privileged local which forms a distinct vantage- point; and those making possible the substitutability of different spatial units" (Giddens, 1997: 19). Most important, time is no longer bound with particular place (geographical time) but bound with the space which it associates with. It is this latter (space) that groupware and ICTs aim to achieve in order to enable communication to happen.

Groupware and ICTs not only transform physical place into virtual space but also integrates various *local* or *clock* times into one *global* or *virtual* time. Global time or virtual time, here, has two meanings. One refers to *same time*, and the other refers to *uniform time.* Based on this argument, the BIS' adoption of GroupWise and decisions about setting up discussion groups within the new system is said to be motivated by the former, while the BOC's decisions about Notes is said to be motivated by the latter.

It might have been seen that BIS' adoption of the new e-mail was to allow activities to take place in multiple local time instead of in one global time. In BIS, local or personal time and space is more important than a single global time (indeed, the focus of the project was mostly on communications within the building, and far less on communication beyond e-mail as we would understand it today). The emphasis of the IS project, therefore, was on providing people with the tools to help them to manage their "local time" and to allow them to read and communicate in their "own time" – whereas with the old system, Higgins, people were forced to read and communicate in a global time when a notification of new message popped up on the screen. The new system empowered employees to make global time become individual and local time, so that individuals could have some control over time to manage their activities.

In contrast, in BOC the expectation as well as the reason to introduce groupware (Notes) was to centralise (globalise) local times in order to match its customers' time. The similar phenomenon has been found in the literature, with a single dominant motive to adopt groupware in such organisations being to globalise various local times in a virtual work space in which people work within virtual time (Bikson, 1996; Ciborra, 1996; Ciborra and Patriotta, 1996; Failla, 1996; Harper, 1998). In this sense *local time* refers to two things. One refers to the physical nature of time which is understood to be characterised by geography. Local time can also be referred to social construction of time which is related to abstract time and only meaningful within context, for example, office hours, coffee breaks, working days. Large multinationals face a problem of standardising/centralising social construction of times created by local or regional offices regardless of removing physical local times. Information communication technologies (ICTs) are therefore thought to be the solutions by companies that wish to integrate local times into a single global time with an aim to co-ordinate activities, to harness R&D process, to speed up their response to the markets, and to build a single system interface between local offices. All of these efforts are to meet the time which is imposed by globalisation.

7.2.3 Equilibrium time

It was assumed at the beginning of the present study that individuals would constantly assess their environments, both external and internal, when they contribute to decisions about IS projects. There was, however, no evidence from the case studies to support this assumption. It was noted that individuals only assess their environments at certain critical stage during the initiation of the project or when a critical event takes place. During the initial stage of the project individuals are seen to scan and assess both external and internal contextual factors which may affect and be affected by the project, and then come to decisions which comprise all the factors. Once the project is formalised in the organisation, individuals' attention shifts to local contingencies while external contextual factors are temporarily ignored until a critical event shifts the project to another stage. *The period of time between two critical events is what we describe as an equilibrium time* (Gazendam, 1996; Gersick, 1991).

Gazendam (1996) summarises Fayol's work relating to the concept of equilibrium in organisations and explains that equilibrium is a result of a dynamic process. Around the

state of equilibrium there are fluctuations and instabilities. The concept of equilibrium that Fayol tries to depict is a balance of forces (interests), fluxes (of personnel), and phases (learning time and productive time). To achieve equilibrium, managers need to make efforts to balance these forces from different dimensions. Similarly, Gersick (1991) explains that equilibrium is a state of stability and defines punctuated equilibrium as "relatively long periods of stability [equilibrium] punctuated by compact periods of qualitative, metamorphic change [revolution]" (p.12). Stability is broken when there are modifications in external or internal conditions, innovation, and so on. Gersick called such broken stability *punctuated discontinuities,* which is similar to the concept of fluctuations described by Fayol. Similarly, Gibson and Nolan (1976) in their stage theory describe external forces as critical events which disturb the stability of the IS Management process and shift the organisation to another stage and begin a new state of equilibrium. This is why, as they explain, the curve of EDP growth is S-shaped because the turnings of the curve "correspond to the main events – often crisis – in the life of the EDP function that signal important shifts in the way the computer resource is used and managed" (Gibson and Nolan, 1976).

Equilibrium of time therefore refers to period in which "not much happens", time is motionless and frozen, and only moves again (or can be be observed) when punctuated discontinuity takes place (Karsten and Jones, 1998; Walsham, 1993). The findings of the BOC case study, however, suggest that this observation is somehow too simple and suggests that equilibrium time should be examined at two levels: macro and micro. It was noted in BOC, that stability with all forces including external and internal in a state of balance, observed at the macro level does not reflect actual happening at the micro level, where a series of small breakdowns and fluxes is constantly taking place (7.1.2). This challenges the concept of punctuated equilibrium in which changes are seen as big bang coming from "nowhere". Similarly, Weick (1993) argues that equilibrium time misleads people to think as if activities are bounded and only occur at a fixed point in time. March (1981) notes:

> "Because of the magnitude of some changes in organisations, we are inclined to look for comparably dramatic explanations for change, but the search for drama may often be a mistake, ... Change takes place because most of the time most people in an organisation do about what they are supposed to do; that is, they are intelligently attentive to their environments and their jobs."

Orlikowski (1996a:65), similarly writes:

> "organisational transformation is not portrayed as a drama staged by deliberate directors with predefined scripts and choreographed moves, or the inevitable outcome of a technological logic, or a sudden discontinuity that fundamentally invalidates the status quo."

On the one hand data from the case studies suggests that individuals do not constantly assess their environments, but only at the initiation stage of the project and when critical events happen. Thus, the decisions made at the initiation stage, once made, represent an equilibrium, and actions are carried out accordingly for some time. On the other hand, the data also suggests that this equilibrium is a false impression because conflicts between forces exist all the time and cause breakdowns which need to be fixed and brought to a balanced state.

In summary, an equilibrium is not a symbol of motionlessness of time; rather, it represents a macro-level situation in which there is a balance between external forces and individuals' choices and the decisions at that point of time. This balance will be destroyed when an event occurs and requires re-examination and order of different external forces. As a result new decisions would be made to restore a new balance. However, underneath this macro-equilibrium there are many undergoing micro changes and in respect, time is not motionless but flowing (Robey and Newman, 1996). This concept leads back to the discussion of situated plan presented earlier in the chapter that individuals have constantly to deal with local breakdowns and perhaps to make incremental changes. Dramatic changes in organisations which are expected to occur around information systems adoption are seldom observed when individuals encounter a new technology the first time, because changes need to be made in individuals' technological frames first in order to facilitate further changes in their actions towards the technology. Changes in technological frames requires time as they are made through a learning process in which individual accumulate experience and knowledge of the technology. This argument then leads us to discussion of the relationship between time and change and which is presented in below (7.2.4).

7.2.4 Time and change

Time and change, similar to the notion of time and space (Section 7.2.2), are intimately bound together. The traditional argument of the relation between time and change is that time does not exist and cannot be observed if there is no change or motion (e.g. of the Sun, Moon, etc.). Put differently, time is something that belongs to movement and

can only be observed in changes (Prior, 1997; Shoemaker, 1997). Topics about organisational and technological changes made around technology introduction have always been a main concern to many IS studies. These studies are especially interested in changes in properties of organisational and social structure due to the adoption of information technology, and to those of the technology because of socio-organisational interactions. Some established models of studying changes seem to implicitly believe that anticipated changes will occur at the time of an information technology implementation. But a body of work argues that not all changes occur instantly at a given time, rather they occur incrementally throughout the time (Ciborra, 1996a; Daft and Weick, 1984; Rogers, 1983; Rogers, 1994; Weick, 1993).

Changes take time to make themselves visible, that is, *through* time changes reveal themselves. Thus, a different interpretation of initial resistance to the introduction of new information technology in organisations emerges. We have observed in BOC that there was an initial resistance to the decision about adopting Lotus Notes which notably came from the members of Group IM. The main reason was that Notes did not run on the existing mainframe which they were familiar with, but on server technology which they knew very little about. In other words, their technological frames which provided them with understandings, images, concepts, knowledge, and heuristics about "computers" were not *up to date* to prepare them to accept the decision. In this sense, the initial resistance to a challenge to existing working practice is perhaps inevitable, since it takes time to alter the existing technological and other relevant frames in order to adapt to changes. Zuboff (1982) writes:

> "During a period of technological transition people are most likely to be aware of and articulate about the quality of the change they are facing. When people feel that the demands a new technology makes on them *conflict with their expectation* [my emphasis] about the workplace, they are likely, during the initial stage of adoption, to resist" (p.143).

This idea of allowing time to let change happen has methodological implications. The main concern here is when the examination of changes are made and how long the observations of changes last, as the answers of these questions are crucial to the conclusions drawn about the changes. That is, the timing has to be right (not too early or too soon) in order to let certain changes be recognised in their own time. For example, as reported some changes in communication patterns were observed in BIS since the implementation of GroupWise but the project manager was not sure whether

these changes were fundamental and permanent or not because it was *too soon to make comments*. The interviewees in BOC noticed that, since the market sector reform and the introduction of Notes, the company had *gradually* adopted the idea of working towards being a global company. According to them the changes might not be obvious or significant to other companies, but to a historically established company like BOC they were relatively significant. The project manager said, "you don't expect BOC to change itself over night because it is not the culture of the company. The company prefers incremental and gradual changes."

Whether a change is incremental, evolving, emerging, drifting, or improvisational depends on when and how it is examined. It means that how soon after the technology implementation the observations are made and what model is used to explain the change (i.e. static or dynamics). Psoinos (1998) notes this in a study of the role of information systems in support of employee empowerment. In the analysis of interview data and survey results a disagreement between the two sets of the data was found. The interview data suggested that time was a dimension for the success of empowerment while the survey result suggested otherwise, as explained by Psoinos:

> "The survey indicates that a change initiative that is not designed to enhance empowerment will not culminate in empowerment over time, while the interview findings refer to the fact that a change designed for empowerment will require a long period of time to show positive performance results" (p298).

Similarly, Gallivan et al. (1993) conducted a case study in a customer support department at a software company headquarters in the Midwest of the States. The department had just introduced Lotus Notes to replace its existing old databases used for customer support. Gallivan et al. suggested that the system was successfully adopted in the company for a number of reasons: user-centred development strategy, a phased implementation strategy, and compatibility of the groupware applications with the department's cooperative culture. The case study (1993) was carried out in the company about a year after the adoption (1992) and the changes noted by Gallivan et al. were mainly made intentionally. A follow up study was carried out by Orlikowski (1995) two years after the Gallivan et al. (1993) study and this time changes made unintentionally, and opportunistically, were observed together with other changes that emerged during use of Lotus Notes. The length of time involved in a study determines the types of changes observed. As Orlikowski (1996b: 57) writes, "changes will evolve over time out of the practical experience of using groupware technology to solve

particular and ongoing organisational problems and from initiating innovation and adaptation of both the technology and the organisation as appropriate."

Another phenomenon of time and change observed in the case studies is that changes may be driven by *the change of time* which refers to the changes in environment caused directly by changes of time dependent contextual factors. For example, the decision about replacing Higgins with GroupWise in BIS can be interpreted as necessary to reflect the change of time. The introduction of Microsoft Windows 3.1 in 1992 had shifted the software industry and IS design to another era, and the DOS based Higgins and other similar products became increasingly unacceptable by their users. Consequently, DOIS was forced to make a decision about replacing the existing system. Similarly, the idea of being a global company and working together as a global team which in turn led to the decision about marketing sector reform can also be interpreted as the result of the change of time. It is that the change of time (i.e. being globalised), which forced BOC to re-examine the existing business strategy (i.e. local and regional oriented). This notion of time leads to an idea that time in itself is a context which constitutes and conditions events to take place.

Giving consideration to time, changes around technology adoption should be viewed in different stages and assumed to have different impacts on organisations. Changes which require a short period of time to be revealed usually are those that do not need fundamental changes to be made in technological frames. Likewise, fundamental organisational changes which requires individuals to alter or even to adapt to new concepts and working practice usually need a longer period of time to let them emerge and happen. Hence, changes such as opportunist, appropriating, emerging, drifting, or evolving need a longer period of time to be revealed. Sometimes, changes are driven by changes of time, that is, changes occur naturally or inevitably when elements within the environment change. In this respect, to know *when* changes occur becomes important in order to identify the nature of changes and explain the actions undertaken.

7.2.5 Being in and time

It has been demonstrated in the above discussion that the initiation of an IS project is no accident (it has a history), and the decisions made about the project are time dependent. That is, the contents of the project and decisions are affected by *when* the project is

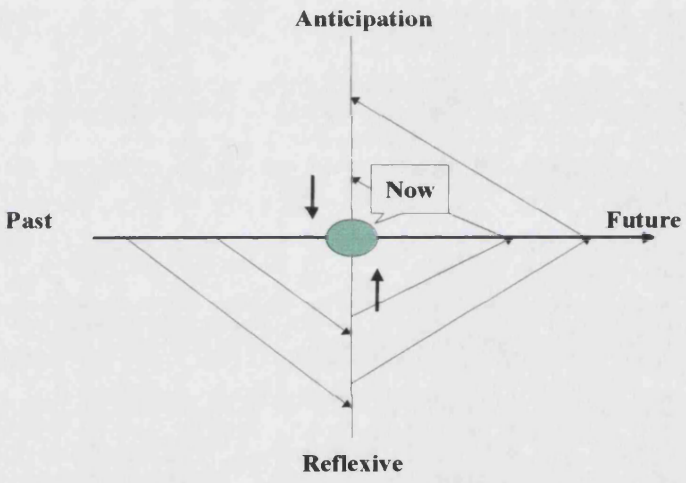
initiated and decisions are made. When, here, is *not* what time but which period of time. This stresses the importance of the notion of *being in and time* for research findings. *Being in* is noted in the case studies not as physical presence but in an existential sense. Time, here, is marked and constructed by a series of significant contextual occurrences; and *being in* means in a particular situation at a particular time. To be more precise, the notion of being-in here is temporal bounded and can be illustrated by clichés such as "in that time", "in that era", or "at the right time".

The idea of **being in that time** (at a particular point of time) is to argue that time is a context which constitutes and conditions individuals' actions and social movement, and being right here at this point of time has different implications and impact from being here then. Based on Schutz's work on phenomenology, Ciborra (1999: 84) writes "meaning of an action may *be relative to a particular moment in time* [my emphasis], and to the recollections the actor is able to perform in those particular circumstances." In order to understand one's actions Nardi (1996: 70) argues that to study a time specific context in which actions are undertaken is the key as it "means finding oneself in the thick of the *complexities of particular situations at particular time with particular individuals* [my emphasis]." Similarly, Lave (1988) argues that *a one-time solution is to a one-time problem*, involving particular individuals and circumstances, and artefacts.

These case studies suggest that the position of time at which individuals are situated impacts on individuals' actions towards the technology in two steps. It firstly affects individuals' activities of reflexivity. Where individuals are situated *now* determines what past experience individuals are able to recall to assist to make sense of current situations. It is worth noting that this recollection is not how *old* the experiences should and will be recalled, but what similar experiences are there in the past to deal with similar present situations. Individuals also go beyond just recalling past experiences but monitor the recollections in accordance with the current situations (self-interaction) and then take action. Similarly, the position in time will affect the formation of anticipation as individuals project reflexivity in the future and form their anticipations of the technology. Therefore we know that to understand *now* is important as it provides the individual with an immediate context to link what has happened and what is going to happen.

Figure 7.3 illustrates the above idea. Assume that an individual is situated at the point of time called now when he/she comes to face the technology. The individual recalls experience with the same or similar technology and re-interpret the experience within the context of *now*. With the interpretation of problem and technology which comprises the reinterpretation of the past experience made in the current context, individuals then anticipate likely outcomes of the technology adoption, project this perceived outcome into the future, and their expectations then are formed and decisions about the technology are made accordingly.

Figure 7.3: Being-in Time



Source: Adapted from Ciborra (1999).

In the BOC case study, the point of time at which the decisions about market sector reform and the choice of Lotus Notes were made, was a period when the global economy was in recession, the IT industry was marketing groupware (i.e. Lotus Notes), and organisational studies emphasised globalisation and teamwork (the point of now in the diagram). The Managing Director called upon the past experience of dealing with the customers and took consideration of the current situations, then formed an anticipation of what BOC would like to be in the industry (i.e. still to be the industry leader) once the recession finishes. Based on such anticipation the Managing Director took a decision to reform the market sector. Similarly, the point of time at which BIS was thinking of replacing the old e-mail system was when the system was completely out-of-date in relation to the development of the IT industry and where pressure from users was inescapable (the point of now). The DOIS recalled their past experience such

as solving the problems caused by Higgins and familiarity with Novell networks, and together with the current situation it then formed an expectation of what qualities of the new technology should have. The DOIS then took decision to implement GroupWise.

The emphasis on a given point of time "now" is to portray a context in which actions take place in order to understand them both in the context and position, which individuals then take. Moreover, it also allows changes and actions to be explained as "inevitable" or as a product of the situation, and provides more sympathetic views about consequences of some decisions or actions.

