AN EMPIRICAL STUDY OF THE IMPACT OF INFORMATION TECHNOLOGY ON CORPORATE FINANCIAL REPORTING: A CONTINGENCY PERSPECTIVE

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Abstract

This thesis investigates whether information technology [IT] ameliorates or exacerbates the information asymmetry between management and external users of financial information, and ascertains whether and under what circumstances IT has an impact on external reporting. These two issues are investigated under the proposed contingency perspective. The main aims of this thesis are to provide a policy-making basis for regulators of corporate financial reporting [CFR], and to formulate a theoretical framework which can be used for research in this area.

A survey design has been adopted. Mail questionnaires have been used to collect data from a sample of UK public companies, supplemented by personal interviews. Statistical procedures have been applied to analyse the data. The results demonstrate that, while contributing to some improvements in CFR, the use of IT has played a role in the aggravation of the information asymmetry between management and external users, and in this sense it has counteracted the social benefits of financial reporting. A major implication of this is that the use of IT in accounting requires monitoring and control at a societal level. However, UK regulators have done little in this respect and thus this thesis proposes several courses of action for them. Moreover, although IT plays a role in improving external reporting, the impact of IT varies depending on factors such as company size and leverage. These results are useful for regulators since they enhance the understanding of and, the ability to predict, the impact of IT.

This thesis is the first study which has empirically evaluated the influence of IT on external reporting and has put the impact of IT into the context of information asymmetry. Moreover, although it should be subject to further empirical test, the proposed contingency framework proves general, flexible, analytical and operational, and appears to be widely applicable.

Statement of Objectives

The main aims of this thesis are to form a policy-making basis for regulators in relation to the impact of IT on CFR, and to provide a theoretical framework which can be used for research in this area.

Its principal objective is to evaluate empirically the impact of IT on CFR. Specifically, it examines the effect of IT on the information asymmetry between corporate managers and external users of financial information, and investigates whether and under what conditions IT has an impact on external reporting. For this purpose, it proposes a contingency framework as theoretical guidance.

In addition, this thesis has two subsidiary objectives. The first is to examine the changes in information provided to corporate managers and external users, which is a prerequisite for achieving the main objective. The second is to evaluate, against some early expectations, the role of IT in accounting method choice and change which constitutes an important part of CFR.

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List of Abbreviations

AAA: American Accounting Association

ACCA: Chartered Association of Certified Accountants (UK)

AI: artificial intelligence

AICPA: American Institute of Public Certified Accountants

APB: Accounting Principles Board (USA)

ASB: Accounting Standards Board (UK)

ASSC: Accounting Standards Steering Committee (UK)

BEXT: extent of computerisation

BFEAT: innovative features of IT use

BOBJ: objective achievement

BRAT: workstation to staff ratio

BSAT: user satisfaction

BSTAT: level of IT integration

BTEC: types of IT applied

BTYP: types of IT-based systems in use

BYRS: years of IT use

CASE: Computer Aided Software Engineering

CERT: certainty of business environment

CFR: corporate financial reporting

CIMA: Chartered Institute of Management Accountants (UK)

COMPT: market competitiveness

DBMS: Database Management Systems

EDEM: external demand for financial information

EDGAR: Electronic Data Gathering Analysis and Retrieval

EDI: Electronic Data Interchange

EIS: executive information systems

E-R: entity-relationship

ERC: external reporting change

ERCAGG: aggregate of ERC items

ES: expert systems

EXACC: access dimension of external reporting

EXCOM: comprehension dimension of external reporting

EXREL: relevance dimension of external reporting

EXTIM: time dimension of external reporting

FAME: Financial Analysis Made Easy

FASB: Financial Accounting Standards Board (USA)

FRSTR: external financial reporting strategy

GAAP: Generally Accepted Accounting Principles

IASC: International Accounting Standards Committee

ICAA: Institute of Chartered Accountants of Australia

ICAS: Institute of Chartered Accountants of Scotland

ICEAW: Institute of Chartered Accountants in England and Wales

IDEM: internal demand for financial information

INACC: access dimension of internal reporting

INCOM: comprehension dimension of internal reporting

INREL: relevance dimension of internal reporting

INTIM: time dimension of internal reporting

IRC: internal reporting change

IRCAGG: aggregate of IRC items

IT: information technology

ITBUS: closeness between business and IT

ITENT: the extent of IT use

ITG: Information Technology Group (UK)

ITQUL: the quality of IT use

ITRAI: IT training for accounting staff

ITUSE: aggregate of IT use variables

ITWAY: the way IT is used

LAN: Local Area Network

LIST: listing status

MIS: Management Information Systems

MA: management accountants

NITTF: National Information Technology Task Force (Australia)

PC: personal computer

PLAN: management compensation plan

PSHIP: professional qualification of accounting staff

SALE: company size (ratio variable)

SEC: Securities and Exchange Commission (USA)

SIZE: company size (ordinal variable)

SPSS: Statistical Package for Social Scientists

WAN: Wide Area Network

XACS11: accessibility in internal reporting

XACS21: accessibility in external reporting

XAUD11: auditability in internal reporting

XAUD21: auditability in external reporting

XAVA11: availability in internal reporting

XAVA21: availability in external reporting

XCOM11: comparative information in internal reporting

XCOM21: comparative information in external reporting

XCOS11: cost of internal reporting

XCOS21: cost of external reporting

XEXT11: external information in internal reporting

XEXT21: external information in external reporting

XFOR11: forecast information in internal reporting

XFOR21: forecast information in external reporting

XFRE11: frequency in internal reporting

XFRE21: frequency in external reporting

XNON11: non-financial information in internal reporting

XNON21: non-financial information in external reporting

XPRE11: presentation in internal reporting

XPRE21: presentation in external reporting

XSEG11: segmental information in internal reporting

XSEG21: segmental information in external reporting

XSTR11: strategic information in internal reporting

XSTR21: strategic information in external reporting

XTAI11: user tailored information in internal reporting

XTAI21: user tailored information in external reporting

XTIM11: timeliness in internal reporting

XTIM21: timeliness in external reporting

XUND11: understandability in internal reporting

XUND21: understandability in external reporting

ZACS12: IT importance in change in accessibility in internal reporting

ZACS22: IT importance in change in accessibility in external reporting

ZAUD12: IT importance in change in auditability in internal reporting

ZAUD22: IT importance in change in auditability in external reporting

ZAVA12: IT importance in change in availability in internal reporting

ZAVA22: IT importance in change in availability in external reporting

ZCOM12: IT importance in change in comparative information in internal reporting

ZCOM22: IT importance in change in comparative information in external reporting

ZCOS12: IT importance in change in cost of internal reporting

ZCOS22: IT importance in change in cost of external reporting

ZEXT12: IT importance in change in external information in internal reporting

ZEXT22: IT importance in change in external information in external reporting

ZFOR12: IT importance in change in forecast information in internal reporting

ZFOR22: IT importance in change in forecast information in external reporting

ZFRE12: IT importance in change in frequency in internal reporting

ZFRE22: IT importance in change in frequency in external reporting

ZNON12: IT importance in change in non-financial information in internal reporting

ZNON22: IT importance in change in non-financial information in external reporting

ZPRE12: IT importance in change in presentation in internal reporting

ZPRE22: IT importance in change in presentation in external reporting

ZSEG12: IT importance in change in segmental information in internal reporting

ZSEG22: IT importance in change in segmental information in external reporting

ZSTR12: IT importance in change in strategic information in internal reporting

ZSTR22: IT importance in change in strategic information in external reporting

ZTAI12: IT importance in change in user tailored information in internal reporting

ZTAI22: IT importance in change in user tailored information in external reporting

ZTIM12: IT importance in change in timeliness in internal reporting

ZTIM22: IT importance in change in timeliness in external reporting

ZUND12: IT importance in change in understandability in internal reporting

ZUND22: IT importance in change in understandability in external reporting

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Chapter 1: Introduction

Information technology (IT) is widely used in accounting (Carr, 1985 & 1987; Clark and Cooper, 1985), and the impact of IT on accountants, and on internal accounting and reporting, has attracted considerable research effort (see, for example, Collier, 1984; McCosh, 1986; King *et al.*, 1991). However, research into the interactions between IT and external reporting is less advanced. In particular, no empirical evaluation has been made of the influence of IT on external reporting, and no study has been undertaken to compare the impact of IT on internal reporting with that on external reporting.

This thesis strives to fill this gap. Its primary concern is whether IT has ameliorated or exacerbated the information asymmetry between corporate management and external users of financial information. It also sets out to ascertain whether and under what circumstances IT has an impact on external reporting. These two issues are investigated under the proposed contingency perspective. The main aims of this thesis are to form a policy-making basis for financial reporting regulators and to provide a theoretical framework which can be used for research in this area.