Another type of relationship between being in and time found in the case studies is *being in that era.* The idea of being in that era is built upon the ideas of time as a context as well as change of time (Section 7.2.3), and emphasises the movement of time. The movement of time is not about the movement of the Sun and Moon, rather it is about the shifts in industries, economies, or politics. It was noted in the case studies that the development in the IT industry (including software and hardware) has provided contexts and even pressure to commerce to adopt particular technology. Thus, the decisions about marketing sector reform (i.e. globalisation and economy recession) and choice of Lotus Notes (i.e. Notes was more publicised than other groupware) to support the reform in BOC and the decision about replacing Higgins in BIS (i.e. the era of Windows operation environment) then could be interpreted as products of being in *that* era.

Individuals' attitudes towards technologies may change according to the shifts of time. In 1988 Grudin (1988) was discussing why groupware failed to live up to expectations but in 1995 Grudin and Palen (1995) discussed why groupware was succeeding. Although these two papers are separate and independent studies, the conclusions drawn from both studies might be seen in this sense as time (era) dependent. In 1988 or earlier groupware was still an innovation and ideas introduced by the technology were new to most people not to mention a lack of experience of managing the technology. By 1995 groupware was no longer a stranger to many and the relevant experiences of managing the technology and the users had been learnt (Section 2.1.1 and 5.2.1). A similar phenomenon was found in BOC. For example, the popularity of the Internet in the recent year has changed the staff's attitudes towards computers such as the expectation of certain user interface (i.e. point and click) from BOC. Hence, Group IM's proposal

to replace Lotus Notes interface with Internal Web partially originated from the idea of the rising number of people browsing in the Internet (Chapter Five) and the proposal was warmly welcome by both management groups and users.

Finally, being-in the "right" time is equally important as being at a particular time and being in that era because good timing can provide a context which enables things to be achieved in a better fashion. At BIS there was a six month delay in the project time because of the reshuffle of the senior management. Initially, the project team was not too happy about this but the delay worked out in favour of the project overall. Because the newly appointed General Manager was interested in making e-mail an official communication means in the Bank, and because of his public endorsement of the project, the rest of Bank received a clear message of the importance of the project, that is, the project ends up in the right time.

In the case of BOC the timing with the introduction of Lotus Notes at BOC can be said to be inappropriate and too soon; as a result it caused the employees frustration and led them to reject the system. It was bad timing because the company had only just begun to perceive of itself as a global company and to ask employees to think of themselves as working in global teams instead of local or regional ones. The rush into the introduction of Lotus Notes only brought in additional unknown variables in the organisation, in addition to networked PCs and client-server computing being unfamiliar to employees and IM personnel. Therefore, on the one hand the employees needed to become accustomed themselves to the new corporate ideas and learn to work together across regions, and on the other hand they had to struggle to use and make sense of the new technology introduced to them. It is then no surprise that the use of the technology did not meet BOC's initial expectations. Comparatively, the introduction of the Knowledge Management and Internal Web program seemed to have had better timing: by then BOC had gradually become used to the idea of being a global company and had become familiar with a number of innovations, the introduction of Domino by IBM, the popularity of the Internet in general, and support from the new IM Director. All in all, the program attracted better publicity and had a better profile in the company.

From the above discussion it is evident that there is a strong link between decisions about technology, being in, and time (i.e. at a particular point of time, in that era, and at the right time). The recognition of this link provides an alternative explanation as to

why organisations choose to adopt one type of technology rather than others by examining the temporal characteristic of the decisions. Individuals' attitudes towards technology (technological frames) change along with the movement of time. Thus, the timing of introducing new system into organisations become a crucial element for a successful technology implementation

7.3 CONCLUSION

This chapter has re-interpreted the findings from the case studies in a broader context to bring together the specific findings from each case study. Generally speaking, the research findings from the case studies have supported and enriched the initial understandings of assumptions and arguments made at the beginning of this thesis. Ontological and epistemological arguments have been discussed in various occasions in IS research including research methodology (Chapter Four of this thesis) (Baroudi and Orlikowski, 1989) and systems design (Hirschheim, 1989, 1999; Wilson, 1999), but this thesis employs these concepts to assist it to understand reasons behind the overt rationale of particular decisions.

The discussion of the concept of the situated plan has shed light on the idea that decisions are time and context specific. A situated plan can be portrayed as an emergent process which cannot be fully articulated and predicted in advance, but which involves acknowledgement of various actions that might be undertaken to respond to unanticipated subsequent outcomes of the previous actions and contingencies. Each action taken to respond to the local situation may create an awareness of different opportunities for action, which in turn affect the following actions. The idea of a situated plan provides an alternative view to examine unexpected and unintentional actions and outcomes during project development.

The discussion of various issues of time that emerged from the findings of the case studies could be said to be the most important finding of the present study. The issues include time as a component of research design, time – place/space, equilibrium time, time and change, and being in and time. By taking these issues of time into account alternative interpretations of the findings are arrived at to enrich the initial understandings of the case studies. A number of important points have been made regarding time. First, researchers should be aware of the element of time during the

research design and analysis because phenomenon under study is time and context specific. Second, time is no longer bound with the national or regional boundary (place) but with the space, therefore, to manage activities taking place in the virtual space requires understanding of different dimension of time. Third, most changes do not occur in a big bang fashion rather, they usually have histories and trajectories that must be studied. Thus in order to understand change to trace back to their origins is necessary. Finally, timing is as good as other attributions to a successful project. These concerns about time have brought attention to the role of time in research design, analysis, and development of findings, is more complicated and important than that it is currently assumed in IS research.

The next chapter (Chapter Eight) is the last chapter of this thesis; it will summarise the thesis; discuss the implications of this research for IS research and practice; report on its contribution to the current body of knowledge; comment on limitations in this research; and areas for further research.

CHAPTER 8

CONCLUSION

This chapter is the closing chapter of this thesis. The first section (8.1) overviews the research and its findings and is followed (Section 8.2) by a discussion of the implications for IS research and practice. The third section (8.3) draws together the preceding discussions and assesses the contributions of the study in the wider scope of IS research; and the fourth section (8.4) discusses the limitations of the research. The chapter ends (Section 8.5) with suggestions of possible areas for further research.

8.1 OVERVIEW OF THE RESEARCH

This study began with a general interest in CSCW and groupware, and its focal objective was developed only after the preliminary case study (JF Taiwan) had been completed (Section 1.2). The study conducted in JF Taiwan was commissioned by the senior manager of the company to identify possible areas in which the company could benefit from Lotus Notes. Several interesting issues emerged from the study, but one finding in particular attracted attention because it did not support assumptions made in most CSCW literature.

The finding suggested that an organisation may choose to adopt groupware not necessarily for the functions that the technology provides or from business requirements but for other reasons. For example, JF Taiwan considered that implementation of Lotus Notes was not because it recognised or understood the potential advantages of using the technology, but because of political pressure from the HK office. Furthermore, the lack of knowledge of groupware and of Notes led staff to formulate expectations and requirements for the system on the basis of subjective perceived problems and personal

experience with other technologies. In this sense, various expectations and requirements were articulated by the employees, each of which reflected individuals' local situations. The finding challenged the general assumption shared in the CSCW domain that organisations realise the benefits offered by groupware (e.g. enabling team/group work, improving communication, allowing information sharing, and removing obstacles caused by time and place) and choose groupware simply because of these (supposed) benefits. The finding also sheds light on a long-standing and taken-for-granted issue that decisions about technology are not always made on an objective and rational basis but are situated and emerge out of a complex local and global context.

A review of the current CSCW literature was presented in Chapter Two. The review showed that most CSCW studies focus on three areas: application development, workplace study, and technology use study. The first one is research about "CS" (computer-supported) and the last two are about "CW" (cooperative work). Each of these focuses on a different stage of an IS project. For example, workplace study is conducted to understand the work process in a workplace which is considering adoption of technology. Technology use study, in contrast, is carried out after a system roll-out to study interaction between technology and its hosting company. Analysis of these three areas showed that research directed at the process of selecting a particular system, at the initial stage of IS projects, was missing from current studies.

Learning from the preliminary case study, it seemed that the process of determining which technology to put in place, has profound influence on the successive events or, at the extreme, directly on the outcome of the adoption. For example, it was observed at JF Taiwan that there was little consensus between departments and between employees about the purposes that the new system should serve, and there were also conflicts between various interests and expectations about the new systems. Further, it was noted that employees made decisions about system requirements on the basis of emotional feelings about problems and about the existing system. Several questions therefore emerged about: what would happen if a company chose an inappropriate technological solution and, in circumstances where the outcome of a chosen solution proved unsatisfactory, whether the technology should be blamed for this outcome. But such questions cannot be answered when the process of why technological solutions are

sought after, or how a particular solution for a problem-situation is chosen, is taken to be a black box.

The focus of the present research, therefore, developed from the synthesis of the findings of the preliminary case study with those of the literature review; and was formulated to investigate the origins of technological solutions. The issues that emerged as needing to be addressed within such a research scope were, firstly, why a particular system is chosen by participants involved in the selecting process; secondly, how participants formulate the problems and determine the purposes of the system. These issues were approached from a social cognitive perspective which focuses predominately on individuals' subjective perceptions and expectations.

The technological frames analysis developed by Orlikowski and Gash was employed to help to examine individuals' cognitive properties concerning information technology. The underlying assumption of the framework is that people's attitudes towards the technology are determined by the meanings of the technology for them personally. The meanings of the technology are derived from frames of reference with regard to information technology in particular, Orlikowski and Gash naming this specific set of frames as technological frames. Technological frames consist of a set of assumptions, knowledge, and experience of the technology. Technological frames differ from one individual to another. Because individuals interact with others at the workplace and because their personal circumstances change over time, technological frames change accordingly; so do the meanings that become assigned to the technology. In order to capture the dynamics of technological frames and the subsequent changes prompted by the changes in the frames, a contextualist approach was employed. The approach emphasises that the process of change is subject to the context in which the process takes place at particular points of time. It also stresses the links between a present event and its past and its possible future. A synthesised conceptual framework on the basis of the technological frames analysis and contextualist approach was then developed to help to understand the topic chosen (Chapter 3).

Examining the underlying assumptions of its arguments in four perspectives (ontology, epistemology, human nature, and methodology), this study views itself as falling into the interpretive paradigm (Chapter Four). The paradigm claims that reality is socially constructed (ontology); that reality is perceived through the lens of personal experience

of the world (epistemology); and that a social science should not be studied in the same way as the natural sciences. For an interpretivist researcher, interpreting and understanding a situation is the process by which to generate knowledge of the social phenomena. Two possible methodologies within the interpretive approach are ethnographic study and case study, but for objective reasons (i.e. time scale, gaining access to the field, and the purpose of this study) the case study approach was chosen. The case studies were conducted at two sites: British Oxygen Company (BOC Group), and the Bank for International Settlement (BIS).

The case studies (Chapter Five and Six) were organised and described according to the conceptual framework developed in Chapter Three. The findings of each case study were discussed separately. Chapter Seven then brought together the findings of the two case studies and examined them in a wider scope in order to draw attention to both general and specific issues derived from the case studies. Overall findings of the case studies supported the assumptions and arguments made at the beginning of the study and illustrated the process of initiating technological solutions and determining particular technology adoption as, indeed, complicated and interesting. Also the case studies demonstrated that various activities taking place within the process could in fact directly contribute to successive activities. Deriving from the synthesis of the findings of the three case studies, this study re-interpreted the findings from the case studies in Chapter Seven to provide an interpretation across case studies and in relating to other studies. The re-interpretation of the findings covers three areas including ontological perspectives on technology, epistemological perspectives on choice- and decision-making, and situated plan. These three areas represent two essential elements in the synthesised conceptual framework developed in Chapter Three – technological frames and context. The discussion supports the arguments made earlier in this thesis that choice and decision about system adoption reflect individual/group knowledge and experience and human response to the context. Another element of the synthesised conceptual framework – time, was discussed separately in different section (7.3) since it was discovered that this element in itself is far more complex and important than was originally assumed. The discussion illustrated a number of concerns about time that sheds light on how the issue has been overlooked in previous research; discussion also enriches current understanding of time in research design and analysis.

8.2 IMPLICATIONS

The research question which this thesis tries to answer has drawn attention to a new dimension for studying the origins of IS projects. It has recognised and identified a number of cognitive properties that play out when individuals encounter technology. The findings from the research case studies suggest that an ontological perspective on technology and its relation with an organisation and its staff, that an epistemology of decision making focusing on individuals' own knowledge and experience, and that the situation in which events take place as well as the time at which a project is initiated and a research study is undertaken, all contribute and enrich understanding of how and why decision about adoption of particular technology are made. This research as a whole and its findings has, therefore, a number of implications for research and practice and the table below (Table 8.1) summarises them.

Table 8.1: Implications

Implication for research
Knowledge, experience, expectation and technology adoption
Organisational learning around technology
Time in IS research
Implication for practice
Managing initiation of an IS project
Time and IS management

8.2.1 IS research

This thesis and its findings have implications for research on social cognition and technology adoption, organisational learning around technology, and the concept of time in IS research design. The findings of the present study show that individuals' choice and decision about particular technology are heavily affected by their knowledge, experience and expectations. When individuals need to make decisions about technology adoption, they tend to recall *their* past experience with other technology, rely on *their* knowledge of technology, and *their* perception of problems that the technology is supposed to resolve. In other words, decisions about adoption

may represent some decisions makers' or a group of individuals' *perceived* not actual organisational needs. The establishment of the relation between knowledge, experience, expectation and information technology adoption stresses that studying decisions about adoption is indeed an ontological and epistemological issue. In such a context researchers are required to understand issues that surround information systems adoption from inside (participants' point of view) instead of from outside. That is, the organising visions should be employed with care when it is used to evaluate implementation outcomes of a specific information system. For example, the issues such as the level of appropriation of technology taken place in organisations, the degree of representativeness of organising visions in the context of particular organisations need to be taken into account in order to assess the outcomes in the context.

It is evident that knowledge, experience and expectation have a historical dimension (accumulated), a present (feedback from the consequence of current action), and a future (accumulating, changing, and modifying the existing frames for future reference). Technological frames analysis has demonstrated its ability to track changes in the contents of individuals' technological frames; and therefore, through analysis, the production and reproduction of meanings that technology has for individuals can be observed. The production and reproduction of meanings of technology, indeed, reflects a learning process occurring around the technology. In order to reveal the quality of the learning process within the organisation, researchers should be encouraged to record people's thinking before changes (i.e. business process re-engineered, installation of new information system), differences between previous and current thinking, the reasons that people think differently, and so on.

The concerns about time that emerged from the re-examination of research design and analysis and research findings of the present research have a number of implications for IS research. First, the concerns alert us to the fact that the element of time can actually make a difference concerning what and how other contextual factors are seen and interpreted. This is particularly important to those studies that are interested in organisational learning or change, because different types of organisational learning or change require different lengths of time given to data collection and observation (Section 7.2.3). So, to avoid any ambiguous analysis and finding, researchers are first required to decide the type of learning or change that is under investigation in order to

calculate and determine the length of time to be given to the investigation. Moreover, the notion of time draws attention to the issue of selection of an appropriate research framework which is able to capture and inform dynamics of time. The concerns about time have, to some extent, answered the questions which are raised by Markus (2000: 45) as follows:

- How can we deal effectively with the time-boundedness of our findings?

- How can we meaningfully study the evolution of organisational IT efforts over time, while technologies, business conditions, and the names we give to concepts and technologies are changing continuously?

- How can we deal effectively with path dependence: organisations very different positions with respect to given technology initiative today owing to their past choices?

The notions of change and time and being-in time and have implication for the argument of inevitability which argues that events are enabled and constrained by the point of time at which they happen. Put differently, the argument sees that a point of time, which is characterised by events happening, actually creates a special context in which things take place. Thus, some choices and decisions may be viewed afterward as irrational and inappropriate, although at the given point of time they can be seen as indeed appropriate. In this sense, it is salient to examine and perhaps separate out time dependent contextual factors found in the environment at particular points of time. To separate time dependent factors is necessary if an investigation is interested in finding out factors which affect organisations' decisions about information systems adoption. The distinction between time dependent and (relatively) independent influences may help to establish a picture of whether the information systems adoptions is due to the fear of being left out the mainstream of technological development, "everyone is doing it" syndrome; or due to the political pressure at a particular time (Drury and Farhoomand, 1999; Swanson and Ramiller, 1997). The conclusion drawn from an analysis of the two sets of factors (time dependent and independent) are likely to be different compared to an analysis which does not distinguish the difference.

Another area that we believe the concept of time derived from the findings has implications for is Internet related research such as distance learning, e-commerce, e-business, and other e-related topics, all of which require us to broaden traditional views of time and space. In other words, the concept of time and space is less bounded by physical and geographical places but becomes more abstract. Various research issues need to be re-examined once we break away from the traditional thinking of time and place and move to cyber time and space. For example, "whether social relationships will change due to the lack of "real" time and place?", "Has time in cyberspace become ever so important (i.e. expectations of instant response) compared to its position in the real world?", "Is global time desirable or should employees be empowered with local time to manage their own activities?" To approach the concept of time and space/place differently and to investigate phenomena accordingly in today's e-culture society is both necessary and inevitable.