A mail questionnaire survey of a sample of UK public companies has been undertaken to collect data, supplemented by a number of interviews. Statistical procedures have been applied to analyse the data. The results demonstrate that IT is a two-fold weapon. On the one hand, its use contributes to some improvements in financial reporting although the extent and pattern of its effect varies depending on contingent factors such as company size, leverage and financial reporting strategy. On the other, its use has counteracted the social benefits of public financial reporting to the extent that it enlarges the information asymmetry between corporate management and external users of financial information. The analyses also show that the proposed framework is general, flexible, analytical and operational, and further it has wide scope of application. These and other findings bear important implications for financial reporting regulators and for further research.

The following sections elaborate on the research topic and the objectives, introduce the research methods used, present the main findings, discuss the possible contributions, and provide an overview of the thesis.

Section 1: Objectives

Since this thesis is concerned with the impact of IT on corporate financial reporting [CFR], it is necessary to define IT, CFR and the impact of IT before the objectives are detailed. Following the Oxford Dictionary (1989), IT is defined here as computer-based technologies concerned with the processing, storage and dissemination of information. This definition excludes traditional tools such as the typewriter, the abacus, and other mechanical devices. It also excludes non-computer-based modern information technologies such as facsimile and the photocopier. While IT can be seen as having three dimensions, namely IT availability, IT use and forecasted IT, this study focuses on IT use, especially on IT application in accounting.

Financial reporting is concerned with the communication of information (mainly financial information) to users. It consists of two main aspects: financial disclosure and accounting method choice and change (Beaver, 1986). This study mainly focuses on the first although the second is also touched as there have been some common but compelling expectations about the role of IT in it and these expectations remain to be evaluated. A distinction is made between internal reporting in which the users are the managers of the reporting entity, and external reporting in which the users are the outside stakeholders such as shareholders and creditors (ICAS, 1988). Financial reporting involves a number of parties, such as accountants, providers, users, auditors, regulators, and intermediaries (Beaver, 1986). In contrast to previous studies which emphasised on accountants, this thesis focuses on users by evaluating the impact of IT on information provided to them. Since the companies investigated are all business enterprises, financial reporting is qualified by the word "corporate".

The impact of IT on CFR is defined as IT-related changes in CFR. This definition encompasses two roles of IT use in CFR: as a cause and a facilitator of a CFR change. Three ways can be used to observe IT-related changes: (1) by directly questioning what changes have been caused by IT use, (2) by asking about the importance of IT use in any changes that have occurred, or (3) by statistically examining the relationship between IT use and CFR changes. The first approach requires the isolation of the impact of IT if a change is caused by multiple factors, while the second one requires a knowledge of all factors and their relative importance in a change. These requirements are in practice very difficult to meet, and therefore the third approach has been adopted in this study.

This thesis has two broad objectives. The first is to evaluate empirically the impact of IT on CFR. Specifically, it attempts to examine the effect of IT on information asymmetry between corporate managers and external users of financial information. It also sets to investigate whether and under what conditions IT has an impact on external reporting. The rationale for this objective is three-fold.

Firstly, there is a bias in the literature concerning IT impact on accounting. Most previous studies concentrated on the IT-made opportunities and threats to accountants while paying little attention to the users of financial information. Apart from some speculations, no evaluation of the actual impact of IT on external reporting has been undertaken. However, it would be valuable for financial reporting regulators to know whether the use of IT has improved or impaired external reporting, and if so, in what respect. This paper, therefore, puts an emphasis on users rather than accountants, on external reporting rather than internal reporting though it is involved. This is achieved by examining the impact of IT on the information provided to external users and the manner it is provided. The study, however, is not intended to investigate how users use this information.

Next, the issue of information asymmetry may have been complicated by the use of IT. Information asymmetry between corporate management and outside investors, and among outside investors has long been a major concern in information economics and agency theory (Beaver, 1986; Walker, 1987). This problem results in some socially harmful consequences such as insider dealing, to which public financial reporting and financial reporting regulation are part of the solution. It is crucial, therefore, for regulators to monitor whether the use of IT has affected the information asymmetry, and to take measures to tackle any negative influence. In this study, the influence of IT on the information asymmetry between corporate managers and external users is probed by contrasting internal reporting with external reporting.

In addition, there have been many speculations about the impact of IT on CFR, for instance, multiple measure reporting (AAA, 1966; Bedford, 1973), on-line reporting (ITG, 1989), database disclosure (Ijiri and Kelly, 1980; Cushing, 1989), and the greater use of mathematically or statistically complicated methods (McRae, 1964; AAA, 1966). Applying Porter and Millar's (1985) model, CFR would also seem to be an area where IT can play an important role, since the process of CFR has high information intensity, and its products possess high information content. However, empirical evidence is required to ascertain whether these expectations have been realised, and if not, why.

The second objective of this study is to propose a contingency framework which can be used as theoretical guidance. This objective is set for three reasons. First, theory is important in research because it offers general but testable predictions, and because it can provide a basis for integrating seemingly disparate studies or research results (Robey and Zmud, 1992). However, there is no ready theoretical framework in the literature concerning the impact of IT on accounting, consequent upon the neglect of theoretical development in previous studies. Moreover, previous studies suffered from a general lack of theoretical guidance. This thesis intends to avoid this problem.

Second, CFR is not a mere technical system, but has complex economic, social and political implications (Solomons, 1978; Zeff, 1978; Markus and Pfeffer, 1983; Beaver, 1986; Dyson, 1991; Xiao, 1994). Similarly, IT is multiple-faceted. On the one hand, it has technological attraction, on the other, its use often represents human judgement, giving rise to social, political, economic, and ethical issues (Weizenbaum, 1984). Although IT use is subject to human control, it may also be liable to misuses and abuses, and moreover, its use may have unintended consequences (Chambers and Court, 1987; Xiao 1990). It follows that the evaluation and prediction of the impact of IT on CFR requires a sophisticated analytical framework rather than intuition.

There are other perspectives which have been adopted in the studies of the impact of IT on organisational changes, including technological imperative, organisational imperative, and emergent theories (Markus and Robey, 1988). However, following a close examination of the nature of IT and CFR, it becomes clear that the evaluation of the impact of IT on CFR requires a framework which allows both technological analysis and non-technological analysis, and which is general yet adaptive and flexible enough for the researcher to delineate the degree and pattern of the impact of IT. The frameworks mentioned above do not seem to be appropriate, and thus a contingency framework has been proposed, analogous to the contingency theory of organisation.

In addition to the two main objectives, this thesis has two related ones. The first is to examine the changes in CFR, and this is a prerequisite for the investigation of the impact of IT on CFR. The second is to evaluate the role of IT use in accounting method choice and change (which is an important aspect of CFR) against some early expectations. The objectives are discussed further in the next section where the contingency perspective is introduced.

Section 2: The Contingency Perspective

Analogous to the contingency theory of organisation, this thesis proposes a contingency perspective on the impact of IT on CFR. The contingency theory of organisation is one of many perspectives on organisations. It holds that the effectiveness of an organisation depends on the extent to which the organisation's structure and process fits such factors as environment, size, and technology (Scott, 1987). Accordingly, the contingency perspective proposed here is not intended to find a universal effect of IT use, but to determine the patterns and degrees of the IT impact in different situations. It assumes that the impact of IT on different aspects of CFR varies, and that the impact is conditional on certain key contingent factors, i.e. environmental, organisational, and management characteristics. This also means that IT may have no impact at all on some aspects of CFR or in some situations.

Given that the impact of IT on CFR is examined by correlating IT use and CFR changes, this perspective suggests (1) that the association between IT use and a change in one aspect of CFR may be stronger than that between IT use and a change in another aspect of CFR; and (2) that the association between IT use and a CFR change may be strong at one level, but weak or non-existent at another level of a contingent factor, or positive at one level, but negative at another.

To adopt the proposed perspective, therefore, the researcher must specify the aspect of CFR which is of interest, and to find contingent factors that may influence the impact of IT on CFR. In this thesis, two aspects of CFR are contrasted: internal reporting and external reporting. Informed by information economics and agency theory, it is hypothesised that IT use is associated more with internal reporting change than with external reporting change. If this is supported, the implication would be that the use of IT has enlarged the information asymmetry between corporate management and external users. In addition, with reference to the studies of financial accounting and reporting under agency theory and positive accounting theory, company size, listing status, financial reporting strategy and management incentive plan are identified as contingent factors, and it is hypothesised that the impact of IT use on CFR is conditional upon these factors.

Section 3: Research Methods

A distinction is made between research design and data collection method. While the former is mainly concerned with enabling causal inferences and defining domain of generalisation (descriptive or analytical), the latter involves all aspects of data collection.

The choice of research design is a matter of matching the requirements of a study with the characteristics of a particular design. Yin (1989) contrasted five designs, namely experiment, survey, archival analysis, history and case study, and proposed three criteria for selecting one for use: (1) the types of research questions, (2) the extent of control that the researcher can exercise over behavioural events, and (3) the study focus, on contemporary or historical events. Adopting Yin's approach, with additional consideration of generalisation, the survey design was chosen for this study. The survey design is suitable for research with questions of "how many" or "how much", which is the case in this study which requires a comparison of the strength of the relationships between IT use and CFR changes at different levels or aspects of specified contingent factors. Also, the current study requires some descriptive generalisation (generalising findings from a sample to a population) which the survey design allows. On the other hand, since neither IT use nor CFR changes is controllable by the researcher, experimental design is not appropriate. Moreover, the focus of this study excludes the history study approach, and data availability rules out the archival analysis strategy.