8.2.2 IS practice

This thesis and its findings also have implications for IS practice. It is noted that a project with less specific aims and objectives is more likely to invite different interpretations. The number of different interpretations can be assumed to depend on the number of interest groups involved, as well as responding to how general the aims and objectives are. In this sense, when the number of interest groups involved or when aims and objectives are broad and less specific, the number of interpretations of the project and system increases. The implication of having a large number of interpretations of a project or system is that the project can be driven into different directions and lose its initial aim (but there is an opportunity that a new and more appropriate one is formed). Project initiators and IS practitioners should either ensure that there are minimum possible ambiguities embedded in a project's aims and objectives or to learn to live with a situated plan. IS practitioners should harness the interpretation process by ensuring that leveraging knowledge and perception of project and technology takes place.

Previous IS research argues that the conflicts come from individuals' political and social differences within an organisation (Checkland and Scholes, 1990; Mumford and Weir, 1979), but the findings of this research add another dimension which argues that conflicts are caused by individuals' personal beliefs in and experiences of technology

(from ontological and epistemological perspectives). This means that IS managers or Chief Information Officers (CIOs) not only need to ease tension caused by political and social differences but also to "leverage" knowledge and perception of technology in order to achieve common understanding of projects and purposes of new technology.

To leverage knowledge and perception of technology within an organisation Orlikowski and Gash suggest that communication and training are the possible means through which individuals may be able to use the technology in a similar way. On the other hand, Marshall et al. (2000) argue that providing users skills and knowledge of the new technology through training adds only marginal benefit to the adoption since the use of technology largely depends on individuals' knowledge of the tasks which they perform. In this sense, it is not only training on the new technology is needed but also tasks related to education and communication. These arguments have been supported by the findings of the research case studies presented in this thesis that illustrate that when people are confronted with the technology they consult other frames (i.e. business, tasks) too. The implication is that a collaborative relationship between IS, business, and human resource departments should be established to provide members of staff appropriate skills to enable them to use technology and knowledge to perform their tasks in order to optimise potential benefits of technology to work.

According to symbolic interactionism individuals perform self and social interactions before they take actions towards events, in this thesis, technologies. Providing training and education only enables people to form appropriate perceptions of technologies but whether individuals perceive that technologies are useful for their work depends on how other people act towards the same technologies. This explains the existence of "wait and see" attitudes towards technology when the technology is first introduced to people. The attitude is potentially harmful to the performance of groupware in particular because it relies on critical mass (i.e. the number of users using the system) which means that the more people wait and see the less people use the system and the less benefit of groupware will be realised and more people wait and see. The loop will eventually lead to abandonment of the system (Grudin, 1988; Markus, 1990). To reduce the number of people who wait and see therefore becomes an urgent agenda for IS managers and CIOs who wish to adopt groupware or another innovative technology. In order to avoid an undesirable outcome efforts to understand and resolve the *wait and*

see phenomenon are needed, and if necessary changes in organisational properties (i.e. structure, reward system, process) and in system (i.e. interface) may need to be made.

The development of groupware and more recently the Internet has inevitably stretched the time and space/place spectrum, and the outcomes have gradually led companies to think and do business differently. This imposes increasing pressure on IS practitioners to provide services to meet the changes. An immediate concern caused by the absence of physical time and space/place is whether managers can integrate local time into one global time and at same time provide local autonomy and discretion over activities This question/problem has created much distraction in some multinationals (Chapter 2.1), and sometimes it is distraction that can lead to disappointments. A reason for this found in studies undertaken by others is the power struggle over ownership of time. As discussed earlier, in many modern societies *clock time* has replaced *task-oriented time* and is used to evaluate individual performance. Hence, questions such as "Your time or my time", and "Who controls the time?", become political issues rather than a simple matter of time management within companies. Awareness of this problem is required and organisations may have to prepare for radical changes in this area in order to maximise technology capability.

8.3 CONTRIBUTION OF THE RESEARCH

This study takes a special interest in the influences of individuals' perception and expectations of technology on their decisions and choices about the initiation and acquisition of a specific information system. This research interest and its findings have contributions to three broad areas in IS research: theory, methodology, and practice. The discussion in this section is organised accordingly.

8.3.1 Contribution to theory

Theoretical contributions of this study to IS research are several. First, the research topic on in its own contributes to the current body of knowledge since it addresses an area which is less well researched. Second, it contributes to the IS domain as there is a possible application of social cognitive theory (SCT) in order to understand thinking behind decisions about adopting a particular technology. Third, the critique of the technological frames analysis contributes to the present knowledge of work on frames.

What makes this study different from others is that it approaches the research topic from a social cognitive perspective, together with associated empirical evidence in order to support its argument. The findings derived from the case studies provide evidence that decisions about a technology in the initial phase can affect, for instance, the functions provided by the software package or system to be built or used; the scope of a project; resources to be allocated, and so forth. These decisions, it is suggested, have lasting effects on the downstream activities (Grudin and Markus, 1997). This insight contributes to the argument for the continuity of IS development as it demonstrates that the reflexive monitoring of IS development cannot be undertaken by using a segmental approach which views each happening or phenomenon as one-off and without a history. Rather, it shows that happenings have history and evinces that, in order to reflect current situations, it is necessary to track their origins.

Another theoretical contribution is the validation of social cognitive theory (SCT) and the demonstration of possible applications for IS research. As discussed in Chapter Two, only recently have people begun to realise that users' attitudes towards technology are not always determined by environmental forces external to them but may be determined by individual cognitive properties. Some researchers introduce cognitive properties and emotions as a device to measure and predict user acceptance of technology, but applications of SCT deployed in IS research remain few. This study *re-introduced* the technological frames analysis as an analytical conceptual model to demonstrate that SCT can be expanded to take on board the social issues that sculpt individuals' cognitive properties so as to understand and explain the phenomena from a different angle. The recognition of individuals' cognition and emotion, and the influence this may have on individuals' attitudes towards technology, gives an alternative explanation which rational models cannot provide. The power to explain the situations at an individual level makes SCT, as well as the frameworks built upon it, complementary to social theories that concentrate exclusively on contextual/environmental forces or factor models.

The study's contributions to the technological frames analysis per se are twofold: firstly, the findings contributes to the research areas, identified by Orlikowski and Gash, which needs further investigation; secondly, its critiques of the framework enriches the initial assertions made by Orlikowski and Gash. Orlikowski and Gash pointed out a number

of areas which need further investigation; and this study contributes to identification of the means used to reduce frame incongruence and to examination of the conditions under which frames change in particular (Orlikowski and Gash, 1994: 201). In terms of the means to reduce the frame congruence, this study demonstrates that techniques such as packaging and repackaging the image of the technology (BOC), framing and reframing the problems (BIS), borrowing power from the management group, talking in different languages, and so forth, all contribute to the process. Technological frames change, it was observed, over time, but in so far as the content was concerned the findings do not show that frame incongruence inevitably reduces, in fact, in the case of BOC frame incongruence was reinforced over time. Employment of the contextualist approach helps to capture the process by which technological frames are shaped and reshaped because of some internal and external triggers as well as changes that lead to further changes in individuals' actions towards the technology.

The critiques of technological frames made by this study have contribution to the technological frames analysis. Based on some fundamental premises of symbolic interactionism the arguments focus on the neglect of self and social interactions that individuals have with themselves and with others, in achieving changes in technological frames. Building upon the argument this study suggests that these two components (self and social interactions) should also be analysed in the context of changes in individuals' attitudes towards the technology. The expansion of the framework can now allow one to explain individuals' "wait and see" regarding the use of the new technology and to examine the relation between social interactions and changes in individuals' personal technological frames.

An unanticipated contribution that this study has for IS research is its discussion of various concepts of time with implications for IS research in general. The contribution is unanticipated because the element of time was considered and treated as a critical contextual factor which constitutes the condition under which the process takes place and time was not expected to play any other role in the study. Yet, at the end of the research it became apparent that time as a research context and a conceptual element of models of IS initiation is far more important than was initially expected. In fact, time deserves a forum dedicated to it in IS research. The discussion of time (Section 7.2.1) reviews and summarises the literature which may or may not make the role of time

explicit in research, and together with experience derived from this study some implications for IS research are suggested. The study has brought the role of time which in the past has been taken for granted in IS to the surface; and has established some possible areas for further research (Section 8.4).

The finding contributes particularly to research which investigates learning around the technology, as it provides a micro-level analysis to understand individuals' and groups' perceptions of, and actions towards, technology. This study reveals a process of individuals' or groups' technological frames changing from one state to another because of changes in the environment, accumulation of knowledge and experience with other technologies, and because of interactions between individuals. The process can be seen as a learning process in which individuals accumulate their knowledge and experience of technology through interaction with the technology. The process of learning can be observed through examination of the changes in the contents of individuals' and groups' technological frames.

8.3.2 Contribution to research methods

This study claims three methodological contributions to IS research. First, the link between the research objectives and the research designs made by systematic review of the most frequently employed research methods in the CSCW. Second, it demonstrates how secondary data sources can be used to support the primary data. Third, it raises a number of concerns in relation to time within research design.

In contrast to the mainstream of IS, research methods have not been seen as a substantial issue in CSCW. Some researchers from the sociology discipline may have published a series of papers to discuss and promote the use of ethnographic (Section 4.1) research approach in order to study work and the workplace, but in general discussions about research objectives and designs are not extensive. The systematic review discussed in Chapter Four is the first original study undertaken in the CSCW domain. In addition, the review of methodology in the CSCW domain has highlighted several issues which have not been previously explored. First, the research objectives and designs tightly link to the development of CSCW research. For example, in the early days when CSCW technologies were not widely available to the user community, laboratory or classroom based, experiments were popular; and case study method and

action research method only became popular at the later phase of the development when technologies had become available for sometime. Second, although there is a lack of discussion about methodological issues in CSCW, researchers do not seem to worry about it. It was observed that scholars from different disciplines appear to adopt the research methods with which they are trained and familiar. Therefore, sociologists use ethnographical study method; IS researchers use case study; computer scientists use laboratory experiment and simulation. The above methodological issues have not been previously discussed in the CSCW domain, so this study can claim originality for these observations. When compared to the multi-disciplinary and high–profile discussions about research methodology in mainstream IS research, the phenomenon is seen as rather interesting.

The second methodological contribution is the demonstration of using secondary data sources to support the primary data in the case studies. The primary data source of the case studies was interview transcripts, but other data sources were also collected and analysed in order to triangulate and complement the primary data. Using documentation to support primary data or undertaking research solely on the basis of it is not new and has been discussed by researchers (Yin, 1994; Forster, 1994). Yin suggested that if documentation is closely analysed it can corroborate and augment evidence from other sources; and Forster (1994: 164) claims "the analysis of company documents can bring fresh insights to our understanding of organisational behaviour." The experience of using this method to track the pattern of individuals' perceptions of their situations and attitudes towards the technology over a period of time has proved that documentation analysis is particularly useful for the studies that are interested social cognition because of its ability to provide historical evidence of individuals' attitudes then up to now. In this study, documentation analysis is also proved to be a method to interpret interviewees' "rewriting" of history in later oral accounts.

Despite the significant benefits that can accrue, it is evident that the nature of documentation has been downplayed in most IS research. It is common for the reliability of a study to be determined by the number of the interviews conducted (the more the better); and to legitimate this practice most published research papers stress the number of interviews only, the quantity of documentation reviewed being rarely stressed. This lack of appreciation of company documents may be because of a general

misconception of what documentation can do. For example, to some researchers company annual reports may be regarded as serving the purposes of public relations (PR) and providing accounting figures to satisfy shareholders. In contrast, this study has demonstrated that, by closely examining reports from Chairmen, Chief Executives, and Managing Directors (the case of BOC) over a period of time, the process of organisational changes can be perceived. The demonstration undoubtedly sets an example for future research of how the annual report can be employed to serve a research purpose.

This study also took advantage of on-line information to conduct a survey to define trends in the development of groupware in commerce. The technique follows the citation analysis (Culnan, 1986; Orlikowski, 1991) principal to search on-line databases (i.e. *ABI/Inform*, *Financial Times* on-line archives) for published articles which discuss groupware and relevant concepts. Data collected via this method can be used to establish conditions under which a process takes place, as the periodic data reveals a dynamic process of how a concept/technology arises, grows, matures, and even declines. Also, collecting data by using the on-line survey, a larger sample size can be obtained at relatively lower cost compared to the traditional distributed survey method. Relying on on-line information to conduct survey has not been widely adopted in IS research but it has potential. Students who have limited time and resources to conduct primary research could be encouraged to employ the method; and so should researchers who need to establish the scope of a particular development.

The discussion of the notion of time in research design and analysis is another important contribution to research methods in IS. The notion of time, as shown by this thesis, is critical to research findings since it is not only a contextual factor which sturctures phenomenon studied, but is also a element built-in with other contextual factors. The experience of adopting different analytical strategies (i.e. chronological analysis, time-series analysis, contextualist analysis) to deal with the problem of time, and the incorporation of these strategies as part of research design to manage data collection and analysis, has been proved to be useful in terms of identifying and distinguishing whether time is a context or a contextual factor contributing to a phenomenon. The contribution of the discussion of time is its efforts to make time explicit in research

design of case study method in IS research, since the issue of time has been taken for granted in the method in the past.

8.3.3. Contribution to practice

This study claims contribution to IS project management in particular. Three areas to which this thesis contributes are: (1) the scope of project management at each stage of a system life-cycle; (2) appreciation of individuals' ability to interpret a project; and (3) differences of attitudes towards a technology.

The argument that an IS development is a continuous and open-ended process has been stressed several times in this thesis as it informs the concept that every phase of a systems life-cycle is important to an IS project and that no one stage should be seen as more important than any other stage. This concept is not new and has a long history in IS management, but there has been an institutional bias as the majority of published research is seen to be more interested in certain phases of a system life-cycle, for example, post-implementation. As a consequence, misconceptions of what is and what is not important are formed, and research continues to be carried out in such a way. This thesis provides theoretical arguments and empirical evidence to illustrates the relations between actions and the historical links between the phases and brings attentions to the fact that an IS development is a continuous process not a process made up with a number of small projects. Therefore, as for practitioners, the perception and method of management of IS development then should be readjusted to avoid opportunity that the IS development drift away[51] from the initial objectives.

A noticeable phenomenon that remains is that even when the lesson has been learned and theories have been developed to take into account socio-cognitive issues and the issues have been incorporated into systems design and management, dissatisfaction with technology or with the outcome of technology adoption will still occur. This thesis offers a possible explanation for this phenomenon. Through the lens of technological frames analysis, a fact which has been forgotten but is now apparent, is that individuals possess the ability to think. This issue may have been addressed in studies using

---

[51] *Drift away* here is not the same as Ciborra's (1996) argument of *drifting*.

structuration theory (reflexive monitoring) but it remains untouched in many studies. Recognition of individuals' ability to think prepares IS practitioners for further learning, drifting, emerging, or evolving with the technology.

Bringing to the surface individuals' subjective perceptions and expectations of problems and technology and their relation with individuals' decisions about technological solutions, highlights the fact that conflicts between people in terms of technology adoption may be more fundamental than has been previously thought. Conflicts have been explained as being caused by socio-economic and socio-political reasons within an organisation; but, supported by the technological frames analysis and the findings of the case studies, this thesis has demonstrated that conflicts also emerge from personal cognitive properties. These properties serve as references that individuals use to take actions towards the technology and situations that they are in. Hence, unanticipated actions undertaken by participants are the result of an interplay between individuals' cognitive properties, actions, and the technology. IS managers need to recognise individuals' ability to think and engage in reflexive monitoring (Giddens, 1984; Orlikowski, 1991) in order to appreciate the explanations behind the actions, and from there to deal with the conflicts.

8.4 LIMITATIONS OF THE RESEARCH

Owing to the nature of the chosen research method, an interpretive case study approach, the analysis and findings presented in this thesis may be limited by the researcher's bias, as well as limited by the ability to generalise the findings to other organisations. It has always been argued that the interpretive approach is not rigorous and that the approach reflects the researcher's bias since the interpretation of the data largely relies on the researcher's conceptual apparatus and theoretical position within the research area. This in-built limitation of the chosen method was attended to by presenting a variety of data from different sources and by continuously creating dialogues between the researcher and interviewees to get feedback on the interpretation. Thus, the risk of bias has been reduced.

Another limitation related to the chosen research method is its ability to provide a basis for generalising the findings to other organisations. As stated earlier in Chapter Two the intent of this research is to provide alternative explanations for the phenomenon as

well as to highlight the issues which have not been well-presented in the literature. The purpose of each case study is to illustrate how the origins of information systems projects can be explained by the social cognitive approach (i.e. technological frames analysis). Therefore, the present study has generalised in the form of principles some of the findings (i.e. ontology and epistemology of technology) yet it would not claim its findings to be regarded universal explanations for similar situations in other organisations.

A possible limitation of this study relates to its determination to study the origins of organisations' IS projects. Data collection was the main problem during the case studies because the data needed was mostly historical. The difficulties encountered regarding collecting of historical data were several. In the case study of BOC, the initiator of the market sector reform had left the company when the case study was carried out, and therefore the information regarding the Managing Director's motives relied on interviewees' interpretations and on company documentation. However, even when it is possible to access the participants involved in the projects initially, it must be expected that some fine details of the project will be missing because of the nature of human memory and the situatedness of all human actions. The limitation is intrinsic because of the nature of the research topic; in order to overcome the problem, secondary data was collected to support the interview transcripts. However, there is no guarantee that all aspects will have been covered.

Another limitation is that the thesis deals with individuals' technological frames only, yet in reality individuals' decisions about the technology solutions are also affected by other frames, such as business frames (i.e. business intentions and performance). Other frames have been analysed and dealt with in terms of contextual factors. It should be remembered that technological frames analysis is a conceptual model to assist in the analysis of thoughts and actions related to technology in particular; analysing too many frames at the same time is likely to create unnecessary confusion and risk fuzziness of the research scope.

Finally, there is some limitation in this research is regard to its research design. The research may have benefited from a longitudinal study: from project initiation, to implementation, to technology in use, and to outcomes. Such a study would, however, be extremely complex and would be more appropriate for post-doctoral research.

8.5 SUGGESTIONS FOR FURTHER RESEARCH

Some interesting issues have emerged from this work that deserve further research. Activities performed at the origins of IS development are not limited to decision-making about adoption of a particular technology as many more activities are involved, for example, selecting an appropriate consulting company to provide advice, negotiating and justifying the necessity of the project, allocating resources, gaining support from elsewhere in an organisation, and so forth. Not only are these activities in themselves interesting, but they also are important to the entire project since they can "result in the selection of inappropriate solutions to organisational problems, or they can result in perceptions and decisions that subsequently have negative effects on system features, use, and impacts" (Grudin and Markus, 1997: 1464). Yet, details of these activities at the origin of IS development remain underexplored in IS research; hence this work strongly suggests that further research should be undertaken to investigate these activities and their effects on IS development.

A second suggestion is the further examination of the process of how individuals' technological frames are affected by social interaction. Section 7.1.4 has briefly discussed and illustrated the effects of social interactions on the process of sense making about technology, and further research may focus on the issue of what types of social interactions (i.e. communication, training, management endorsement) effectively serve as catalysts for frame changes; and on the process of the interplay between social interactions and technological frames, and how these lead to changes in action.

The demonstration of using the synthesised conceptual framework (Chapter 3) to record and analyse changes in individuals' technological frames and that lead to further changes in subsequent action has suggested a possible approach to investigation of organisational learning around technology (Section 8.2). Future research is suggested in order to build and develop a conceptual framework similar to the one used in this work to record changes in individuals' frames of references and changes in actions, in particular to track learning around a technology.

The discussion of *time* has also opened up interesting issues that need further exploration. As discussed (Section 7.2), time is still viewed by many as operating in the background of a research design and is not paid much attention in IS. But the

discussion presented in Chapter Seven has demonstrated that the concept of time not only affects how one arranges and analyses the data but also affects how one interprets events. Additional research is required in order to explore further issues raised in Section 7.2.1 by acquisition of enriched empirical data. Evidently, resource devoted to the specific issue raised by this thesis is still necessary.

BIBLIOGRAPHY

Ackoff, R. L. "Management Misinformation Systems", *Management Science* 14(4), 1967, pp.147-156.

Ackerman, M. "Augmenting the Organisational Memory: A Field Study of Answer Garden", *Proceedings of the CSCW'94*, Chapel Hill, NC, 1994, pp. 243-252.

Ackroyd, S., Harper, R., Hughes, J, Shapiro, D. and Soothill, K. *New Technology and Practical Police Work: The Social Context of Technical Innovation.* Open University Press, Milton Keynes, 1991.

Adam, B. *Time and Social Theory*, Polity, Cambridge, 1990.

Adams, D., Nelson, R. and Todd, P., "Perceived Usefulness, Ease of Use, and Usage of Information Technology: A Replication", *MIS Quarterly* 1992, pp.227-247.

Anderson, B. and Button, G. "Supporting The Design Process Within an Organisational Context", In *ECSCW* Milan, Italy, 1993.

Anderson, B. "Work, Ethnography and System Design," Technical Report EPC-1996-103, Rank Xerox Research Centre, 1996.

Auramaki, E., Robinson, M., Aaltonen, A., Kovalainen, M., Liinamaa, A. and Tuuna-Vaiska, T., "Paperwork At 78kph", In *CSCW'96*, ACM Press, Boston, MA, 1996, pp. 370-379.

Avgerou, C., Cornford, T. and Poulymenakou, A. "Information Systems Professionals and the Challenge of BPR," *New Technology, Work and Employment* 10(2), 1995, pp. 132-141.

Avgerou, C. and Cornford, T. *Developing Information Systems: Concepts, Issues, and Practice*, Macmillan Press, London, 1998.

Avison, D. and Fitzgerald, G. *Information Systems Development : Methodologies, Techniques and Tools*, McGraw-Hill, London, 1995.

Avison, D.E. and Fitzgerald, G. "Information Systems Development," In *Rethinking Management Information Systems*, W. L. Currie and B. Galliers (eds.), Oxford University Press, Oxford, 1999, pp. 250-278.

Bannon, L, Bjorn-Andersen, N. and Due-Thomsen, B., "Computer Support for Cooperative Work: An Appraisal and Critique", In *Information Technology for Organisational Systems: Concepts for Increased Competitiveness,* Bullinger H, Protonotarios, E. Bouwhuis, D. and Reim, F. (eds.), North-Holland, Amsterdam, Holland, 1988, pp. 297-303.

Bannon, L. J. and Schmidt, K., "CSCW: Four Characters in Search of a Context", In *Studies in Computer Supported Cooperative Work,* Bowers, J. M. and Benford, S. D. (eds.), North Holland, Amsterdam, Holland, 1991, pp. 3-16.

Bannon, L. "Section Introduction: Ethnography and Design," In *The Design of Computer Supported Cooperative Work and Groupware Systems*, D. Shapiro, M. Tauber and R. Traunmuller (eds.), North Holland, Amsterdam, 1996, pp.13-16.

Barley, S. "Technology as an Occasion for Structuring: Evidence from Observation of CT Scanners and the Social Order of Radiology Developments," *Administrative Science Quarterly* (31), 1986, pp.78-108.

St John Bate, J. and Travell, N. *Groupware: Business Success with Computer Supported Cooperative Working*, Alfred Waller, Orchards, 1994.

Bellotti, V. and Bly, S. "Walking Away from the Desktop Computer: Distributed Collaboration and Mobility in a Product Design Team," In *CSCW96*, ACM Press, Boston, MA, 1996, pp.209-218

Benford, S., Brown, C., Reynard, G. and Greenhalgh, C. "Share Spaces: Transportation, Artificiality, and Spatiality," In *CSCW96*, ACM Press, Boston, MA, 1996, pp. 77-86.

Benford, S., Greenhalgh, C., Snowdon, D. and Bullock, A., "Staging a Public Poetry Performance in a Collaborative Virtual Environment. In *ECSCW'97*, Kluwer Academic Publishers, Lancaster, 1997, pp. 125-140.

Benson, I., Ciborra, C. and Proffitt, S. "Some Social and Economic Consequences of Groupware for Flight Crew," *Proceedings of the CSCW'90*, Los Angeles, CA, 1990, pp. 119-129.

Bentley, R., Busbach, U., Kerr, D. and Sikkel, K., "Preference", *Computer Supported Cooperative Work: The Journal of Collaborative Computing* 6(2-3), 1997, pp.v-vi.

Bentley, R., Hughes, J., Randall, D., Rodden, T., Sawyer, P., Shapiro, D. and Sommerville, I., "Ethnographically-informed systems design for air traffic control," In *CSCW'92*, ACM Press, Toronto, Canada, 1992, pp.123-129.

Berlin, L. and Jeffries, R., "Consultants and Apprentices: Observations about Learning and Collaborative Problem Solving,". In *CSCW'92*, ACM Press, Toronto, Canada, 1992, pp. 130-137.

Bikson, T., "Groupware at The World Bank," In *Groupware and Teamwork* Ciborra C (ed.), John Wiley & Sons Ltd., London, 1996, pp. 145-184.

Bikson, T. and Eveland, J., "Groupware Implementation: Reinvention in the Sociotechnical Frame". In *CSCW96*, ACM Press, Boston, MA, 1996, pp. 428-437.

Bikson, T. K. and Eveland, E, "The Interplay of Work Group Structures and Computer Support," In *Intellectual Teamwork: Social and Technological Foundations of Cooperative Work,* Galegher, J., Kraut, R. E. and Egido, C. (eds.), Lawrence Erlbaum Associates, Hillsdale, NJ, 1990, pp. 245-290.

Bjorn-Andersen, N. and Turner, J., "The Metamorphosis of Oticon," In *Information Technology and Organisational Transformation: Innovation for the 21st Century Organisation,* Galliers R and Baets W (eds.), John Wiley & Sons, Chichester, 1997, pp. 65-83.

Blumer, H., *Symbolic Interactionism: Perspective and Method.* University of California Press, Berkley, CA, 1969.

Bødker, S., Ehn, P., Knudsen, J., Kyng, M. and Madsen, K., "Computer Support for Cooperative Design," In *CSCW'88,* ACM Press, Portland, Oregon, 1988, pp.377-394.

Boland, Jr. R., "Phenomenology: A Preferred Approach to Research on Information Systems," In *Research Methods in Information Systems,* Mumford, E., Hirschheim, R. A., Fitzgerald, G. and Wood-Harper, T. (eds.), North-Holland, Amsterdam, 1985, pp.193-201.

Boland, R, "Information System Use as a Hermeneutic Process," In *Information Systems Research: Contemporary Approaches and Emergent Traditions,* Nissen, H-E, Klein, H. K. and Hirschheim, R. A. (eds.), NorthHolland, Amsterdam, 1991, pp. 439-464.

Borenstein, N. and Thyberg, A., "Cooperative Work in the Andrew Message System," In *CSCW'88,* ACM Press, Portland, Oregon, 1988, pp. 306-323.

Bostrom, R. P. and Heinen, J. S., "MIS Problems and Failures: A Socio-Technical Perspective, Part I - The causes," *MIS Quarterly* 1(3), 1977, pp.17-32.

Bowers, J. "The Work to Make a Network Work: Studying CSCW in Action," In *CSCW'94,* ACM Press, Chapel Hill, NC, 1994, pp. 287-298.

Bowers, J. "Making It Work: A Field Study of a "CSCW Network"," *The Information Society, 11*(3), 1995, pp. 189-207.

Bowers, J., Button, G. and Sharrock, W., "Workflow from within and Without: Technology and Cooperative Work on Print Industry Shopfloor". In *European Conference on Computer-Supported Cooperative Work,* Kluwer Academic, Stockholm, Sweden, 1995, pp. 51-66.

Boynton, A.C., Jacobs, G.C. and Zmud, R.W. "Whose Responsibility is IT Management," *Sloan Management Review* 33(4), 1992, pp. 32-38.

Brynjolfsson, E. and Hitt, L.M. "Beyond the Productivity Paradox: Computers are the Catalyst for Bigger Changes," *Communication of the ACM* 41(8), 1998, pp. 49-62.

Bullen, C. V. and Bennett, J. L., "Groupware in Practice: An Interpretation of Work Experiences," In *Computerisation and Controversy: Value Conflicts and Social*

Choices, Dunlop, C. and Kling, R. (eds.), Academic Press, Boston, Mass, 1991, pp. 257-287.

Burrell, G. and Morgan, G., *Sociological Paradigms and Organisational Analysis.* Heinemann, Portsmouth, New Hampshire, 1979.

Button, G. and Harper, R. H. R., "Taking the Organisation into Accounts," In *Technology in Working Order: Studies of Work, Interaction, and Technology,* Button, G. (ed.), Routledge, London, 1993, pp. 98-107.

Button, G. "Ethnomethodology and the Human Sciences," Cambridge, 1991.

Button, G. and Dourish, P. "Technomethodology: Paradoxes and Possibilities," Technical Report EPC-1996-101, Rank Xerox Research Centre, 1996.

Caron, R.J., Jarvenpaa, S.L. and Stoddard, D.B. "Business Reengineering at CIGNA Corporation: Experiences and Lessons Learned from the First Five Years," *MIS Quarterly* 18(3), 1994, pp. 233-250.

Carroll, J. S. and Perin, C., *How Expectations About Microcomputers Influence Their Organisational Consequences,* Sloan School of Management, MIT, Cambridge, MA, 1988.

Ciborra, C. and Olson, M. "Encountering electronic work groups: transaction costs perspective," *Proceedings of the CSCW'88,* Portland, Oregon, 1988, pp. 94-101.

Ciborra, C, "Introduction: What does Groupware Mean for the Organisations Hosting it?" In *Groupware and Teamwork,* Ciborra, C. (ed.), John Wiley & Sons Ltd, London, 1996a, pp. 1-19.

Ciborra, C., "Notes on Improvisation and Time in Organisations," *Accounting Management and Information Technologies,* 9, 1999, pp. 77-94.

Ciborra, C. and Patriotta, G., "Groupware and Teamwork in New Product Development: The Case of a Consumer Goods Multinational," In *Groupware and Teamwork,* Claudio, C. (ed.), John Wiley & Sons Ltd, London, 1996, pp.121-142.

Ciborra, C. and Suetens, N., "Groupware for an Emerging Virtual Organisation". In *Groupware and Teamwork,* Ciborra, C. (ed.), John Wiley & Sons Ltd., London, 1996, pp. 185-209.

Ciborra, C. U., "Mission Critical: Challenges for Groupware in a Pharmaceutical Company," In *Groupware and Teamwork,* Ciborra, C. (ed.), John Wiley & Sons Ltd., London, 1996b, pp. 91-120.

Compeau, D., Higgins, C. and Huff, S., "Social Cognitive Theory and Individual Reactions to Computing Technology: A Longitudinal Study," *MIS Quarterly 23*(2), 1999, pp.145-158.

Computing, "Top 100 IT Users," In *Computing,* 2 October, 1997, pp.41-56.

Cook, S., Birch, G., Murphy, A. and John, W. "Modelling groupware in the electronic office," *International Journal of Man-Machine Studies* 34(2), 1991.

Cook, S.D. and Brown, J. "Bridging Epistemologies: The Generative Dance Between Organisational Knowledge and Organisational Knowing," *Organisation Science* 10(4), 1999, pp. 381-400.

Coombs, R. and Hull, R. "BPR as 'IT enabled organisational change': and assessment," *New Technology, Work and Employment* 10(2), 1995, pp. 121-131.

Cross, J., Earl, M. and Sampler, J. "Transformation of the IT Function At British Petroleum," Working Paper London Business School, 20 August 1997.

Culnan, M. "The Intellectual Development of Management Information Systems, 1972-1982: A Co-Citation Analysis," *Management Science* 32(2), 1986, pp. 156-172.

Culnan, M.J. "Mapping the Intellectual Structure of Management Information Systems 1980-1985: A Co-citation Analysis," *MIS Quarterly* (11), 1987, pp. 341-353.

Davenport, T. and Short, J. "The new industrial engineering: information technology and business process redesign," *Sloan Management Review* 11(Summer), 1990.

Davis, F. "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology," *MIS Quarterly, September*, 1989, pp. 319-332.

Dietz, J. and Widdershoven, G., "Speech Acts or Communicative Action?" In *ECSCW'91*, Kluwer Academic Publishers, Amsterdam, 1991, pp. 235-248.

Dix, A., "Challenges and Perspectives for Cooperative Work on the Web: An Analytical Approach," *Computer Supported Cooperative Work: The Journal of Collaborative Computing* 6(2-3), 1997, pp.135-156.

Dreyfus, H.L. *Being-in-the-World: A Commentary on Heidegger's Being and Time*, The MIT Press, Cambridge, MA, 1994.

Drummond, H. *Escalation in Decision-Making.* Oxford University Press, Oxford, 1996.

Earl, M. and Feeny, D. Information Systems in Global Business: Evidence from European Multinationals. In *Information Management: The Organisational Dimension,* Earl, M. (ed.), Oxford University Press, Oxford, 1996, pp.77-100.

Egger, E. and Wagner, I., "Time-Management: A Case for CSCW," In *CSCW'92*,ACM Press, Toronto, Canada, 1992, pp. 249-256.

Egido, C. "Teleconferencing as a Technology to Support Cooperative Work: Its Possibilities and Limitations," In *Intellectual Teamwork: Social and Technological Foundations of Cooperative Work,* Galagher, J., Kraut, R. E. and Egido, C. (eds.), Lawrence Erlbaum Associates, Hillsdale, N.J, 1990, pp. 351-371.

Eveland, J. D. and Bikson, T. K. "Work Group Structures and Computer Support: A Field Experiment," *ACM Transactions on Office Information Systems* 6(4), 1988, pp.354-379.