Mail questionnaire, telephone interview and face-to-face-interview are the main data gathering methods for a survey design. With reference to Frankfort-Nachmias and Nachmias (1992), and Dillman (1978), the mail questionnaire method was selected. The justifications for this decision are as follows. To test the formulated hypotheses, comparable data are required. While this may be achieved by all the three methods assuming interviews are structured, the mail questionnaire method is relatively economical and less time-consuming. Unstructured personal or telephone interviews are not suitable for obtaining consistent data, although they may be superior to mail questionnaires in collecting in-depth information. Telephone interviews were excluded, because the researcher is unable to control the interview and respondents are unable to consult additional information sources other than their memory. However, the questionnaire survey was supplemented by limited numbers of personal interviews in order to acquire in-depth information while keeping costs down.

The survey sample consists of 1,515 public UK companies, drawn at random from the CD-ROM database FAME (Financial Analysis Made Easy) (FAME User Manual, 1993). In determining the sample size, the advice of Hoinville *et al.* (1989) was followed, and three factors were considered, namely the number of sub-samples, sizes of sub-samples and the survey response rate. Only public companies were surveyed, for it was anticipated that private ones would be less likely to participate for resource reasons. Moreover, since the main concern of this study is external reporting and the information asymmetry between internal and external users of financial information, public companies were thought to be more appropriate whereas private ones, by implication, would be less concerned about public reporting.

It should also be pointed out that the companies in the sample were treated as reporting entities rather than users. Users were not directly investigated although they are the emphasis of this study compared with the emphasis of previous studies which was on accountants. The emphasis on users is in the sense that information provided to users is examined. The main reason for not surveying users lies in the fact that they do not normally know the exact extent and quality of internal reporting, and thus it is difficult to bring their perceptions into the context of the information asymmetry between internal users and external ones. In addition, it is difficult to match a provider with its users and thus difficult to obtain comparable data. Moreover, the variety of external users makes it difficult to draw a proper survey sample. Finally, resource constraints prevented this study from including both providers and users. However, because users may have perceptions different from providers regarding external reporting, this study may be seen as only one side of the story.

The questionnaire design was guided by the contingency framework and the formulated hypotheses. Relevant literature was also consulted. The questionnaire comprises a group of questions measuring the sophistication of IT use in accounting which form an IT use index, and a set of questions describing changes in financial reporting which constitute an internal reporting change index and an external reporting change index, and a collection of questions concerning the contingent factors. Since the major objective of the face-to-face interviews was to enrich the survey data, the questions posed to the interviewees were mainly an extension to those in the mail questionnaire.

The questionnaire was pilot studied in two forms. The first was to evaluate the draft by way of discussion with financial directors or chief accountants from three companies, as well as comments from colleagues. The second was to estimate the response rate and further test the adequacy of the questions. Following the pilot studies, the questionnaire was sent to financial directors of the 1,500 companies, yielding 376 replies and a response rate of 25%. The Ferber test (Ferber, 1948/1949) indicates that there is little non-response bias in the data. In addition, 32 respondents agreed to take part in an interview. Eventually, 14 of them were interviewed.

Section 4: Main Findings and Their Implications

The most important finding is that IT is a two-fold weapon in relation to financial reporting. On the one hand, its use has contributed to some improvements in both internal reporting and external reporting, on the other its use plays a role in exacerbating the information asymmetry between corporate managers and outside users of financial information, and perhaps in some companies it has a part in increasing the information asymmetry among external user groups such as creditors and shareholders. This nagative effect on information asymmetry may have reduced the social benefits of public reporting. The result may or may not be intended, but it raises some strategic issues for financial reporting regulators. For example, it suggests that the use of IT in accounting is not merely a matter of technological innovation, but it also involves the interest of a large range of users of financial information. Similarly, the effect of IT use in accounting is not confined to individual organisations, and thus it needs monitoring and controlling at a societal level.

This study finds that UK regulators have done little to influence the use of IT for external reporting, and this contrasts sharply with the US regulators, some of whom have been actively engaged in promoting IT use for external reporting as evidenced by EDGAR developed by the Securities and Exchange Commission (SEC). This thesis proposes several ways in which UK regulators may involve themselves in the use of IT for external reporting.

It is also found that although IT plays a role in improving external reporting, the impact of IT is conditional. It seems to be moderated by contingent factors such as company size (IT is more associated with external reporting change in *very* large companies than in smaller ones) and gearing (IT is more associated with external reporting change in companies with a *very* high gearing than in those without or with a lower gearing). These results not only provide support to the proposed contingency framework, but are also useful for financial reporting regulators to monitor the impact of IT use on external reporting, or if desirable, to regulate the use of IT in accounting.

A further finding is that the association between IT use and internal reporting change tends to be stronger in small companies than in large ones, suggesting that small companies may have benefited more from IT use than large ones. One reason for this could be that IT use has freed small companies from some resource constraints regarding information production, storage and dissemination. An implication of this is that the competitive position of small companies may be improved.

There is only very limited evidence to indicate that IT causes accounting methods to change. Generally, the data do not support the prediction that the use of IT results in greater use of (1) mathematically complicated methods or (2) multiple methods in accounting. One reason for these is that accounting change is largely regulation driven and the scope of choice is small in the UK. Moreover, IT is seen as a means to ends (accounting policy change), not the converse. In spite of this, IT plays a significant facilitating role in the process of accounting method choice and change. For example, the data suggest that IT makes the method change-over much easier and is very useful in predicting the possible consequences of a policy change.

Section 5: Contributions

This study is a substantial addition to the literature concerning the impact of IT on accounting. First, while previous studies focused on internal accounting and on accountants, for the first time this thesis has put an emphasis on external reporting and on information provided to users. This fills a gap in the literature.

Next, this study has made a first step in bringing the use of IT into the context of information asymmetry by contrasting the effect of IT on internal reporting with that on external reporting. This innovation has led to the finding that IT has played a role in increasing the information asymmetry between internal users and external ones, although it also makes a contribution to some improvements in both internal reporting and external reporting. Perhaps more importantly, such a finding presents to financial reporting regulators some challenging issues which have not been raised before, and this together with other findings may be used as a basis for them to formulate policies related to IT use in accounting.

Further, the proposed contingency framework proves useful in guiding the current study, and its basic principles and analytical techniques may be equally applied into the study of the impact of IT on other aspects of accounting such as accounting organisation and accountants. Interfaced by the contingency perspective, this thesis has also attempted to bridge the study of IT impact on accounting with other existing knowledge such as information economics, agency theory, and positive accounting theory. This represents an improvement compared with previous studies which largely ignored existing accounting theories.

The findings of this study also highlight some new directions of research, for instance, what policies the financial reporting regulators should adopt to counteract the negative effect of IT on information asymmetry, and what the exact consequences of the enlarged information asymmetry are.

Moreover, this thesis portrays the changes in internal and external reporting, revealing both the structural features and the relative degrees of these changes. It draws attention to a major limitation of the traditional approach to the investigation of CFR: it focuses on annual and/or interim financial reports only, while neglecting the disclosure of management accounting information. Finally, this thesis provides a descriptive model of the process of accounting method choice and change against which the roles of IT as both a cause and facilitator can be evaluated. A main feature of the model is that it incorporates the process of accounting choice and change as well as factors affecting accounting choice and change.

Overview of the Thesis

The thesis consists of eight chapters. The second chapter reviews the literature concerning the impact of IT on accounting. It shows that most previous studies suffered from a lack of theoretical guidance and some methodological problems, and little effort has been made to evaluate the impact of IT on external reporting. The main objectives of this thesis are highlighted: (1) to undertake an empirical evaluation of the impact of IT on CFR, and (2) to propose a theoretical framework.

The third chapter presents the contingency perspective, analogous to the contingency theory of organisation. The rationale for the adoption of this perspective is provided by discussing the nature of IT, financial information and CFR, and by contrasting the perspective with others. The strengths and weaknesses of the contingency theory of organisation is discussed. Moreover, the research topic is transformed into six testable hypotheses under the proposed framework.

The research design and data collection methods are considered in Chapter 4. The survey design was selected, and the mail questionnaire was chosen as the main means of data collection, supplemented by a limited number of interviews. The justifications for these choices are provided. The design of the mail questionnaire and interview schedule, and the data gathering process are described.

The next three chapters deal with data analysis. Chapter 5 describes changes in information provided to corporate managers and external users. A comparison is made between them, and factors (including IT use) that may affect these changes are investigated. In Chapter 6, the relationships between IT use and changes in information provided to internal and external users are examined at different levels of data aggregation, and the hypotheses developed in Chapter 3 are tested using statistical procedures. Chapter 7 evaluates some early predictions concerning the impact of IT on another aspect of CFR: accounting method choice and change. For this purpose, the process of accounting method choice and change is described.

The last chapter elicits the implications of the main findings for financial reporting regulators and for further research. The novelty and the limitations of this study are discussed. The proposed contingency framework is assessed. This chapter is followed by appendices which fall into two groups: (1) data collection instruments, and (2) descriptions of statistical procedures and results of data analysis.

Chapter 2: The Impact of IT on Accounting: Literature Review

This chapter reviews the literature concerning the impact of IT on accounting. The objective of such a review is to select a topic of study and to establish the genuineness of the selected topic (Howard and Sharp, 1991). For both purposes, a question that needs to be answered is what has already been done and is known. This involves, among other aspects, the lines of research that have been pursued, the issues that have been tackled, the findings that have been generated, and new directions that have been proposed. By systematically mapping these aspects of previous research, niches for further investigation emerge, and indeed the topic of this study is so determined. Moreover, by acknowledging the work of previous researchers, the contribution of this study can be assessed.

It is suggested that a thorough review should also pay close attention to a critical analysis of the theoretical frameworks that have been adopted or developed, and an exposition of the methods that have been used in previous studies (Locke *et al.*, 1992). Thus, this chapter also discusses these aspects, so that it can serve as part of the basis for determining the theoretical framework and methodology for investigating the chosen topic in the next two chapters. Accepting the risk of some overlap, the review is presented along three themes identified from the literature: (1) speculation and forecast, (2) experiment and application, and (3) empirical evaluation.

This chapter, however, is not the only one dealing with literature review. Howard and Sharp (1991) distinguished two lines of literature review: a scan of the literature of the chosen subject of study, and a familiarisation with literature dealing with research tools and methodology. Following this notion, however, a third line can be added, that is, a review of the relevant literature concerning theory, paradigm or conceptual framework. Accordingly, a search of theoretical perspectives in relation to IT impact is undertaken in Chapter 3, and the literature related to research designs and data collection methods is consulted in Chapter 4.

Section 1: Speculation and Prediction

Accounting, as an information processing speciality, is one of the areas which provided the first commercial applications of computers (Kee, 1993). Almost immediately after the first computer [ENIAC] came into existence in 1946, Matz (1946, p.375) wrote in the Accounting Review :

> Let us see in what way the advent of the ENIAC can mean not only entirely new types of business machines but may well also revolutionize methods and systems of dealing with everyday business transactions.

Numerous forecasts of the potential impact of IT on accounting have persistently emerged in the literature. While it seems impossible, and indeed it is not the purpose of this thesis, to show the variety of predictions, several lines of prediction can be identified, such as expansion, integration, centralisation, the future of accountants, accounting methods and information delivery. The rest of this section first presents such studies along these lines, and then gives a summary and evaluation.

Expansion

Prior to the use of computers, accountants had been very much burdened by the time-consuming routine data processing and calculation. As organisations became larger and more complex, accountants had been bewildered by the large quantity of data. When the speedy computer came into being, it was immediately expected to take over such routine processing and calculation. So impressed by the power of ENIAC, Matz (1946) believed that the "all-electronic computing device" would free the accountant from the time-consuming burden of routine calculation, and allow his time to be devoted more than ever to the solution of manifold problems, such as inventory valuation at average costs, and incremental or differential cost of added output. Blundell (1953) concurred, and added that new work such as sales and production analysis would also be automated and be added to the organisation's regular information. Most of the specific areas that Matz and Blundell took as examples of possible expansion have become routine in today's accounting.

The expansionist speculation continued, with new forms of expansion proposed. Following an examination of the information requirements of both management and external users, the American Accounting Association [AAA] Committee to Prepare a Statement of Basic Accounting Theory (AAA, 1966) expected computers to facilitate an expansion of the scope of accounting in the form of multiple valuation and multi-dimensional reporting. Two possibilities for multiple valuation were suggested. One was the simultaneous use of several measurements such as historical acquisition costs and current values, and the other involved the use of non-deterministic measures or quantum ranges with or without probabilistic measures. The multi-dimensional reporting would involve measurement against more than one goal or objective (such as profit-making and consumer satisfaction) with the use of multiple units of measurement (monetary or physical). Bedford (1973) augmented the committee's vision. He undertook a feasibility study of multiple disclosures comprising multiple measures, multiple uses, multiple communication media, multiple disclosure formats and multiple classifications. One aspect of his conclusion was that such a comprehensive disclosure framework would be capable of implementation in an economical manner, using a computer-based information system.

Clearly, these predictions had not become true by the 1980s. However, the new developments in IT, especially the developments in database management technology and the rapid convergence of telecommunications and computers provided sustained incentives for even bolder speculation. An example illustrates this point. The Future Issues Committee of The American Institute of Public Certified Accountants [AICPA] (Abramson, 1986) predicted that in 1996 the databases would let the accountant prepare multiple analyses and comparisons. To interpret the term "multiple analyses", Abramson (1986) added that computer-based reporting programs would offer 26 basic income definitions with an average of 10 different subsets for each, giving a total of 260 definitions. Although it is not yet 1996, as will be seen in Section 3, the realisation of the Future Issues Committee's dream is still awaited.

Integration

Accounting functions were totally isolated from each other and from other functions by way of labour division under manual operations. Not only did this result in much unnecessary repetitive work and data, but it also led to inconsistent data and required the need for internal control. The powerful computer was regarded as the ideal solution almost immediately when it became available. For example, Jeming (1952) visualised an integrated electronic accounting system where all accounting functions must be planned in advance so that they would in fact be parts of an integrated plan, and they must be so not only on an organisational chart but as physical parts of a completely integrated and electronically intercommunicated accounting system. Similarly, Young (1954) anticipated that the electronic communication between various parts or functions of an electronic assembly would tear down the departmental walls which then neatly segregated accounting functions and other sections, and allow data to be processed virtually simultaneously. It should be borne in mind that these speculations were made before computers were used in accounting and when data communications technology was still beyond the horizon.

This line of prediction has subsequently become a lasting theme. The AAA

Committee to Prepare a Statement of Basic Accounting Theory (AAA, 1966) expected the large scale computers to integrate all data collection, storage and synthesis, and communication functions within the firm. Such an integrated system was thought to have many advantages, for example, centralising authority for the development and maintenance of the system, eliminating gaps and duplication in the data processing function, and improving accuracy, consistency and control of information. Thus the committee recommended, in the design of future accounting systems, to integrate as far as possible the wide variety of data sources and data uses in order to deal with the multiple characteristics and ramifications of every activity.

Evidence of accounting integration began to appear along with the introduction of the third generation of computers in 1964 which were used by some firms to integrate computer applications around broad operational functions and transaction cycles (Leitch and Davis, 1992). For many years to come, however, the term (integration) was replaced by another phrase "total system" which meant a single and integrated system (Dearden, 1965), and IT professionals strived to achieve this. Unfortunately, this attempt was not a success and indeed the "total system approach" was later regarded as "the silliest thing that has been done in the name of science and progress" (Dearden, 1972, p. 90). This failure led to recommendations for developing more limited but more meaningful consolidation of applications (Kaufman, 1966).

While greater integration of accounting systems was still awaited, the integration of accounting information with other information was envisaged and expected. The National Information Technology Task Force [NITTF] (1984) of the Institute of Chartered Accountants of Australia [ICAA] predicted that accounting information and other information would be transferred to a single or integrated database, and that review and control of information systems might be claimed as the province of professionals outside the accounting sphere. Note that the single, total system approach was still seen as a possible future development in the 1980's, though it was much opposed some 20 years ago. It is also interesting that the challenge or the threat of integration was finally noticed. This prediction of the convergence of accounting and other information was also made by the Information Technology Group [ITG] of the Institute of Chartered Accountants of England and Wales [ICAEW] (ITG, 1989).

Moreover, imaginative integration would not be confined to a single company. In fact, as early as in 1966, information systems across company boundaries were envisaged (Kaufman, 1966). Such systems would be possible using telecommunications technologies. Today's electronic data interchange [EDI] systems are an example.

The term "integration" was sometimes confused up with "centralisation" (see, for example, AAA, 1972). However, centralised data processing does not necessarily mean integrated information systems while integration can be achieved without centralising data processing. Huff *et al.* (1988) distinguished five stages of integration: (1) isolation, (2) standalone, (3) manual integration, (4) automated integration, and (5) distributed integration. Each is defined in terms of the extent of interconnectedness of the applications and hence the five stages represent an integration growth model. None of them seems to be particularly related to centralisation. On the contrary, distributed integration actually means decentralisation. It seems that this stage is still not quite sustainable because of the current limitations of network and distributed technology (Martin *et al.*, 1991). However, distributed data processing systems, in which data are processed remotely by computers connected to a network and can be exchanged between them, began to be used as early as in the 1970s (Capron and Perron, 1993).