Failla, A., "Technologies for Co-ordination in a Software Factory," In *Groupware and Teamwork,* Ciborra, C. (ed.), John Wiley & Sons Ltd, London, 1996, pp.61-88.

Fiedler, K. D., Grover, V. and Ten, J. T. C., "An empirical study of information technology enabled business process redesign and corporate competitive strategy," *European Journal of Information Systems 4*(1), 1995, pp.17-30.

Forster, N. "The Analysis of Company Documentation," In *Qualitative Methods in Organisational Research,* C. Cassell and G. Symon (eds.), Sage Publications Ltd, London, 1994, pp. 147-166.

Frissen, V.A. "ICTs in the Rush Hour of Life," *The Information Society* (16), 2000, pp. 65-75.

Galegher, J. and Kraut, R. E., "Computer-Mediated Communication for Intellectual Teamwork: A Field Experiment in Group Writing," In *CSCW'90* ACM Press, Los Angeles, CA, 1990a.

Galegher, J. and Kraut, R. E., "Technology for Intellectual Teamwork: Perspectives on Research and Design," In *Intellectual Teamwork: Social and Technological Foundations of Cooperative Work,* Galagher, J., Kraut, R. E. and Egido, C. (eds.), Lawrence Erlbaum Associates, Hillsdale, NJ, 1990b, pp.1-20.

Galliers, R. "Information Systems Planning in Britain & Australia in the mid-1980s: Key Success Factors," *Unpublished PhD Thesis,* University of London, 1987.

Galliers, R.D. "Choosing Appropriate Information Systems Research Approaches: A Revised Taxonomy," In *Information Systems Research: Contemporary Approaches and Emergent Traditions,* H.-E. Nissen, H. K. Klein and R. A. Hirschheim (eds.), NorthHolland, Amsterdam, 1991, pp. 144-162.

Galliers, B. and Baets, W., *Information Technology and Organisational Transformation: Innovation for the 21st Century Organisation,* John Wiley & Sons, Chichester, 1998.

Gallivan, M., Cheng, H. G., Hitt, L. and Wyner, G., *Incident Tracking at InfoCorp: Case Study of A Pilot Notes Implementation,* Centre for Coordination Science, Sloan School of Management, MIT, Cambridge, MA, 1993.

Gallivan, M. J., Hofman, D. and Orlikowski, W., *Implementing Radical Change: Gradual versus Rapid Pace,* Centre for Information Systems Research, MIT, Boston, MA, 1994.

Gallupe, R. B. and McKeen, D., "Enhancing computer-mediated communication: An experimental investigation into the use of a group decision support system for face-to-face versus remote meetings," *Information and Management* 18, 1990, pp.1-13.

Gazendam, H. W. M., "The Concept of Equilibrium in Organisation Theory," In *Computational and Mathematical Organisation Theory Workshop,* Washington Hilton & Towers, 1996.

Gersick, C. J. G., "Revolutionary Change Theories: A Multilevel Exploration of the Punctuated Equilibrium Paradigm," *Academy of Management Review* 16(1), 1991, pp.10-36.

Gibson, C. and Nolan, R., "Managing the Four Stages of EDP Growth," In *Readings in Management Information Systems,* Davis, G. and Everest, G. (eds.) McGraw-Hill, New York, 1976.

Giddens, A., *The Constitution of Society.* University of California Press, Berkeley, CA, 1984.

Giddens, A. *The Consequences of Modernity,* Polity Press, Cambridge, 1997.

Ginsburg, M. and Duliba, K., "Enterprise-Level Groupware Choices: Evaluating Lotus Notes and Intranet-Based Solutions," *Computer Supported Cooperative Work: The Journal of Collaborative Computing* 6(2-3), 1997, pp.201-225.

Ginzberg, M. J., "Early Diagnosis of MIS Implementation Failure: Promising Results and Unanswered Question," *Management Science* 27(4), 1981, pp.459-478.

Gioia, D. and Sims, H., "Introduction: Social Cognition in Organisations," In *The Thinking Organisation,* Gioia, D. and Sims, H. (eds.), Jossey-Bass Publishers, San Francisco, CA, 1986, pp. 1-19.

Gioia, D. A., "Symbols, Scripts, and Sensemaking: Creating Meaning in the Organisational Experience," In *The Thinking Organisation,* Sims, J. H. and Gioia, D. (eds.), Jossey-Bass, San Francisco, CA, 1986, pp. 49-74.

Goles, T. and Hirschheim, R. "The paradigm is dead, the paradigm is dead ... long live the paradigm: the legacy of Burrell and Morgan," *Omega International Journal of Management Science* (28), 2000, pp. 249-268.

Greenberg, S., *Computer-supported Cooperative Work and Groupware,*. Academic Press Ltd, London, 1991.

Grief, I., *Computer-Supported Cooperative Work: A Book of Readings,* Morgan Kaufmann Publishers, Cambridge, Massachusetts, 1988.

Grint, K. and Willcocks, L. "BPR in theory and practice: business paradise regained?," *New Technology, Work and Employment* 10(2), 1995, pp. 99-109.

Grinter, R., "Supporting Articulation Work Using Software Configuration Management Systems," *Computer Supported Cooperative Work: The Journal of Collaborative Computing* 5(4), 1996, pp.447-465.

Grinter, R., "From Workplace to Development: What Have We Learned So Far and Where Do We Go?" In *GROUP 97* ACM Press, Phoenix, Arizona, 1997.

Gronbek, K., Kyng, M. and Mogensen, P., "CSCW Challenges in Large-Scale Technical Projects: A Case Study," In *CSCW'92,* ACM Press, Toronto, Canada, 1992, pp.338-345.

Grudin, J., "Why CSCW Applications Fail: Problems in the Design and Evaluation of Organisational Interfaces," In *CSCW'88*, ACM Press, Portland, Oregon, 1988, pp.85-93.

Grudin, J., "Obstacles to user involvement in software product development, with implications for CSCW," *International Journal of Man-Machine Studies* 34(3), 1991, pp.435-452.

Grudin, J., "Groupware and Social Dynamics: Eight Challenges for Developers," *Communications of the ACM* 37, 1994, pp.93-105.

Grudin, J. and Palen, L., "Why Groupware Succeeds: Discretion or Mandate?" In *European Conference on Computer-Supported Cooperative Work*, Kluwer Academic, Stockholm, Sweden, 1995, pp.263-278.

Grudin, J. and Markus, M.L. "Organisational Issues in Development and Implementation of Interactive Systems," In *Handbook of Human-Computer Interaction*, M. Helander, T. K. Landauer and P. Prabhu (eds.), Elsevier Science B V., 1997, pp. 1457-1474.

Gutek, B. A., "Work Group Structure and Information Technology: A structural Contingency Approach," In *Intellectual Teamwork: Social and Technological Foundations of Cooperative Work*, Galagher, J., Kraut, R. E. and Egido, C. (eds.), Hillsdale, NJ, 1990, pp.63-78.

Hackman, J. R. and Oldham, G. R., *Work Redesign.* Addison-Wesley, Reading, Massachusetts, 1980.

Harper, R. and Randall, D., *Rouges in the Air: An Ethnomethodology of 'Conflict' in Socially Organised Airspace*, Rank Xerox Research Centre, Cambridge, UK, 1992.

Harper, R. *Inside the IMF*, 1998.

Hartley, J., "Case Studies in Organisational Research," In *Qualitative Methods in Organisational Research*, Cassell, C. and Symon, G. (eds.), Sage, London, 1994, pp. 208-229.

Heath, C. and Luff, P., Collaborative Activity and Technological Design: Task Coordination in London Underground Control Rooms. In *ECSCW'91*, Kluwer Academic, Amsterdam, Netherlands, 1991, pp.65-80.

Heath, C. and Luff, P., "Documents an Professional Practice: 'Bad' Organisational Reasons for 'Good' Clinical Records," In *CSCW'96*, ACM Press, Cambridge, MA, 1996, pp. 354-363.

Heath, C., Marina, J., Luff, P. and John, H., "Unpacking Collaboration: the Intersectional Organisation of Trading in a City Dealing Room," In *ECSCW'93*, Kluwer Academic, Milan, Italy, 1993, pp. 155-170.

Hindus, D., Ackerman, M., Mainwaring, S. and Starr, B., "Thunderwire: A Field Study of an Audio-Only Media Space," In *CSCW96*, ACM Press, Boston, MA, 1996, 283-247.

Hirschheim, R., *Office Automation: A Social and Organisational Perspective.* Wiley, New York, 1985.

Hirschheim, R. and Klein, H., "Four Paradigms of Information Systems Development," *Communications of the ACM* 32(10), 1989, pp.1199-1216.

Howard, R., "Systems Design and Social Responsibility: The Political implications of "Computer-Supported Cooperative Work". *Office: Technology and People* 3, 1987, pp.175-187.

Hughes, J., King, V., Mariani, J., Rodden, T. and Twidale, M., "Paperwork and its Lessons for Database Systems: an initial assessment," In *The Design of Computer Supported Cooperative Work and Groupware Systems,* Shapiro, D., Tauber, M. and Traunmuller, R. (eds.), North Hollan, Amsterdam, 1996, pp. 43-66.

Hughes, J., King, V., Rodden, T. and Hans, A., "Moving Out from the Control Room: Ethnography in System Design," In *CSCW'94,* ACM Press, Chapel Hill, NC, USA, 1994, pp. 429-439.

Hughes, J., Randall, D. and Shapiro, D., "CSCW: Discipline or Paradigm? A Sociological Perspective", In *ECSCW'91,* Kluwer Academic, Amsterdam, 1991, pp. 309-323.

Hughes, J., Randall, D. and Shapiro, D., "Faltering from Ethnography to Design," In *CSCW'92,* ACM Press, Toronto, Canada, 1992, pp.115-122.

Hughes, T. P., "The Evolution of Large Technological Systems," In *The Social Construction of Technological Systems,* Bijker, W., Hughes, T. and Pinch, T. (eds.), MIT Press, Cambridge, Mass, 1987, pp.51-82.

Hutchins, E., "The technology of team navigation," In *Intellectual Teamwork: Social Foundations of Coopertive Work,* Galegher, J., Kraut, R. E. and Egido, C. (eds.) Lawrence Erlbaum Associates, Hillsdale, New Jersey, 1991.

Ilvari, J. and Lyytinen, K. "Research on Information Systems Development in Scandinavia Unity in Plurality," In *Rethinking Management Information Systems,* W. L. Currie and B. Gallier (eds.), Oxford University Press, Oxford, 1999, pp. 56-102.

Isaacs, E., Tang, J. and Morris, T., "Piazza: A Desktop Environment Supporting Impromptu and Planned Interaction," In *CSCW96,* ACM Press, Boston, MA, 1996, pp.315-324.

Introna, L.D. *Management, Information and Power,* Macmillan, London, 1997.

Ives, B. and Learmonth, G., "The Information System as a Competitive Weapon," *Communications of the ACM* 27(12), 1984, pp.1193-1202.

Jackson, S. "Re-engineering the Post Office," *New Technology, Work and Employment* 10(2), 1995, pp. 142-146.

Johnson-Laird, P.N., "Mental Models," in *Foundations of Cognitive Science,* M. I. Posner, Ed. Cambridge, MA: The MIT Press, 1989, pp. 469-499.

Johnson-Lenz, P. and Johnson-Lenz, T. "Post-mechanistic groupware primitives: rhythms, boundaries and containers," *International Journal of Man-Machine Studies* 34(3), 1991, pp. 395-417.

Jones, M. "Structuration Theory," In *Rethinking Management Information Systems*, W. L. Currie and B. Galliers (eds.), Oxford University Press, Oxford, 1999, pp. 103-135.

Karahanna, E., Straub, D. and Chervany, N., "Information Technology Adoption Across Time: A Cross-Sectional Comparison of Pre-Adoption and Post-adoption Beliefs," *MIS Quarterly* 23(2), 1999, pp.183-213.

Karsten, H., "Converging paths to Notes: in search of computer-based information systems in a networked company, *Information Technology & People* 8(1), 1995.

Karsten, H. and Jones, M., "The Long and Winding Road: Collaborative IT and Organisational Change," In *CSCW98*, ACM Press, Seattle, Washington, 1998, pp.29-38.

Keen, P.G.W. *Shaping the future: business design through information technology*, Harvard Business School Press, Boston, MA, 1991.

Keil, M., "Pulling the plug: software project management and the problem of project escalation," *MIS Quarterly* 19(4),1995, pp. 421-447.

Keil, M., Cule, P., Lyytinen, K. and Schmidt, R., "A Framework for Identifying Software Project Risks," *Communication of the ACM* 41(11), 1998, pp.76-83.

Kensing, F. and Blomberg, J. "Participatory Design: Issues and Concerns," *Computer Supported Cooperative Work: The Journal of Collaborative Computing* 7(3-4), 1998, pp. 163-165.

Kiecolt, K. J. and Nathan, L. E., *Secondary Analysis of Survey Data.* Sage, London, 1985.

King, R. "The Effects of Communication Technology and Reward Systems on Collaborative Work," In *Collaborative Work, Social Communications and Information Systems,* Stamper, R. K., Kerola, P., Lee, R. and Lyytinen, K. (eds.), North-Holland, Amsterdam, 1991, pp. 355-372.

Klein, H. and Myers, M. "A Set of Principles for Conducting & Evaluating Interpretive Field Studies in Information Systems," *MIS Quarterly* 23(1), 1999, pp. 67-94.

Kling, R., "Social Analyses of Computing: Theoretical Perspectives in Recent Empirical Research," *Computing Surveys* 12(1), 1980, pp.61-110.

Kling, R. "Defining the boundaries of computing across complex organisation," In *Critical Issues in Information Systems Research,* R. Boland and R. Hirschheim (eds.), Wiley, New York, 1987, pp. 301-362.

Knights, D. and Murray, F. "Managers Divided: Organisation Politics and Information Technology Management," Chichester, 1994.

Knights, D. and Murray, F. "Markets, Managers, and Messages: Managing Information

Systems in Financial Services," In *Information Technology and Organisations: Strategies, Networks, and Integration*, B. Bloomfield, R. Coombs, D. Knights and D. Littler (eds.), Oxford University Press, Oxford, 1997, pp. 36-56.

Knights, D., Noble, F. and Willmott, H., "We Should Be Total Slaves to the Business': Aligning Information Technology and Strategy - Issues and Evidence," In *Information Technology and Organisations: Strategies, Networks, and Integration*, Bloomfield, B., Coombs, R., Knights, D. and Littler, D. (eds.) Oxford University Press, Oxford, 1997.

Kraemer, K. L. and Pinsonneault, A., "Technology and Groups: Assessments of the Empirical Research," In *Intellectual Teamwork: Social and Technological Foundations of Cooperative Work*, Galegher, J. and Kraut, R. (eds.), Lawrence Erlbaum Associates, Hillsdale, NJ, 1990, pp.375-405.

Lash, S. and Urry, J., *Economies of Signs & Space.* Sage Publications, London, 1994.

Latour, B., *Science in Action.* Harvard University Press, Cambridge, MA, 1987.

Latour, B. *Pandora's Hope: Essays on the Reality of Science Studies*, Harvard University Press, Cambridge, MA, 1999.

Lave, J. *Cognition in Practice*, Cambridge University Press, Cambridge, 1988.

Lea, M. and Spears, R. "Computer-mediated communication, de-individuation and group decision-making," *International Journal of Man-Machine Studies* (34), 1991, pp. 283-301.

Lee, A. "Strategizing for Compelling and Significant Research," *MIS Quarterly* 23(2), 1999, pp. xxv-xxviii.

Lee, A.S. "Electronic Mail as a Medium for Rich Communication: An Empirical Investigation Using Hermeneutic Interpretation," *MIS Quarterly* 18(2), 1994, pp. 143-157.

Lin, A. and Cornford, T. "Sociotechnical Perspectives on Emergence Phenomena," In *The New SocioTech*, E. Coakes, R. Lloyd-Jones, and D. Willis (eds.), Springer, Surrey, 2000.

Lloyd, P. "Groupware in the 21st Century," Adamantine Press Ltd., London, 1994.

Lord, R. and Foti, R. "Schema Theories, Information Processing, and Organisational Behaviour," In *The Thinking Organisations*, J. H. Sims and D. Gioia (eds.), Jossey-Bass, San Francisco, CA, 1986, pp. 2-48.

Lyytinen, K. and Hirschheim, R. "Information systems failures: A survey and classification of the empirical literature," *Oxford Surveys in Information Technology* (4), 1987, pp. 257-309.

Lyytinen, K. and Ngweyama, O. "What Does Computer Support for Cooperative work

Mean? A Structruational Analysis of Computer Supported Cooperative Work," *Accounting, Management and Information Technology* 2(1), 1992, pp. 19-37.

Mackay, W.E. "Diversity in the Use of Electronic Mail: A Preliminary Inquiry," *ACM Transactions on Office Information Systems* 6(4), 1988, pp. 135-164.

Malone, T., Grant, K., Lai, K.-Y., Rao, R. and Rosenblitt, D. "Semistructured Messages Are Surprisingly Useful for Computer-Supported Coordination," *ACM Transactions on Office Information Systems* 5(2), 1987, pp. 115-131.