Centralisation

Centralised data processing in its earliest sense meant that everything (all processing, hardware, software, and storage) was placed in one location, all input had to be physically transported to the computer, and all output had to be picked up and delivered to the users. Because this total centralisation subsequently proved inconvenient, centralised teleprocessing systems were introduced in the middle 1960s. In these systems, terminals were connected to the central computer via communications lines, and users were allowed to access or to transmit data to the central computer from their terminals at a distance. However, all data were still processed by the central computer.

The speculation of centralised accounting data processing largely stemmed from the technical, physical and cost characteristics of the earliest machines: speedy but very large in size and very expensive. When the first commercial purpose built computers were introduced, Blundell (1953) expected that data processing at branches and subsidiaries would be reduced to a minimum with most records being dealt with by the group financial headquarters. Pelej (1954) foresaw another kind of centralisation: the centralisation of supervision over the entire system in the operation of the equipment. McRae (1964) also expected an increasing centralisation of accounting functions, and he claimed that this had been realised a decade later (McRae, 1976).

Centralisation was not only a prediction, but in fact became a recommendation of the AAA Committee on Information Systems (AAA, 1972). This committee expected computer systems to allow for potential re-centralisation of both the record keeping and decision making functions, and argued that such centralisation of data processing would facilitate better, faster and more timely information. It therefore urged organisations to adapt their structure to this technological development.

However, this prediction of centralisation was not without its rival. In fact, Burlingame (1961) provided a totally different vision: the advances in IT need not lead to centralisation and the extinction of the middle manager. Instead, decentralisation and the middle manager would be more likely to flourish than to wither and die in the future. His reason was that decentralisation would provide a means of matching economic efficiency and social responsibility, coupled with advancing IT. Centralisation, in contrast, would tend to separate the society into two classes, a group of top managers and technologists, and a group of all others, and not to provide a match of economic efficiency and social responsibility for the latter.

Burlingame did not base his prediction on advances in IT. However, his prediction acquired technological support when personal computers [PC], distributed database systems and networks made inroads into commercial markets on a large scale in the early 1980s. The trend towards decentralisation of data processing and decision making was evidenced by the mushrooming end-user computing and information centres in companies (Panko, 1988). Today, decentralised accounting data processing has become a matter of fact via distributed systems in which data are processed in each operating units, transmitted to the headquarters via telecommunications lines, and finally consolidated there (Martin *et al.*, 1991).

Future of accountants

The earliest speculators were rather optimistic. In a reaction to the emergence of computer technology, Matz (1946) saw a bright future for accountants. On the one hand, the use of computers and the time saved as a result from this use would enable accountants to pay attention to the dynamic features of cost analysis and cost control, and to identify, evaluate, and present new and alternate strategies to be pursued, and this would in turn influence considerably price-setting and policy-making. On the other hand, powerful computers would allow accountants to tackle many untouched and untried aspects of cost and production, and to present information speedily and accurately which would influence not only governmental action, economic and juridical decisions, but also disputed areas of labour-management relations. Thus, accountants would not only be a part of management decision-making, but would also become an agent of social and economic control.

Pelej (1954) expected that the role of accountants was likely to change as advanced mathematics and statistics were introduced into business operations by the use of computers. Although he did not expressly state how this change would take place, he seemed to suggest that accountants would change from being data processors to data analysts using sophisticated mathematics and statistics, made possible by computers.

A threat, however, was predicted by the AAA Committee on Information Systems (AAA, 1972): the accounting department might be one of the first to vanish in the breakdown of the functional organisation, when a broader approach to information systems (beyond accounting) was to be adopted and a portion of accountants' work (book-keeping) was to be programmed. Accountants must therefore be willing to constructively adapt to this changing environment. Nor was NITTF very optimistic about the future of the accounting profession (1984):

> While the nature of the profession will undergo change and require different skills, the basic principles of accounting will not change. Indeed the demand for accountancy services may well grow with the expanded horizon that advances in technology will provide. However, the profession must keep pace with this change if it is to retain the confidence of the public in its ability to deal with the new environment.

In short, IT has been seen as a two-fold weapon for accountants. If they can adapt to it and use it, they will survive the changes, otherwise they will become its victims.

Accounting method

Methods and procedures form part of an accounting system. IT has long been seen as a means of implementing more sophisticated methods. Some such expectations have already been presented in the preceding paragraphs (for example, AAA, 1966).

The use of IT would enhance the calculation capacity of accounting systems, and as a result, advanced mathematical and statistic methods would be widely used. Based on a summary of technological forecasts in the literature, McRae (1964) prognosticated a proliferation of mathematical models of accounting and financial problems, and the wide use of probabilistic estimates using confidence levels and confidence intervals in accounting reports. Interestingly, however, a decade later McRae (1976) himself observed that mathematical models were still rarely used by accountants and probabilistic estimates even more difficult to find.

The future of the double entry book-keeping method has also been subject to speculation. Some anticipated that it would be replaced by the database technology (Harper, 1985; List, 1986). Elliott (1991), however, envisaged that it would be substituted by a new accountability technology. His prophecy was based on a retrospective analysis of the parallel developments of wealth creation eras (agricultural, industrial and information), information technologies and accountability technologies. In the agricultural age, the information technology was labour, and the single entry accounting was used. In the industrial era, printing technology came into existence and the double entry accounting became dominant. The information age characterised by computers calls for a new means of accountability. A possibility would be Ijiri's triple entry which intends to measure not only the changes in resource and wealth creation, but also the rate of these changes. However, this system is borne out of the conventional double entry model, and therefore Elliott argued that it might be inadequate.

Information delivery

This line of forecasts is largely based on computer data communications technology. NITTF (1984) foresaw that the increasing availability of computing facilities would enable decision makers to have direct access to data. The Future Issues Committee of AICPA (Abramson, 1986) speculated that by 1996 all large business would have complete and real-time databases of financial and other information, instantly accessible to nearly anyone with a PC. Similarly, ITG (1989) expected that IT would facilitate on-line and more frequent reporting to both internal and external users, and that market pressures would force companies to do so even if they were unwilling.

It is clear from the above cited studies that little attempt has been made to distinguish internal accounting and reporting from external accounting and reporting. However, Elliott (1991) is an exception. By examining the defects of the accounting used in the industrial age, he projected what the accounting in the new information era was likely to be and then investigated whether IT would permit it. In internal accounting, he speculated a shift of focus from accounting for resources and processes to accounting for the rates of change in them, from measuring value of products to measuring value for customers, from recording past events to processing information during the process of events that occur, from mapping the organisational hierarchy reflected by the general ledger coding structure to enabling a networked organisation, and from accounting for tangible resources to intangible assets. He believed that these changes would be made possible by wide area networks, automated data capture, database management systems, and access to external databases.

As for external accounting, Elliott predicted that the boundaries posed by the concept of financial information would be broken; more frequent reporting of some sort would be beneficial; forecast information and market value-based information could be supplied; real-time release of material facts as they occur or direct access to company database by external users would replace the physical form of statements. He added that IT would sustain such changes. Moreover, in his view, the generally accepted accounting principles [GAAP] should be reconsidered because they possess several limitations, such as favouring historical events, financial information and tangible assets, looking inward at the product value, and ignoring rates of change in resources and processes. However, he did not expect that any change to GAAP could be easily accomplished because of the political nature of standard settings.

There have been other forecasts. For example, Blundell (1953) expected that, by automating some technical calculations, the use of computers would bring accounting into much closer touch with "technicalities". The Future Issues Committee of AICPA envisaged that accounting expert systems and other artificial intelligence products would be the tools commonly used by accountants in 1996 (Abramson, 1986).

Summary

Though it is not possible in this thesis to present all the forecasts that have been made, the above description is sufficient to provide a flavour of this stratum of research. From this description, the following observations can be obtained. First, the main focus of this literature has been placed upon the efficiency of accounting. Most of the forecasts stemmed from the computer's technological characteristics (such as speed, large memory, and accuracy), for example, those forecasts regarding expansion, centralisation, integration, the use of complicated accounting methods, and faster and more frequent information delivery. In contrast, less concern has been shown about the consequences for various users of accounting information. This is not strange because one of the main aims of using IT has been to save clerical costs and reduce employees since the very beginning of IT application (Matz, 1946; Pelej, 1954). Nonetheless, slightly more attention was paid to non-technological issues in more recent forecasts. For example, Elliott (1991) realised that the impact of IT on

GAAP carried some political implications.

Next, none of these studies was guided by formal theory. Consequently, forecasts were ad hoc and piece-meal. It is therefore not surprising that all the cited studies are conceptually disintegrated from each other. The absence of theory, however, was substituted by intuition. Thus, most took for granted that IT use would either cause a change or facilitate a change. It was also assumed that accountants could only play a passive role or at best a reactive role; if they did not adapt to IT developments, their position would be endangered. The possibility was not perceived that accountants could be pro-active or even visionary, and could make IT a means to their ends.