Malone, T.W. and Crowston, K. "The Interdisciplinary Study of Coordination," *ACM Computing Surveys* 26(1), 1994, pp. 87-119.

March, J.G. "Footnotes to Organisational Change," *Administrative Science Quarterly* (26), 1981, pp. 563-577.

March, J.G. "The Technology of Foolishness," In *Organisation Theory*, D. S. Pugh (ed.), Penguin Books, London, 1997, pp. 339-352.

Markus, M.L. "Power, Politics, and MIS Implementation," *Communication of the ACM* 26(6), 1983, pp. 430-444.

Markus, M.L. "Toward a 'Critical Mass' Theory of Interactive Media," In *Organisations and Communication Technology*, J. Fulk and C. Steinfield (eds.), Sage Publications, Newbury Park, London, 1990, pp. 194-218.

Markus, M.L. and Connolly, T. "Why CSCW Application Fail: Problems in the Adoption of Interdependent Work Tools," *Proceedings of the CSCW'90*, Los Angels, CA, 1990, pp. 371-380.

Markus, L. and Benjamin, R. "The Magic Bullet Theory in IT-Enabled Transformation," *Sloan Management Review* (Winter), 1997, pp. 55-68.

Markus, L. "Conceptual Challenges in Contemporary IS Research," *Journal of Global Information Management* (July-September), 2000, pp. 42-46.

Martin J (1998) *Organisational Behaviour.* International Thomson Business Press, London.

Martin, R. "Changing the Mind of the Corporation," In *Harvard Business Review on Change*, Harvard Business School Press, Boston, MA, 1998, pp. 113-138.

Martins, L.L. and Kambil, A. "Looking Back and Thinking Ahead: Effects of Prior Success on Managers' Interpretations of New Information Technologies," *Academy of Management Journal* 42(6), 1999, pp. 652-661.

McGrath, J., E. "Time, Interaction, and Performance (TIP): A Theory of Groups," *Small Group Research* 22(2), 1991, pp. 147-174.

McGrath, J.E. and Hollingshead, A.B. *Groups Interacting with Technology*, Sage Publisher, 1994.

Michelotti, S. "Time & Society: A 'Primitive' Globalisation," *Proceedings of the Making Time/Marking Time*, York University, 2000,

Mintzberg, H. "An Emerging Strategy of 'Direct' Research," *Administration Science Quarterly* (24), 1979, pp. 582-589.

Mintzberg, H. "Crafting Strategy," *Harvard Business Review* (July-August), 1987, pp. 66-75.

Mitchell, J.C. "Case and Situation Analysis," *The Sociological Review* (31), 1983.

Mumford, E. "Sociotechnical Systems Design: Evolving Theory and Practice," In *Computers and Democracy: A Scandinavian Challenge*, G. Bjerknes, P. Ehn and M. Kyng (eds.), Avebury, Aldershot, UK, 1987, pp. 59-76.

Mumford, E. and Weir, M. *Computer Systems in Work Design - the ETHICS Method*, Associated Business Press, London, 1979.

Mumford, E. "Routinisation, Re-engineering, and Socio-technical Design: Changing Ideas on the Organisation of Work," In *Rethinking Management Information Systems*, W. L. Currie and B. Galliers (eds.), Oxford University Press, Oxford, 1999, pp. 28-44.

Myers, M. D., "A disaster for everyone to see: an interpretive analysis of a failed IS project," *Accounting, Management and Information Technologies* 4(4), 1994, pp.185-201.

Nardi, B.A. "Studying Context: A Comparison of Activity Theory, Situated Action Models, and Distributed Cognition," In *Context and Consciousness*, B. Nardi (ed.), The MIT Press, Cambridge, MA, 1996, pp. 69-102.

Norman, D.A. "Cognition in the Head and in the World: An Introduction to the Special Issue on Situated Action," *Cognitive Science* 17(1), 1993, pp. 1-6.

O'Day, V.L., Bobrow, D. and Shirley, M. "Network Community Design: A Social-Technical Design Circle," *Computer Supported Cooperative Work: The Journal of Collaborative Computing* 7(3-4), 1998, pp. 325-337.

Olson, G.M. and Olson, J.S. "Research on Computer Supported Cooperative Work," In *Handbook of Human-Computer Interaction*, M. Helander, T. K. Landaer and P. Prabhu (eds), Elsevier Science B.V., 1997, pp. 1433-1456.

Olson, M.H. "Computer-Supported Cooperative Work," *Office: Technology and People* (3), 1987, pp. 77-81.

O'Neill, M. "The Negotiation of Power Through Time and Space: An Ethnographic Study of Police and Football Supporters in Scotland," *Paper presented in the British Sociological Association Annual Conference: Making Time/Marking Time*, York University, 2000.

Opper, S. and Fersko-Weiss, H. *Technology for teams - Enhancing Productivity in Networked Organisations*, Van Nostrand Reinhold, New York, 1992.

Orlikowski, W.J. "The Duality of Technology: Rethinking the Concept of Technology in Organisations," CISR WP No. 219, Centre for Information Systems Research, Sloan School of Management, MIT, January 1991.

Orlikowski, W. and Baroudi, J. "Studying Information Technology in Organisations: Research Approach and Assumptions," *Information Systems Research* 2(1), 1991, pp. 1-28.

Orlikowski, W. and Gash, D. "Changing Frames: Understanding Technological Changes in Organisations," CISR WP No.236, Centre for Information Systems Research, MIT, April 1991.

Orlikowski, W.J. "Learning From Notes: Organisational Issues in Groupware Implementation," CISR WP No. 241, Centre for Information Systems Research, Sloan School of Management, MIT, May 1992.

Orlikowski, W. "CASE Tools as Organisational Change: Investigating Incremental and Radical Changes in Systems Development," *MIS Quarterly* (September), 1993, pp. 309-340.

Orlikowski, W.J. and Gash, D.C. "Technological Frames: Making Sense of Information Technology in organisations," *ACM Transactions on Information Systems* 12(2), 1994, pp. 174-206.

Orlikowski, W.J. "Evolving with Notes: Organisational Change Around Groupware Technology," CISR WP No.279, Centre for Information Systems Research, Sloan School of Management, MIT, June 1995.

Orlikowski, W., "Improving Organisational Transformation Over Time: A Situated Change Perspective," *Information Systems Research* 7(1), 1996, pp.63-92.

Orlikowski, W. J., "Evolving with Notes: Organisational Change Around Groupware Technology," In *Groupware and Teamwork* Ciborra C U (ed.), John Wiley & Sons Ltd., London, 1996b, pp.23-60.

Patterson, E., Watts-Perotti, J. and Woods, D. "Voice Loops as Coordination Aids in Space Shuttle Mission Control," *CSCW: Journal of Collaborative Computing* 8(4), 1999, pp. 353-371.

Pepper, S.C. *World Hypotheses: A Study in Evidence*, University of California Press, Berkely, CA, 1942.

Pettigrew, A.M. *The Awakening Giant: Continuity and Change in Imperial Chemical Industries*, Basil Blackwell, Oxford, 1985.

Pettigrew, A.M. "Contextualist Research and the Study of Organisational Change Processes," In *Research Methods in Information Systems*, E. M. et al. (ed.), North-Holland, Amsterdam, 1985, pp. 53-78.

Pettigrew, A.M. "Context and Action in the Transformation of the Firm," In

Organisation Theory, D. S. Pugh (ed.), Penguin Books, London, 1987, pp. 460-485.

Pinch, T.F. and Bijker, W.E. "The Social Construction of Facts and Artefacts: Or How the Sociology of Science and the Sociology of Technology Might Benefit Each Other," In *The Social Construction of Technological Systems*, W. Bijker, T. Hughes and T. Pinch (eds.), MIT Press, Cambridge, Mass, 1987, pp. 17-49.

Plowman, L., Rogers, Y. and Ramage, M. "What are Workplace Studies for?," *Proceedings of the ECSCW95*, Stockholm, Sweden, 1995, pp. 309-324.

Podsakoff, P.M. and Dalton, D.R. "Research Meothdology in Organisational Studies," In *Research Methods*, P. McNeil (ed.), Routledge, London, 1990,

Poole, M.S. and DeSanctis, G. "Use of Group Decision Support Systems as an Appropriation Process," *Proceedings of the 22nd Annual Hawaii International Conference on Systems Science*, 1989, pp. 149-157.

Porac, J., Thomas, H. and Baden-Fuller, C. "Competitive Groups as Cognitive Communities: The Case of Scottish Knitwear Manufacturers," *Journal of Management Studies* 26(4), 1989, pp. 397-417.

Porter, M. and Millar, V. "How Information Gives you Competitive Advantage," *Harvard Business Review*, 1985, pp. 49-160.

Prior, A. "Changes in Events and Changes in Things," In *The Philosophy of Time*, R. Le Poidevin and M. MacBeath (eds.), Oxford Press University, Oxford, 1997, pp. 35-46.

Psoinos, A. "Information Systems in Support of Employee Empowerment: A Study of Manufacturing Organisations in the UK," unpublished Social Science, The University of London, 1998.

Randall, D., Rouncefield, M. and Hughes, J. "Chalk and Cheese: BPR and Ethnomethodologically Informed Ethnography in CSCW," *Proceedings of the European Conference on Computer-Supported Cooperative Work*, Stockholm, Sweden, 1995, pp. 325-340.

Rennison, N., *Waterstone's Guide to Ideas*. Waterstone's Booksellers Ltd, Middlesex, 2000.

Riley, P. "A Structurationist Account of Political Culture," *Administrative Science Quarterly* 28(3), 1983, pp. 414-437.

Robey, D. "User Attitudes and Management Information Systems Use," *Academy of Management Journal* (22:3), 1979, pp. 527-538.

Robey, D. and Newman, M. "Sequential Patterns in Information Systems Development: An Application of a Social Process Model," *ACM Transactions on Information Systems* 14(1), 1996, pp. 30-63.

Robey, D., Boudreau, M.-C. and Rose, G., M. "Information Technology and Organisational Learning: A Review and Assessment of Research," *Accounting,*

Management, and Information Technology 10(2), 2000, pp. 125-155.

Robinson, M. "Double Level Languages and Co-operative Working," *AI Society* (5), 1991, pp. 34-60.

Rockart, J., Earl, M. and Ross, J. "Eight Imperatives for the New IT Organisation," *Sloan Management Review* (Fall), 1996, pp. 43-55.

Rogers, E. *Diffusion of Innovations*, Free Press, Macmillan, New York, 1995.

Rogers, Y. "Ghosts in the Network: Distributed Troubleshooting in a Shared Working Environment," *Proceedings of the CSCW'92*, Toronto, Canada, 1992, pp. 346-355.

Rogers, Y. "Exploring Obstacles: Integrating CSCW in Evolving Organisations," *Proceedings of the CSCW'94*, Chapel Hill, NC, 1994, pp. 67-77.

Rosenberg, D. and Hutchison, C. *Design Issues in CSCW*, Springer-Verlag, London, 1994.

Rouncefield, M., Hughes, J.A., Rodden, T. and Viller, S. "Working with "Constant Interruption": CSCW and the Small Office," *Proceedings of the CSCW'94*, Chapel Hill, NC, 1994, pp. 275-286.

Sahay, S. "Implementing GIS Technology in India: Some Issues of Time and Space," *Accounting, Management, and Information Technology* (8), 1998, pp. 147-188.

Schein, E., H. "Three Cultures of Management: The Key to Organisational Learning," *Sloan Management Review* (Fall), 1996, pp. 9-20.

Schmidt, K. "Riding a Tiger, or Computer Supported Cooperative Work," *Proceedings of the ECSCW'91*, Amsterdam, The Netherlands, 1991, pp. 1-16.

Schmidt, K. and Bannon, L. "Taking CSCW Seriously Supporting Articulation Work," *Computer Supported Cooperative Work* 1(2), 1992, pp. 7-40.

Schneider, S. and Angelmar, R. "Cognition in Organisational Analysis: Who's Minding the Store?" *Organisation Studies* 14(3), 1993, pp. 347-374.

Schwab, R.G., Hart-Landsberg, S., Reder, S. and Abel, M. "Collaboration and Constraint: Middle School Teaching Teams," *Proceedings of the CSCW'92*, Toronto, Canada, 1992, pp. 241-248.

Sellen, A. and Harper, R. "Oticon: Experiences of a "Paperless" Office," A research note Rank Xerox Research Centre, 1996.

Sellen, A. and Harper, R. "Can Workflow Tools Support Knowledge Work? A Case Study of the International Monetary Fund," Tech. Report Rank Xerox Research Centre, 1996.

Shapiro, D. "Ferrets in a Sack? Ethnographic Studies and Task Analysis in CSCWQ," In *The Design of Computer Supported Cooperative Work and Groupware Systems*, D.

Shapiro, M. Tauber and R. Traunmuller (eds.), North Holland, Amsterdam, 1996, pp.309-330.

Shapiro, D., Tauber, M. and Traunmuller, R. "The Design of Computer Supported Cooperative Work and Groupware Systems," Amsterdam, 1996.

Shoemaker, S. "Time Without Change," In *The Philosophy of Time*, R. Le Poidevin and M. MacBeath (Ed.), Oxford University Press, Oxford, 1997, pp. 63-79.

Sims, J.H. and Gioia, D. "The Thinking Organisation," San Francisco, CA, 1986.

Smith, C.N. "The Case-Study: A Vital Yet Misunderstood Research Method for Management," In *Research Methods*, P. McNeil (eds.), Routledge, London, 1990.

Smithson, S. and Hirschheim, R. "Analysing information systems evaluation: another look at an old problem," *European Journal of Information Systems* (7), 1998, pp. 158-174.

Sproull, L. and Kiesler, S. "Reducing Social Context Cues: Electronic Mail in Organisational Communication," *Management Science* 32(11), 1986, pp. 1492-1512.

Sproull, L. and Kiesler, S. *Connections: New Ways of Working in the Networked Organisation*, The MIT Press, Cambridge, Massachusetts, 1991.

Star, S. and Ruhleder, K. "Steps Towards an Ecology of Infrastructure: Complex Problems in Design and Access for Large-Scale Collaborative Systems," *Proceedings of the CSCW'94*, Chapel Hill, NC, 1994, pp. 253-264.

Suchman, L.A. *Plans and Situated Actions: The problem of human machine communication*, Cambridge University Press, Cambridge, 1987.

Suchman, L. "Making Work Visible," *Communication of ACM* 38(9), 1995, pp. 56-65.

Swanson, B.E. and Ramiller, N.C. "The Organising Vision in Information Systems Innovation," *Organisation Science* 8(5), 1997, pp. 458-474.

Tan, B., Wei, K.-K. and Raman, K. "Impact of GDSS and Task Type on Consensus in Small Group Meetings," In *Collaborative Work, Social Communications and Information Systems*, R. K. Stamper, P. Kerola, R. Lee and K. Lyytinen (eds.), North-Holland, Amsterdam, 1991, pp. 33-51.

Taylor, J.A. "Don't Obliterate, Informate: BPR for the Information Age," *New Technology, Work and Employment* 10(2), 1995, pp. 82-88.

Threlkel, M.S. and Kavan, C.B. "From Traditional EDI to Internet-based EDI: Managerial Considerations," *Journal of Information Technology* 14(4), 1999, pp. 347-360.

Tyre, M. and Orlikowski, W. "Windows of Opportunity: Creating Occasions for Technological Adaptation in Organisations," CISR WP No.227, Centre for Information Systems Research, MIT, July 1991.

UKAIS "UKAIS definition of information systems," *The UKAIS Newsletter*, (3:4), 1997, p.5.

Varela, F., Thompson, E. and Rosch, E. *The Embodied Mind: Cognitive Science and Human Experience*, MIT Press, Cambridge, MA, 1993.

Venkatraman, N. "IT-Enabled Business Transformation: From Automation to Business Scope Redefinition," *Sloan Management Review* 35(2), 1994, pp. 73-87.

Walsham, G. "Organisational metaphors and information systems research," *European Journal of Information Systems* 2(2), 1991, pp. 83-94.

Walsham, G. *Interpreting Information Systems in Organisations*, John Wiley & Sons Ltd., Chichester, UK, 1993.

Walsham, G. "Interpretive case studies in IS research: nature and method," *European Journal of Information Systems* (4), 1995, pp. 74-81.

Walsham, G. "The Emergence of Interpretivism in IS Research," *Information Systems Research* 6(4), 1995, pp. 376-394.

Ward, J., Pat, G. and Whitmore, P. *Strategic Planning for Information Systems*, John Wiley, Chichester, 1990.

Watson, R.T. and Bostrom, R.P. "An Integrative Framework for Understanding Why a GDSS is Successful," In *Collaborative Work, Social Communications and Information Systems*, R. K. Stamper, P. Kerola, R. Lee and K. Lyytinen (eds.), North-Holland, Amsterdam, 1991, pp. 9-31.