Moreover, until recently, most studies gave little or no attention to methodological considerations. Confined by the limited commercial application of computers, the earliest studies were essentially speculative. They were usually based on personal observation and awareness of IT developments. While some of these speculations may have proved correct, it is mainly because they usually covered a short time span (that is, they were usually concerned with the immediate effects of an IT advance). Even so, there have been many spectacular failures, for example, the forecasts regarding centralisation, and the wide use of mathematical and statistical models in accounting. Methodological issues, however, began to gain attention in some more recent studies. For example, NITTF (1984) adopted methods such as interviews and consultations with experts (however, without details being disclosed), and Elliott (1991) adopted a history-based projection approach. Even so, not all recent studies saw the importance of methodology. This can be seen from the fact that ITG (1989) made no mention of the methods used in its visionary report, "IT and the Future of Audit". In addition, it seems that almost all forecasts are descriptive in the sense that only single variables are involved. In addition, given the fact that forecasting IT impact on accounting has been a research interest for so many years, it is somewhat surprising that some formal methods (such as the Adelphi method and econometric methods) which have been used elsewhere have rarely been adopted.

Nonetheless, these forecasts are not without value. Firstly, they can be used to form hypotheses in empirical research. McRae (1976), for instance, evaluated four forecasts that he made at an earlier time and found that integrated accounting, and more use of budgeting and exception reports had been realised, while the forecasts concerning the increased use of mathematical and statistical methods were still awaited. In addition, the forecasts can bring the possible consequences into focus, and thus may increase the awareness of accounting or non-accounting communities and lead people to work constructively towards shaping the future direction of accounting (AAA, 1972). In this sense, the state of the art of accounting is, at least partly, attributable to these forecasts.

In addition, the variables or dimensions concerning IT and accounting used in these studies are informative to the current study. It is noticeable that some forecasts were based on available IT, while some were based on IT in use, and still others were based on forecasted IT developments. It is also observable that some predications were made of the impact of IT at a more general level, whereas others forecasted the impact of a specific instance of IT such as data communications technology. Similarly, these studies together have presented a picture of the aspects of accounting where IT has or may have an impact, as indicated by the speculations and forecasts presented above. These variables or dimensions provide input for choosing the research topic in Section 4 of this chapter, and for selecting research strategies in the next chapter.

Section 2: Experiment and Application

Apart from forecasts, a great deal of research has been undertaken to experiment with and/or apply IT in accounting. Naturally, the easiest way to apply IT is simply to automate manual operations. However, persistent efforts have been made to explore new approaches to accounting procedures and to develop accounting systems which are beyond conventional accounting wisdom. To give a flavour of the research development in this line, two major spheres of research are reviewed here, namely matrix-based accounting, and database accounting and reporting.

Matrix-based accounting

There have been two directions. One is concerned with the use of a matrix in implementing the duality principle of accounting. Such a matrix consists of rows and columns which are used to represent "debit" and/or "credit" respectively. Each row and column is headed by an account title and all accounts are displayed in both rows and columns in the same order. The amount of a transaction is recorded in the cell where the two related accounts intersect. Thus each transaction needs to be recorded only once. The other direction of matrix-based accounting is related to the application of matrix algebra for the purpose of cost allocation, budgeting and financial planning.

Matrix-based accounting can be traced in the accounting literature back to 1846, when De Morgan introduced a matrix presentation of accounting data in his book entitled Elements of Arithmetic (Mepham, 1988). In the economics literature, however, the matrix approach was described even earlier, mainly for presenting data concerning national income. For example, Quesnay (1760) developed a matrix to estimate the flow of goods for consumption and investment between various sectors of the economy.

However, matrix-based accounting did not become a topic of research interest in accounting until the 1950s when the matrix tradition of economics was developed into an input-output framework by Leontief (1951) to specify the interrelationships of various sectors of an economy in the form of a matrix. Leontief's framework provided a foundation for the subsequent developments of matrix-based accounting. However, the revival of matrix-based accounting was largely due to the availability of computers. On the one hand, the computer has the power which makes such an approach practicable. For example, the size of a real accounting matrix is formidable when it is operated manually, but it does not seem to be a problem on a computer. On the other hand, with a computer, the matrix framework appears to be more easily manipulated than the traditional double entry system (Leech, 1986). Further, the matrix model seemingly provides a more mathematical way to process accounting data which can be readily done with computers (Pichler, 1956).

Matrix book-keeping systems. Applying Leontief's framework, Mattessich (1957, 1964a) explored the possibility of a matrix approach to replacing double entry. In 1957, he depicted a matrix-based system with opening and closing matrices in order to account for the change between accounting periods, and found that a separate matrix would be necessary for each transaction if disaggregated information was needed. However, this idea was impracticable because a large amount of space was required. In 1964, he further discovered that a matrix was not appropriate to store transactions with several attributes such as date, account code and amount. Since there is no mathematical relationship between them, it is impossible, say, to derive the amount from the account code and date. Moreover, if the multiple attribute nature of a transaction was considered, the space problem would be even more prominent. The net result of Mattessich's search for implementing duality without double-entry is that the matrix approach is only appropriate to store aggregated data.

Further attempts were made to incorporate transaction details into a matrix system. Kemeny *et al.* (1962) proposed to record several transactions in a single cell (thus a cell represents a page or a series of pages in a traditional "ledger"), but realised that manual implementation of this would be inferior to the traditional double-entry system and therefore resorted to computers. However, they did not consider how this approach could be implemented on the computer, and hence the practicability of their proposal remained unsolved.

Adopting a multiple-matrix approach (a matrix for the general ledger, another for posting transaction data, and others for different transactions such as accounts receivables), Mathews (1971) put forward two ways of recording transaction details: either by preparing a new ledger matrix each day and then aggregating the results, or by adding a third dimension to the table to provide information about the date of each transaction. However, he did not implement either of them. Leech (1986) identified two problems associated with these proposals: the first suggestion would not assist in the case of many transactions affecting the same matrix element and a separate matrix would be needed for each transaction, while the alternative solution seemed incomplete because a transaction may have a fourth or fifth dimension. It is easy to conceive that there would again be a space problem if these were considered.

The clear message of all the above-mentioned and other similar studies (such as Corcoran, 1964; Goetz, 1967; Doney, 1969, Johnson and Gentry, 1970) is that the matrix approach is inappropriate to store details of transactions. However, Kucic and Battaglia (1981) observed that general ledger matrices had been used for many years to maintain aggregated data and to generate balance sheets and income statements. They also extended this use to generate the statement of changes in financial position.

Following this thread, Leech (1986) proposed to integrate a general ledger-type matrix into an accounting information system. In such a system, a matrix holds account balances which are sufficient to produce a trial balance and financial statements, and may also be used as direct input into financial modelling packages for budgeting and financial planning. The matrix balances are derived from other sub-systems which process and store transaction details. In effect, the matrix is only used as an interface between transaction processing systems and reporting, budgeting and planning systems. Therefore, Leech made no attempt to provide an alternative to implementing duality. Four reasons were given for this use of a matrix: (1) such a matrix can give a total picture of the state of a firm at any time; (2) periodic reports can be generated from it with little need to refer to transaction files; (3) transaction details are stored only once in the transaction files and journals, from which specialised reports can be prepared; and (4) the accounts balances are stored in a form compatible with financial modelling and spreadsheet packages for budgeting and financial planning purposes. However, it is unclear whether such an interface is superior to other approaches. For example, a simple list of account balances may be sufficient to provide an overall view of a company's state of affairs, and to enable the preparation of periodical reports. Also, the matrix itself does not necessarily ensure that each transaction is stored only once. It is more of a matter of system design.

In a comment on Leech's study, Mepham (1988) made more claims for the matrix approach. He contended that a transaction matrix could be used to safeguard the integrity and completeness of accounting data in a relational database system, and provide windows each of which would give an ordered tabular view of a portion of disaggregated data in a database. He further argued that the matrix model was a suitable basis for developing a new canonical accounting model which would in turn facilitate the integration of financial and managerial accounting, the development of multi-dimensional accounting, the move to an events accounting system and the wider use of appropriate mathematical techniques. However, these claims were rather superficially made since they were neither conceptually justified nor empirically tested. In spite of this, Leech and Mepham (1991) urged the incorporation of the matrix framework into the design of computerised accounting information systems.

In summary, the attempts to represent the duality of transactions using the matrix approach has not been a success. It provides an example of how IT cannot impact on accounting. Perhaps, the purpose of such attempts should have been more thoroughly thought through. Leech (1986) observed that there was little evidence that this approach had been incorporated into actual accounting systems design due to its inability to handle disaggregated and multi-dimensional data. Conceptually, computers appear to be able to solve this problem. Practically, however, such a solution does not seem economical or superior to the traditional one. Everest and Weber (1977) found two other problems, one being related to the complexities introduced to suppress cells without entries in order to save storage space, the other being that this approach does not lend itself readily either to establishing interrelationships among different sets of data or to minimising data redundancy.

Matrix-based planning and budgeting systems. While Leech and Mepham (1991) advocated the use of the matrix framework as an interface between transaction systems and financial planning and budgeting systems, there has been some research into the direct use of a matrix framework for financial planning and budgeting.

Richards (1960) attempted to demonstrate how a matrix approach might be used as a tool for financial analysis and planning. He translated the traditional accounting system into a Leontief input-output matrix, with no interest in recording transactions. His matrix shows the flows into and out of the accounts with rows representing inputs (debits) and columns outputs (credits). Using actual financial data and five aggregate accounts, input-output coefficients are determined from the matrix and can be used to estimate the effect of a change in any account on the balances of the other accounts. Note that this is essentially a kind of sensitivity analysis or "what-if" analysis which is a common feature of today's electronic spreadsheets. Richards concluded that such a model allowed management to predict changes in balance sheet accounts arising from a change in the level of operations, and to analyse the flows into and out of accounts. He further contended that his approach could be applied into intra-firm analysis and intra-industry analysis.

Richards' work was followed by many other researchers. Charnes *et al.* (1963) intended to use the matrix framework and linear programming for financial planning. It is interesting that they used the word 'spread sheet' to refer to their matrix, though the spreadsheet as an electronic product only emerged in the late 1970s. Based on the matrix framework, Mattessich (1964b) developed a computer-based budgeting system for a manufacturer. Williams and Griffin (1964), Churchill (1964) and Manes (1965) made some attempts to apply the matrix framework and linear algebra to cost allocation. While the above studies were devoted to specific aspects, Livingstone (1969) argued that the input-output matrix-based analysis was a general model, and demonstrated how to apply this framework to planning, cost allocation, and incremental and opportunity cost analysis. In the light of many alternative input-output models developed, Butterworth and Sigloch (1971) developed a generalised multi-stage input-output model.

Note that many of these matrix-based models were developed without considering how they could be implemented. Given the fact that this research was largely motivated by the advent of computers, it seems that there was an implicit assumption that their implementation would not be a problem with the power of computers. However, these studies did not intend to explore the relationship among the matrix framework, financial modelling and computer power, rather they were heavily mathematically oriented. It was not until 1978 when Bricklin developed the first electronic spreadsheet "Visicalc" that this triangular relationship was finally made clear. Since then, the use of spreadsheet packages has mushroomed.

An electronic spreadsheet is essentially a two dimensional matrix consists of rows and columns. It allows information to be presented and stored in the same way as on a manual worksheet, but it provides a much more convenient way to manipulate data (such as move, copy and clear). Users can build their models by writing mathematical formulas into the cells. A typical task that a spreadsheet performs is "what-if" analysis. It is now common for spreadsheets to automate financial, statistical, arithmetic, logical, trigonometric and other functions. More recent packages even provide sophisticated programming languages, interface with other software, debugging and auditing tools for checking the logic and errors in models, and high resolution graphics facilities. Spreadsheet packages are being widely used in accounting, marketing, taxation, finance, and non-business aspects such as engineering, education, the sciences and medicine (Ballantine, 1991).

Database accounting and reporting

Database technology. A database is an organised collection of related data files. This concept originated in the 1960s mainly as the result of practical work to solve two fundamental problems in the use of data files: data dependence and data redundancy (Fry and Sibley, 1976; Senko, 1977). The first refers to a phenomenon of directly linking each application program to a file that provides the required data, while the second involves storing the same item of information in several files or more than one location in a single file. The major consequence of the first problem is that the application program ceases working when there is a change in file storage organisation (such as a change from hash to index sequential) or a change to record structure (a removal of a field from a record). The second issue results in not only a waste of storage but also a high risk of inconsistency in the stored data.

The search for solutions led to an evolution from file management to database management which is characterised by (1) representation of the relationships between data, (2) independence between application programs and data, (3) little or no data redundancy since the database is accessible by each application, and (4) the interface between the user and the database through a high-level, non-procedural language. These attributes are achieved by the use of database management systems [DBMS], which is software creating, managing, protecting, and providing access to a database. One of the first accepted DBMS was IBM's Information Management System released in 1969 (IBM, 1969), and since then the database technology has been undergoing rapid development. One development has centred around the database structure, thus hierarchical, network, relational and object-oriented DBMS have emerged. Another is computer-based telecommunications, the product of which is distributed DBMS. Other advances are related to the problems of database management, such as data recovery, integrity and security.

A number of studies have been undertaken, exploring the potential of database technology for accounting. Since most of these studies adopt the "events" approach to accounting theory, it is necessary to give a brief account of the latter.

"Events" accounting theory. Traditionally, accounting has largely been confined to historic data, financial information, periodical reports, and single valuation base. Theoretically, the information needs of various users are assumed to be similar because the decision models that they use are similar (APB, 1970; FASB, 1978-1985). In practice, a set of general-purpose reports is supplied to various user groups. However, there has been a strong contention that accounting could be expanded. For example, it was proposed that a method of reporting could be developed to produce detailed information which could satisfy many different information needs, given the lack of prior knowledge of the decision models used by the external users (AAA, 1966). Some of these proposals for extension were finally formalised by Sorter

(1969) under the umbrella "events" approach.

The "events" approach suggests that "the purpose of accounting is to provide information about relevant economic events that might be useful in a variety of possible decision models" (Sorter, 1969 p. 13). While the traditional "value approach" assumes that users' needs are known and can be well specified, the "events" approach contends that how accounting information and what decision models will be used are unknown. Thus accounting should only provide information about relevant events and let users themselves generate their own input values for their decision models. According to Sorter, the major difference between the two approaches is the level of aggregation. While the value approach insists that accountants must aggregate and assign weights and values to data, the "events" approach leaves this task to the users since such aggregation results in the loss of information in excess of its benefits.

Sorter's work was elaborated by Johnson (1970) who argued that while the value approach provides value information largely inferred from indirect observations, the "events" approach reports relevant events which are directly observable. He further distinguished three kinds of summation: (1) aggregation (simple addition of the same kind of measurement on numerous occasions of the same characteristics of the same kind of happenings), (2) combination (the addition of numerous measurements of the same characteristic of different kinds of happenings), and (3) composition (addition of numerous measurements of different characteristics of the same or different kinds of happenings). He argued that the "events" approach disliked "composition" rather than "aggregation", adding that summation was not the fundamental issue between the two approaches, and thus dismissing Sorter's notion that the major difference between the two approaches lies in the level of aggregation.

In defining the kinds of information uses, Johnson commented that value inferences were more likely to be subject to manipulation than events observations, and that it would be desirable that only aggregations of the characteristics observed in connection with real events should be reported so that users could be free to create for themselves both value inferences and event forecasts. In his view, the main issue between the two approaches was whether the receivers of accounting reports would be better served by the limited range of forecasts possible with inferences, or by the wider range possible with observations. Based on these arguments, he gave a tentative definition of the events theory of accounting:

> In order for intended persons ... to better *(sic)* forecast the future of social organisations ... the most relevant attributes (characteristics) of the crucial events (internal, environmental, and transactional) which affect the organisation are aggregated (temporally and sectionally) for periodic publication free of inferential bias (Johnson, 1970, p. 650).

However, because accounting reports then existing consisted of too many calculations of inferred values rather than magnitudes of event observations, Johnson found that events theorists had to develop new forms of reports.

Database Accounting. The foregoing description shows that at least some aspects of the "events" approach have yet to be agreed upon, refined and developed. However, from a pure information processing perspective, what is advocated by this school is clear: monetary characteristic is but one aspect of an economic event and accounting needs to be expanded to include the most relevant characteristics of the crucial events. This "events" approach thus provides a theoretical basis for the application of database technology into accounting. A database is an integrated collection of computer files which consists of records describing various attributes of events, and can be shared through various applications developed for/by different users. In other words, the database facilitates numerous views for various users, and traditional financial reports can be seen as one of many possible views.

The earliest studies concerning database accounting concentrated on experimenting with different database structures. Colantoni *et al.* (1971), Lieberman and Whinston (1975), and Haseman and Whinston (1976) proposed several variants of hierarchical database systems, in which the data structures are represented by trees with the top record referred to as the root which is connected to its subordinate records which in turn are connected to their subordinate records. These studies aimed to (1) utilise computer efficiency, (2) accommodate all economic events, and (3) support all users' queries or requests for data. In order to achieve the efficient use of the computer, Colantoni *et al.* (1971) proposed to modify the double-entry system using the database technology by decomposing transactions into constituent economic events, for example, "purchase of materials for cash" was broken into "receipt of material" and "payment of cash"; and by abandoning the notion of "debit equals credit".