Watts, J., Woods, D., Corban, J., Patterson, E., Kerr, R. and Hicks, L. "Vice Loops as Cooperative Aids in Space Shuttle Mission Control," *Proceedings of the CSCW'96*, Cambridge, MA, 1996, pp. 48-56.

Weick, K.E. "Organisational Redesign as Improvisation," In *Organisational Change and Redesign*, G. P. Huber and W.H.Glick (eds.), Oxford University Press, New York, 1993, pp. 346-379.

Wenger, E. *Communities of Practice: Learning, Meaning, and Identity*, Cambridge University Press, Cambridge, 1998.

Whittaker, S. "Talking to Strangers: An Evaluation of the Factors Affecting Electronic Collaboration," *Proceedings of the CSCW96*, Boston, MA, 1996, pp. 409-418.

Wilson, F. "Flogging a dead horse: the implications of epistemological relativism within information systems methodological practice," *European Journal of Information Systems* 8(1), 1999, pp. 161-169.

Wynn, E. "Groupware in a Regional Health Insurer: Local Innovations and Formative Context in Transition," In *Groupware and Teamwork*, C. Ciborra (ed.), John Wiley & Sons Ltd., London, 1996, pp. 211-236.

Yetton, P.W., Johnston, K.D. and Craig, J.F. "Computer-aided Architects: A Case Study of IT and Strategic Change," *Sloan Management Review* (Summer), 1994, pp. 273-286.

Yin, R. *Applications of Case Study Research*, Sage, Newbury Park, CA, 1993.

Yin, R.K. *Case Study Research: Design and Methods*, Sage Publications, Thousand Oaks, CA, 1994.

Zuboff, S. "New Worlds of Computer-Mediated Work," *Harvard Business Review* 60(September-October), 1982, pp. 142-152.

APPENDIX

Paper submitted to and accepted by International Conference of Information Systems (ICIS'2000).

Title: Framing Implementation Management

Contact Author: Angela Lin

Keywords: implementation management, technological frames, translation process, case study.

Contact information: Angela Lin[1] & Tony Cornford[2]

1. School of Information Management
Leeds Metropolitan University
The Grange, Beckett Park
Leeds LS6 3QS, UK
Tel: +44 (0)113 283 2600 ext 3646
Fax: +44 (0)113 283 3182
e-mail: a.lin@lmu.ac.uk

2. Department of Information Systems
London School of Economics and Political Science
Houghton Street
London WC2A 2AE, UK
Tel: +44 (0)20 7955 7337
Fax: +44 (0)20 7955 7385
e-mail: t.cornford@lse.ac.uk

Framing Implementation Management

Abstract

The research reported in this paper explores IS implementation in the early stages of a project as a process of social translation of ideas about technology. The research employs a technological frames analysis to examine how human agents translate public or global accounts into things that they are familiar with and are of interest, filter out alternative meanings and engage in social interaction in order to pursue their images of a technology coming into use. The paper is based on a case study of the early stages of a new e-mail system in an international banking institution. The findings of the case study suggest that a translation process which takes place at both individual and organisational level at the initial stage of an IS project can have significant consequences for the overall implementation process.

Keywords: implementation management, technological frames, translation process, case study.

Introduction

This paper offers a distinct perspective on implementation, one that is less well represented in the literature, which focuses on the early stages of a project as ideas and notions of what is to be achieved, and what technology offers, are explored and shaped. If information artefacts are seen as independent entities with functional and planned uses, but no wider impacts on or responses from host organisations, implementation is a technical and project bound issue with a scope limited to questions such as preparation of data, training, acceptance testing and conversion (Avgerou and Cornford, 1998). Such a simple view of implementation management has been challenged both by academic studies and by reported experiences in recent years. For example, alternative accounts of implementation can be found in the literature on resistance to change (Keen, 1981; Keen, 1991), IS failure (Lyytinen and Hirschheim, 1987; Poulymenakou and Holmes, 1996), escalation (Drummond, 1996; Keil, 1995; Markus and Keil, 1994), incremental development (Gallivan, et al., 1994; Jackson, 1995; Orlikowski, 1996) and drifting (Ciborra, 1996, 2000). In each case, the narrative of implementation of a system

is seen as problematic, at times conflictual, and bound up in a complex set of political actions and reactions, situated accommodations and learning. This paper examines the issue from a contrasting perspective and argues that implementation management is a process of managing social translations of technology (see also Whitley and Pouloudi, 2000). This is achieved through a social cognitive approach that provides important countervailing insights when contrasted with more techno-managerialist accounts of implementation.

Various distinct theoretical positions underpin all these more complex accounts of implementation activity. The school of *technological determinism* assumes that these artefacts are potent external forces with instrumental power over organisational and social properties (King, 1991; Siegel, et al., 1986; Sproull and Kiesler, 1986). Technological determinism sees implementation as a part of a larger process of historically driven organisational change achieved through the characteristics of available information artefacts. Implementation management is then about facilitating the initial entry of the technology. The related school of *organisational imperativism* sees the artefacts as equally potent but capturable, as a means to an end, with their power at the disposal of wise planners, managers or reformers (Hammer and Champy, 1993). This views implementation as the introduction of changes via a choice of new artefacts with the purpose of creating strategic and sustainable links between the business environment, business processes and organisational forms (Porter and Millar, 1985; Randall, et al., 1995; Taylor, 1995). In contrast to the above, the school of *socio-technical interactionism*, consider information artefacts as (to some degree) multi-valent and plastic; and needing refinement, shaping and situating within the social structures of the organization (Lin and Cornford, 2000; Mumford, 1987), with implementation as, ideally, an explicit, creative and contextual process of linked and mutually sustaining social and technological shaping negotiated within the organisational setting (Ackoff, 1967; Kling, 1980; Markus, 1983). Managing implementation then means to sustain and harness changes simultaneously in both the social and technological arena.

More recent *structurational* work, influenced by the work of Giddens (Giddens, 1984) suggests that the above approaches all provide an incomplete view of implementation and change, and emphasises that changes in either organisational *or* technological properties are the consequences of situated human actions (Barley, 1986; Jones, 1999;

Orlikowski, 1991; Poole and DeSanctis, 1990; Riley, 1983; Walsham,1993). Structurationism gives a more prominent role to agency (human action) and the modalities (including information artefacts) through which agency influences, and is influenced by, organizational structures. The assumption is that information artefacts themselves are socially constructed, and the uses found for such artefacts depend on meanings that human agents assign to them (Grint and Woolgar, 1997). The premises of technology made by structurationism (Orlikowski, 1991) are twofold; that technology is created and changed by human action; and that technology is interpretively flexible and its use (consequences and trajectories) depends on human agents. Because the structures of both organisations and technologies poses the capability to produce and reproduce, and human agents posses the capability to make sense of their surrounding environment and to reflect their knowledge in their behaviours, the distinction between intended (inevitable, planned, predicted or managed) and unintended (emergent, unplanned, unpredicted, unmanaged) narratives become far less clear.

The research reported in this paper is broadly within this structurational school and explores implementation management as a process of social translation of ideas about technology, with human agents translating public or global accounts into things that they are familiar with and of interest, filtering out redundant meanings and engaging in social interactions in order to pursue their images of a technology in use. Within this research framework we employ technological frames analysis to examine human agents' knowledge of and experiences with technology, and the meanings which they assign to it. Our study, carried out in an international financial institution, reveals how through social interactions human agents translate, attenuate and eliminate meanings of technology to meet their own agenda. The study aims to provide pertinent implications for the management of implementation, both in theory and in practice.

Research approach

Various research studies in information systems have drawn on models that might be described as contributing to a school of social cognitive theory (SCT). Such studies have addressed individual reactions to and beliefs about information technology, as well as systems' outcomes (Boland, et al., 1994; Bostrom and Heinen, 1977; Ginzberg, 1981; Orlikowski, 1992; Orlikowski and Gash, 1994; Swanson and Ramiller, 1997; Weick and Bougon, 1986). A recent methodological contribution to SCT is technological

frames analysis (TFA); a generic conceptual approach for examining cognition when a new technology is encountered (Bijker, 1995; Orlikowski and Gash, 1994). Orlikowski and Gash (1994) define technological frames as:

> a set of assumptions, meanings, knowledge, and expectations that people use to understand the nature and role of technology in organisations. This includes not only the nature and role of the technology itself, but the specific conditions, applications, and consequences of that technology in particular contexts.

Bijker (1995) provides a contrasting definition, emphasising technological frames as a group phenomenon, a dynamic account of a technology formed and shared through interaction.

> A technological frame structures the interactions among a relevant social group. A technological frame is built up when interaction "around" an artefact begins.

Orlikowski and Gash (1994) argue for the importance of understanding people's technological frames as references to their interpretations of technology, which then shape behaviour. In this they quote Weick (1986) "cognition and micro-level processes are keys to understanding the organisational impact of new technologies", and offer technological frames as a "crisp and powerful lens for focusing ... on how people make sense of particular aspects of the world." For Bijker, technological frames offer, "a theoretical concept...used by the analyst to order data and to facilitate the interpretation of the interaction within a relevant social group" (Bijker, 1995).

The underlying assumption behind TFA is essentially structurational: people (or groups) act according to the meanings that technologies have for them, and their actions shape meaning of technologies for others and for institutions. As such, frames can be both enabling and constraining. They are enabling when they "structure organisational experience, allow interpretation of ambiguous situations, reduce uncertainty in situations of complexity and change, and provide a basis for action"; they are constraining when they "reinforce unreflective reliance on established assumptions and knowledge, distort information to make it fit existing cognitive structures and inhibit creative problem solving" (Orlikowski and Gash, 1994). They argue that technological

frames analysis, as a research construct, allows researchers to understand the thought processes and cognitive resources (frames) behind individuals' behaviour, in contrast to research approaches that only record happenings.

TFA's ability to expose the production and reproduction of individuals' or groups' experiences, in relation to their attitudes towards technology and organisational understanding, provides a powerful framework to examine the process by which individuals try to make sense of technology. In order to examine how individuals' technological frames and their attitudes towards the technology develop in relation to others' and in an organizational context, we borrow here the concept of translation. Translation, as introduced by Latour (1987) is a process which offers new interpretations of a statement (a technology) and channels people in different directions. As defined in Latour (1999), a translation is "the work through which actors modify, displace, and translate their various and contradictory interests". Latour's use of the word translation is intended to convey a complex notion of ideas and facts moving and changing among a community; in part as a linguistic restatement in a new language, but also as a move in space or time, from one place to another. Latour (1987) further argues that an initial statement would (potentially) no longer be the same as an increasing number of interest groups become involved in a chain of translations, and he calls this phenomenon "translation drift". Each translation associates with a transformation and after a series of translations and transformations an artefact becomes what it is now.

In line with other critiques (Brown and Capdevila, 1999; Lee and Brown, 1994), we hesitate at the indiscriminate treatment that some accounts of the notion of translations gives to subjects (people-actors) and objects (artefacts), and the positioning of entities (both subjects and objects) in a network. Our interest in translation is limited to its underlying semiotic approach, which tells us that artefacts achieve their form as a consequence of how and by whom they are interpreted. That is, we are interested in how translators' positions and situations in relation to others' affect their interpretation of the artefact. This process, by which individuals or groups try to make sense of an idea or artefact according to their relation with others, is termed here a process of *social translation of technology*. This notion is used in conjunction with TFA to conceptualise the management of implementation as a process in which various interest groups are

keen to construct and communicate their own interpretations of a technology as *the* definition of the technology.

Research site and method

Our research was conducted in an international financial institution, the Bank (a pseudonym), and studied a project to replace an old e-mail system with a new one. Data came from a number of sources including semi-structured interviews, documentation, memoranda, informal conversations, observations, and follow up e-mail questionnaires. Six people were formally interviewed and each interview lasted 1 to 2 hours, and each interview was tape-recorded and transcribed. Over 163 documents and memorandums were also reviewed. Lunch in the canteen provided another research opportunity, to meet and talk to members of the staff. It was natural that people were more relaxed in the canteen than in a meeting room, and discreet observations were made of conversations between colleagues. After the fieldwork period, some follow-up questions were sent via e-mail to the interviewees.

Data was interpreted cautiously within the research framework chosen, thereby preserving openness to the data gathered in the field and remaining sensitive to the context studied (Walsham, 1995). We are aware of the limitations associated with this analytical approach and have no intention to claim gross generalisation of the findings. Nevertheless, we believe that the findings from this case study can help us to look at implementation management differently.

Research study

In 1993 the Bank was thinking of replacing its old e-mail software, in use since 1988. The old system had been selected at the same time as a new network operating system as part of the establishment of a desk-top office automation platform. In 1988 it had been judged as the best suited to the Bank's requirements, but the coming of Windows made this MS-DOS based and command driven package be seen as increasingly problematic. Users had not found the software intuitive and this demotivated them to explore the system further; many knew only how to read and send messages although many other functions were available. As new employees came to the Bank and saw the system they often remarked negatively in terms of "What is this? Where I worked

before the systems could do such and such...", creating further pressure for a new 'modern' system.

It was not only users who complained, so too did IS personnel, since the system posed a significant workload for them. The mail and appointment call programs and the printer drivers had to be developed at the Bank since the features were not available or did not run properly. The security and reliability of the e-mail database also caused concern; regular corruption, loss of mail, unauthorised database access and service unavailability were evident, partly because the system database could not be properly protected at the network operating level. Among all the technical problems and user complaints, it was perhaps the instability of the system that drove the Information Systems Department (ISD) to decide to launch a project to provide a replacement. For example, ISD needed to spend at least one working day per week to maintain the system and sort out system crashes.

Research findings

In this abbreviated account three interest groups involved at the early stages of implementation are identified: office information systems (OIS); the user group (UG); and the management group (MG). OIS was the division within the ISD responsible for providing office automation applications and formally owned the project. The UG was set up to contribute to the project, consisting of 10 representatives from user departments with a role as a bridge between OIS and the wider user community. The role of the MG in the project was to assess and allocate the required budget to the project, and to demonstrate its support for the project to the rest of the Bank.

In analysing our research material, documents and transcripts, four domains of technological frames held by these interest groups were identified. As in Orlikowski and Gash's work, we used our data to generate these domains.

The nature of problems – understandings of organisational and workplace problems in relation to technology.

Requirements for the system – positive expectations of the technology in organisational and workplace terms.

Images of implementation – understandings of the process of change that brings technology into the organization

Issues of use – concerns about technology in use and impact on work activities.

As summarised in Table 1, each of the groups identified had their own technological frames, with distinct content in each of the four domains. For reasons of space, the rest of this section only examines in detail the technological frames of the OIS as these operated at the early stages of the project.

Table 1: Comparison of the key elements of technological frames at the early stages of the project

	OIS	User Group	Management Group
The nature of problems	Technological, with user voices at some distance.	Operational, old fashioned, unusable.	Organisational.
Requirement for the system	Fit to the current infrastructure, overcome current problems; rapid deployment, user training, and management support.	User friendly, easy to learn; require minimum new skills; modern, up-to-date.	Cost effective, achieving what had been offered by the old system and offering enhanced facilities.
Images of Implementation	Speed is the essence; stock of skills; support in depth; training as transition.	Getting in the way; we have real jobs to do.	Risk.
Issues around use	Easier to manage; reduced complaints from users; secure.	Seamless.	Official communication channel, no misuse of the technology.

The Nature of problems. OIS respondents saw the project as a solution to technical problems embedded in the current system such as "not robust enough", "instability", "unreliability", "MS-DOS based". OIS were also upset about a situation in which users

continually complained to them and they spent much time on repeatedly fixing the same problems. The project co-ordinator recollected:

> (The old system) could just about manage the internal e-mail requirements all the time. It was just running the DOS Box within Windows, (but) it was not stable enough. I had to spend half a day to a day a week to keep the system active. And you could not put external mail on it because of the large number of users and traffic which would break ...the system. So we realised that the system was not robust enough to meet the requirements of today's situation.

A survey carried out by the UG demonstrated users' contrasting understandings of the problems:

- The current e-mail system is not user friendly and is difficult to understand
- The current e-mail system is out of date
- The current e-mail system is unstable and crashes
- Users expect to receive a replacement soon and expect that the new system to be easy enough for them to pick up *without* investing time or effort because they have other real jobs to do.

Viewing the current problem as technological, OIS naturally sought for technological solutions, but at the same time they had to make some sense of users' complaints. OIS's conclusion was that a new e-mail system was needed. On the basis of this understanding the WORKGROUP project was initiated.

Requirements for the system. OIS had a clear and specific vision of what the future system needed to achieve, and had a strong feeling that the new system needed to be compatible with the existing IT infrastructure since they considered incompatibility of the current system as the origin of the problems that the Bank had encountered. Since OIS understood the problems as being technological and infrastructural ones, the requirements which they put forward were naturally technologically-oriented, too.

To overcome current weaknesses of the existing mail system in the areas of availability and security

- To provide a robust platform for future development
- To simplify and automate the administration and maintenance of the system
- To provide a proper integration with the Windows environment in order to take full advantage of the data interchange and to link with other applications
- To simplify the use of the overall package (electronic mail, filing, diary, to-do list, etc.)

It was noted that users' understandings were not strongly incorporated as part of these requirements.

Images of implementation. OIS believed that managing the change implied in adopting the new technology (in their words roll-out) was critical for a successful project, including having sufficient technical skill and knowledge of the new system, user training, vendor's ability to provide local technical support, and management endorsement. These criteria, which were strongly reflected in the OIS team members, were formed on the basis of past experiences. For example, concern with rapid system roll-out originated from earlier experience of introducing PCs into the Bank when a delay between training and delivery of PCs meant that, by the time the PCs arrived, users had either lost enthusiasm or could not remember what they had learned in training.

The issue of implementation (roll-out) was so key in the minds of OIS that most of their actions within the early project might be seen as driven by a concern with this 'moment of use' and haunting images of failure. This led them to take some very deliberate actions to shape and control the project's progress, as described below. However, we do not wish to place these actions within any strongly managerialist-translation model. We do not suggest that they 'attempted controlled translation', rather that we can see their situated actions in terms of shaping technological frames through translation.

Issues of use. OIS had a firm idea of how e-mail should be used and for what purposes. OIS explained their view in project documentation:

> Electronic mail is appropriately viewed as a store-and-forward transport for electronic objects across a heterogeneous environment, among people, among people and applications and among applications.

OIS saw e-mail as primarily a formal, business communication channel and not for personal use; behaviour such as distributing private and non-business messages around the Bank was not to be encouraged. However OIS was prepared to create some spaces, discussion groups, within the system to allow people to post general announcements.

A Translation Process

The above outline of OIS' technological frames at the initiation of the project illustrates the issues which concerned OIS at that time. As such, OIS took necessary steps to act upon their interpretations of these issues. It is notable that, in general, the three interest groups did not share the same view, explained by Orlikowski and Gash as an incongruence of technological frames. Incongruence refers to differences in important expectations, assumptions, or knowledge about some key aspects of the technology. According to their research findings, the existence of incongruence is likely to cause failure, or at least a less successful technology adoption, but this is not the case here. This project was reported by senior ISD managers as being the most successful one in the Bank's IT history. The different outcomes of the two case studies can be interpreted as being the result of the two organisations having different attitudes towards a translation process at the early stages of the project. The translation process in Alpha was loose and not closely monitored and managed, while the process at the Bank was carefully managed with active intervention by OIS to make sure that the progress of the project was (in their terms) on track. Here, we illustrate how OIS actively intervened to reshape different views between the interest groups by translating them into something else.

The issue of usability versus infrastuctural fit. Based on these distinct technological frames, the UG and OIS selected different software for the new e-mail system. The UG chose what they saw as a user-friendly package, Beyond Mail, whereas OIS chose a technologically fit system, GroupWise. The OIS were happy to admit that Beyond Mail was more user friendly than their choice, an acknowledgement of others

technological frames, but they then set out both overtly and covertly to change the frames. The overt action was to lobby UG members and to talk confidently and in technological language (jargon), about the superiority of their preferred product. Users were inclined, in the face of such confidence, and such mystification, to defer. The covert action was to set up formal evaluation criteria that expressed their own interests in an exaggerated way. Thus issues of diary and calendar functions emerged as critical criteria (and once selection was undertaken, never reappeared). In its conclusion to the evaluation exercise, the OIS suggested that GroupWise was better in terms of maintenance, costs and benefits, security etc. even though Beyond Mail was judged as considerably easier to use. At the end of the evaluation exercise the UG members, in an example of the Stockholm syndrome, felt that the OIS obviously 'knew what they were doing' and had better judgement compared to them, and hence agreed to the OIS' choice.

Thus OIS deliberately and actively set out to engineer a process (through talk and evaluation criteria) to change the UG's frames and expected that the UG's initial criteria for a successful system would be changed. This is the first major conflict that the OIS and UG came across at the initiation stage and was resolved as the different versions of the project were translated and reduced to the one that the OIS had in mind, occupying their territory.

Three in one: managing different understandings. The three groups studied approached the issue of the Bank's e-mail from different perspectives: technological (OIS), operational (UG), and organisational (MG). To manage these different perspectives, and at the same time to make sure that the project remained under control, OIS needed to work on translation in two different languages; to translate operational requirements into technological requirements for the UG, and to translate technological requirements into organisational requirements for the MG.

OIS did not have much power in the institution, it was identified as a support activity and associated with a number of failed projects going back over decades. Hence, in order to push the project forward on the basis of its interests, OIS deliberately translated users' operational requirements into technological ones and reframed users' problems as technological ones. By doing so, people would be less able to challenge OIS' decisions about the project, giving an impression that their authority was being challenged in their

own area of expertise. When OIS was confronted with users' questions about their actions they spoke in technological terms in order to de-motivate further discussion.

In contrast, in facing the MG. OIS could not speak its own language but had to translate to the language of the MG, to translate technical rationales into organisational abstractions in order to make a link to business operations. For example, the project name was purposely chosen to reflect a current management theme, as the manager pointed out

When the project was initiated the idea of "working together" was regarded as one of the most popular themes within organisational studies. The term "WORKGROUP" was chosen purposely to draw the attentions of the MG.

Yet, at the same time it was made clear during the research that OIS had no intention of introducing the concept of "working together" into the Bank, despite suggesting to the MG that the project was about enhancing groupwork in the Bank. The project manager said:

The notion of "working together" may be considered in DOIS' next IS project but it was definitely not a part of the WORKGROUP project.

Conclusion and implications

This might be seen as just a typical technology push project, well managed by a competent IS department. However, what our study shows is that there were potentially critical conflicting views and tensions between the technologists and users during the project's initiation. By some accounts, the project should have failed miserably but quite the opposite happened. We argue that this successful outcome is made understandable as a translation process at the project initiation stage.

Traditional accounts of IS implementation refer to a discrete period of time and concrete activities which occur during or after a system is delivered to users. In this paper we argue that the idea of implementation should be expanded, and the findings suggest that the sense making process surrounding technology, and which is often thought to take place primarily only after a technology is put to use, indeed takes place at the initiation stage of the project. How people think about and evaluate technology at this stage

substantially influences the course that the project takes. We describe this as a process of social translation of technology in which interest groups involved make sense of the technology and offer others their interpretations of technology based on their own interests. It is expected that ***the*** definition of the technology will derive eventually during the process. The challenge that IS management faces is how to appreciate the processes of translation that occur, and how to achieve an optimal balance between different versions or translations offered by interest groups. Neglecting this challenge may result in a critical lack of control and a consequence would be that the initial interests and purposes of the project are lost – an acute case of Latour's (1987) "translation loss" that may lead to a system actually acquired being far from any actual needs.

As noted here, OIS constantly pursued their technological frames, how things should be seen and done, and any interests in the technology which diverged from theirs were actively reframed. The intention was that the changes made in frames would subsequently enable people to view the technology in a way compatible to theirs. Altering technological frames in order to enable people to think and act similarly and accordingly is, to an extent, a reiteration of Orlikowski's (Orlikowski,1992, p367) concluding analysis of the Alpha study: people's technological frames often need to be changed to accommodate a new technology. The approach proved to be quite effective in the Bank.

But could the OIS really claim its victory? Viewing the project in a wider timeframe, we found that OIS might have achieve almost full control over the translation process prior to the system roll-out (and minimal translation loss), but it seemed to lose this control (or did not want to retain it) after the system was delivered to users. For instance, formal rules of using e-mail were established to prevent misuse of the system, but in practice people still distributed general and private message around the Bank despite being "educated" during the training and "told" by the General Manager not to do so. Some began to send e-mail messages to senior managers directly instead of going through traditional channels. Such a development of was not planned or articulated by OIS, (indeed it was not in their technological frame), but derived from a growing sophistication emerging through an exploration of the new technology, which enabled people to translate the technology differently from the rules.

In this we might see the nature of the translation process as different prior to and after the system roll-out. Prior to the system roll-out people make sense of the technology according to their needs and their problems, and this will affect their decisions about which technology to adopt and the further direction of the project. After system roll-out, users in particular make sense of the technology in relation to their work, their position within the organization, and their relationship with peers', and what they come up with in this local context will strongly influence their attitude towards the technology (reshape their frames). Thus, IS managers needs to reflect on different strategies to manage different stages in the process. The case study in this paper suggests that managing the process prior to system roll-out can be done by reframing the needs, 'reengineering' the technological frames, and engaging in social interactions, even exercising political power. To manage the process in such a way after the system roll-out could be problematic as numerous translations are undertaken by individuals. Orlikowski (1992) suggests using communication and education to ensure individuals think and act similarly. However, this is a short-term strategy since individuals (and disparate groups), through their personal experiences with the technology, will develop different understandings of the technology and seek to use it accordingly, and management action then needs to explore, assess, evaluate the opportunities provided by users' translations.

In this paper, we have sought to present IS implementation as a process of translation. That people involved in implementation try, on the basis of their frames and interests, to translate a technology into something that they are familiar with. Managing an implementation process means appreciating this translation process as a basis for action. This is not to say that translation, any more than technological frames, can be simply engineered or constructed. But, building on these insights, we do suggest that there is a case for rethinking implementation management: to move beyond the prioritising of organisational or technological imperatives, and to characterise effective implementation management as the sensitive response to and careful managing of an emergent process of translation.

Reference

Ackoff, R.L. "Management Misinformation Systems," *Management Science* (14:4), 1967, pp. 147-156.

Avgerou, C. and Cornford, T. Developing Information Systems: Concepts, Issues and Practice, Macmillan, Basingstoke, 1998.

Barley, S. "Technology as an Occasion for Structuring: Evidence from Observation of CT Scanners and the Social Order of Radiology Developments," *Administrative Science Quarterly* (31), 1986, pp. 78-108.

Bijker, W.E. Of bicycles, bakelites, and bulbs: Towards a theory of sociotechnical change, The MIT Press, Cambridge, MA, 1995.

Boland, R. J., Tenkasi, R.V. and Te'eni, D. "Designing information technology to support distributed cognition," *Organization Science* (5:3), 1994, pp. 456-475.

Bostrom, R.P. and Heinen, J.S. "MIS Problems and Failures: A Socio-Technical Perspective, Part I - The causes.," *MIS Quarterly* (1:3), 1977, pp. 17-32.

Brown, S.D. and Capdevila, R. "Perpetuum mobile: substance, force and the sociology of translation," In *Actor Network Theory and after*, J. Law and J. Hassard (Ed.), Blackwell Publishers, Oxford, 1999, pp. 26-50.

Ciborra, C. "Introduction: What does Groupware Mean for the Organisations Hosting it?," In *Groupware and Teamwork*, C. Ciborra (Ed.), John Wiley & Sons Ltd, London, 1996, pp. 1-19.

Ciborra, C.U. "Drifting: From control to drift," In *Planet Internet*, K. Braa, C. Sorensen and B. Dahlbom (Ed.), Studentlitteratur, Lund, 2000, pp. 185-195.

Drummond, H. *Escalation in Decision-Making*, Oxford University Press, Oxford, 1996.

Gallivan, M.J., Hofman, D. and Orlikowski, W. "Implementing Radical Change: Gradual versus Rapid Pace," CISR WP 271, Centre for Information Systems Research, MIT, August 1994.

Giddens, A. *The Constitution of Society*, University of California Press, Berkeley, CA, 1984.

Ginzberg, M.J. "Early Diagnosis of MIS Implementation Failure: Promising Results and Unanswered Question," *Management Science* (27:4), 1981, pp. 459-478.

Grint, K. and Woolgar, S. *The machine at work: Technology, work and organization*, Polity Press, Cambridge, 1997.

Hammer, M. and Champy, J. *Reengineering the Corporation*, Harper Business, New York, 1993.

Jackson, S. "Re-engineering the Post Office," *New Technology, Work and Employment* (10:2), 1995, pp. 142-146.

Jones, M. "Structuration Theory," In *Rethinking Management Information Systems*, W. L. Currie and B. Galliers (Ed.), Oxford University Press, Oxford, 1999, pp. 103-135.

Keen, P. "Information systems and organizational change," *Communications of the ACM* (24:1), 1981, pp. 24-33.

Keen, P.G.W. Shaping the future: business design through information technology, Harvard Business School Press, Boston, MA, 1991.

Keil, M. "Pulling the plug: software project management and the problem of project escalation," *MIS Quarterly* (19:4), 1995, pp. 421-447.

King, R. "The Effects of Communication Technology and Reward Systems on Collaborative Work," In *Collaborative Work, Social Communications and Information Systems*, R. K. Stamper, P. Kerola, R. Lee and K. Lyytinen (Ed.), North-Holland, Amsterdam, 1991, pp. 355-372.

Kling, R. "Social Analyses of Computing: Theoretical Perspectives in Recent Empirical Research," *Computing Surveys* (12:1), 1980, pp. 61-110.

Latour, B. *Science in Action*, Harvard University Press, Cambridge, MA, 1987.

Latour, B. Pandora's Hope: Essays on the Reality of Science Studies, Harvard University Press, Cambridge, MA, 1999.

Lee, N. and Brown, S.D. "Otherness and the Actor Network: The Undiscovered Continent," *American Behavioural Scientist* (37:6), 1994, pp. 772-790.

Lin, A. and Cornford, T. "Sociotechnical Perspectives on Emergence Phenomena," In *The New Sociotech*, E. Coakes, L.-J. R. and D. Willis (Ed.), Springer-Verlag, Surrey, 2000,

Lyytinen, K. and Hirschheim, R. "Information systems failures: A survey and classification of the empirical literature," *Oxford Surveys in Information Technology* (4), 1987, pp. 257-309.

Markus, M.L. "Power, Politics, and MIS Implementation," *Communication of the ACM* (26:6), 1983, pp. 430-444.

Markus, M.L. and Keil, M. "If we build it they will come: Designing information systems that people want to use," *Sloan Management Review* :Summer, 1994, pp. 11-25.

Mumford, E. "Sociotechnical Systems Design: Evolving Theory and Practice," In *Computers and Democracy: A Scandinavian Challenge*, G. Bjerknes, P. Ehn and M. Kyng (Ed.), Avebury, Aldershot, UK, 1987, pp. 59-76.

Orlikowski, W. "Improving Organisational Transformation Over Time: A Situated Change Perspective," *Information Systems Research* (7:1), 1996, pp. 63-92.

Orlikowski, W.J. "The Duality of Technology: Rethinking the Concept of Technology in Organizations," CISR WP No. 219, Centre for Information Systems Research, Sloan School of Management, MIT, January 1991.

Orlikowski, W.J. "Learning From Notes: Organizational Issues in Groupware Implementation," CISR WP No. 241, Center for Information Systems Research, Sloan School of Management, MIT, May 1992.

Orlikowski, W.J. and Gash, D.C. "Technological Frames: Making Sense of Information Technology in organisations," *ACM Transactions on Information Systems* (12:2), 1994, pp. 174-206.

Orlikowski, W. J. "Improvising organizational transformation over time: A situated change perspective," *Information Systems Research* (7:1), 1996, pp. 63-92.

Poole, M. and DeSanctis, G. "Understanding the Use of Group Decision Support Systems: The Theory of Adaptive Structuration," In *Organisations and Communication*

Technology, J. Fulk and C. Steinfield (Ed.), Sage Publications, Newbury Park, London, 1990, pp. 173-193.

Porter, M. and Millar, V. "How Information Gives you Competitive Advantage," *Harvard Business Review*), 1985, pp. 49-160.

Poulymenakou, A. and Holmes, A. "A contingency framework for the investigation of information systems failure," *European Journal of Information Systems* (5:1), 1996, pp. 34-46.

Randall, D., Rounceield, M. and Hughes, J. "Chalk and Cheese: BPR and Ethnomethodologically Informed Ethnography in CSCW," *Proceedings of the European Conference on Computer-Supported Cooperative Work*, Stockholm, Sweden, 1995, pp. 325-340.

Riley, P. "A Structurationist Account of Political Culture," *Administrative Science Quarterly* (28:3), 1983, pp. 414-437.

Siegel, J., Dubrovsky, V., Kiesler, S. and McGuire, T. "Group Process in Computer-Mediated Communication," *Organisational Behavior and Human Decision Processes* (37), 1986, pp. 157-187.

Sproull, L. and Kiesler, S. "Reducing Social Context Cues: Electronic Mail in Organizational Communication," *Management Science* (32:11), 1986, pp. 1492-1512.

Swanson, E.B. and Ramiller, N. "The organizing vision in information systems innovation," *Organization Science* (8:5), 1997, pp. 458-474.

Taylor, J.A. "Don't obliterate, informate: BPR for the information age," *New Technology, Work and Employment* (10:2), 1995, pp. 82-88.

Walsham, G. "Interpretive case studies in IS research: nature and method," *European Journal of Information Systems* (4), 1995, pp. 74-81.

Weick, K.E. and Bougon, M.G. "Organisations as Cognitive Maps: Charting Ways to Success and Failure," In *The Thinking Organisations*, J. H. Sims and D. Gioia (Ed.), Jossey-Bass, San Francisco, CA, 1986, pp. 102-135.

Whitley, E.A. and Pouloudi, A. "Studying the translations of the NHSnet," *Journal of End-User Computing* (Forthcoming), 2000.