Later, Haseman and Whinston (1977) constructed a network database accounting system, in which any record could have more than one parent record, and there might be several access paths to a given record. However, Everest and Weber (1977) advocated a relational database approach. A relational database organises data in a table format consisting of related rows and columns. Such a table is called a relation. Relational algebraic operations such as union, intersection, difference, minus or product of two relations can be performed on relations. These operators provide mechanism for users to retrieve various information from a database. Everest and Weber demonstrated how this relational database approach could be applied to accounting, though without attempting to expand accounting as proposed by the "events" accounting theorists. They also identified several problems associated with the hierarchical database approach adopted in other studies. Again, they called for more attention to machine processing efficiency.

While the above cited studies examined various database structures for accounting systems, McCarthy (1979) was more interested in how to model accounting systems. Data structures are logical models concerning how data are structured, while data modelling involves data analysis and the development of a conceptual model of an organisation. A conceptual model must be constructed before a logical model, and the conceptual model is independent of specific database structures. The specific technique that McCarthy used was the entity-relationship (E-R) modelling suggested by Chen (1976) which is perhaps the most important data analysis technique. It views an organisation as a set of data elements (or entities) and their relationships. McCarthy attempted to construct an accounting model using this technique in order to avoid the limitations of double-entry and monetary measurement, and to accommodate more of dimensional and disaggregated aspects as proposed by Sorter (1969). As a result, some traditional items or features such as accounts receivable and the debit-credit framework were missing from his model, although the traditional model and the proposed one could be reconciled. He concluded that E-R modelling provided a sound theoretical basis for the expansion of the "events" approach to accounting, since an E-R based system could easily incorporate multiple measures, and could store and provide summarised information according to the requirements of particular users. However, as an E-R model only reflects data in the business rather than the processes, that is, it is concerned with the data that exist instead of how they are used, these claims are a little superficial.

McCarthy (1982), McCarthy and Gal (1983), and Geets and McCarthy (1991) extended the E-R approach for developing accounting systems in a shared data environment. They contended that the information needs of both accountants and non-accountants could be served via a centrally defined corporate database. To develop such a database, data modelling should be separated into three phases: (1) requirements analysis which identifies users' information needs or local views, (2) view modelling which presents the local views' individual components in terms of a semantic data model such as the E-R framework, and (3) view integration which combines the local views into a global data model and specifies how these local views can be derived from that combined model. For the view modelling phase, an REA (resources, events and agents) accounting model was proposed. The model maps various types of relationships: (1) association which relates one entity to another (e.g. "pays for" relates "cash payment" to "purchase"), and (2) generalisation which links different sub-types of entity to a generalised type (for example, "inventory" is a generalisation of "working-in-progress", "raw materials" and "finished goods"). It also incorporates a number of so-called declarative features of accounting systems such as stock, flow, duality, control and responsibility. To make the model operational, four types of retrieval procedure were given: triggered procedure, adjustment procedure, view procedure and derivation procedure. The first two procedures were used to update data immediately or periodically, while the other two were designed for retrieving instant or periodical information without effecting a change to the data. The REA model deliberately discarded some elements of double entry book-keeping such as debits, credits and accounts, although any double entry manipulation could be treated as a local view and effected using a kind of retrieval procedure. Alternatively, the general ledger elements could be maintained as a separate file outside the centrally defined database.

A number of common features and associated problems can be identified from these "events"-approach based studies. Firstly, they all aimed to extend the traditional accounting to meet more management information needs. However, one fundamental issue was not answered: to what extent can management information needs be met by accounting information systems? Traditionally, there have been other systems which provide the information that these studies contended to include into accounting systems. These studies did not intend to integrate accounting systems with these other systems. They assumed that a mass database could be developed, but they concentrated on how to model accounting systems. Therefore, whether the assumed database was practicable and whether the accounting models built were compatible with other systems remained unsolved. McCarthy (1982) realised the latter part of the problem, and called for further research into assessing how well a shared database could facilitate the integration of accounting systems with other information systems that process overlapping information.

Next, all these studies concentrated on how to store and maintain transaction data in a disaggregate form and how to provide disaggregate information. However, events accounting does not equal disaggregation. It also needs aggregated reports though different from existing ones (Johnson, 1970). Yet no attempt has been made in this aspect. It should be realised that the design of new aggregated reports may be more of an accounting issue and thus may not or cannot be solved by the use of IT.

Moreover, many studies treated double-entry bookkeeping as a pure error checking mechanism incompatible with the "events" approach and database accounting, and contended that it should be abandoned (Harper, 1985; List, 1986). However, the double-entry system is a reflection of the duality reality that exists in the business world, rather than being merely designed for error checking. A computer may be able to process data more accurately than human beings, but it is unable to extinguish the duality phenomenon. More importantly, the double-entry method provides the most sophisticated way to determine income by incorporating nominal accounts. It is difficult for organisations to return to the way of income determination provided by the single entry method. Before a better approach to income determination is developed, the conventional double-entry system may continue to be used. Perhaps because of this, McCarthy (1979 & 1982) incorporated the duality concept and provided procedures to reconcile their conceived database accounting systems with the elements of the double-entry method.

One may argue that there is no room for the double-entry system in the "events" approach, since income determination and other aggregation are concepts of the value approach. However, as described above, the major difference between the two approaches is not related to aggregation (Johnson, 1970). If one is willing to take the "events" approach to its extreme, that is, accounting systems only provide raw data, then it must be realised that somebody else (the user) has to exercise various aggregation operations. This implies that users rather than accountants fulfil the role of accounting, or that it has to be expected that all users will become accountants.

Database reporting. Another common feature of the above cited studies concerning database accounting is that they all concentrated on meeting management information needs. However, the "events" approach was largely proposed for external reporting. Traditionally, internally reported information is not necessarily aggregated or confined to financial information. It is external financial reports that have been largely aggregated and confined to financial measurement.

To address this last issue, Ijiri and Kelly (1980) proposed a multi-dimensional distributed database accounting system in order to (1) make accounting systems free of valuation as much as possible, (2) meet diverse information needs, and (3) take advantage of IT capabilities. While traditional accounting over-emphasises the price and valuation issues, they suggested that an accounting system could be developed without prices but not without quantities. Since a single set of prices could not satisfy all users as a means of aggregating assets and liabilities, they proposed that data useful to all or most users should be recorded systematically in order that results could be aggregated by a set of prices most suitable for a specific user. This way, accounting systems would become more descriptive and more fact-based, leaving the evaluation of facts to users. Database technology could support this multi-dimensional and valuation-free system and the distributed database technology made it possible to build a nation-wide system of databases for both internal and external reporting. However, the implementation of such a system would be constrained by two major factors: (1) defining user information needs and standardising accounting concepts, definitions, and measurements, and (2) protecting privacy. Ijiri and Kelly's study was unique, not only because it focused on external reporting, but also because it touched on organisational and social implications.

This proposed database approach to financial reporting attracted much attention. The first reaction came from the Securities and Exchange Commission [SEC] which embarked on building a national reporting system called EDGAR (standing for Electronic Data Gathering, Analysis and Retrieval) in 1983 (Coffey, 1994). The system is essentially a mass database which stores corporate financial reports, aiming to provide them to anyone with access. The system experienced pilot operations for nine years during which about 1,800 companies filed over 1,600 electric filings. In 1992, it entered into the operational phase and elected companies who had participated in the pilot became the first group required to file financial reports electronically. By 1996, this will be a requirement for all listed companies.

The launch of EDGAR stimulated further interest. Seeing EDGAR as a worthwhile but only first step toward a database approach to financial reporting, Beaver and Rappaport (1984) proposed additional features that might be added: (1) the database should contain the data needed to produce conventional financial statements and alternative forms of analysis, (2) users could prepare different financial statements under a variety of accounting assumptions, and undertake better and more comprehensive evaluations by comparing one company with another or with the industry, (3) users could choose accounting methods which they prefer, thus mitigating the problem of inconsistency, (4) the role of accounting standards would shift from restricting accounting methods to concerning the relevance of data to be included in the database, and (5) management performance could be gauged by using a variety of measures in addition to reported earnings. However, they anticipated that although IT might make these features realisable, there would be political as well as economic obstacles.

Following Beaver and Rappaport's warning, Cushing (1989) examined the technical and economic feasibility of the database approach to financial reporting, concluding that while technically feasible, it would have varying economic effects on significant classes of participant groups. Drawing upon theoretical results from the accounting, economic and finance literature, he investigated the possible consequences for each group and made predictions concerning whether a group would oppose or favour the approach. This analysis represents the most comprehensive feasibility study and provides some valuable insights. However, some implicit assumptions made by the study are questionable. For example, it assumes that the database approach equals full disclosure, and that the database disclosure approach can be achieved once and for all. In addition, the study does not distinguish individuals from institutions in analysing some participant groups such as investors.

It is noticeable that all these proponents of database reporting again attempted to exclude aggregation from the scope of accounting, a departure from the "events" approach defined by Johnson (1970). An associated problem is that they failed to answer the question of who is responsible for developing the variety of decision and valuation models. Further, they clearly ignored the sources of information asymmetry: technology and accounting knowledge, by assuming that everyone possesses equally powerful technology and the same amount of accounting knowledge.

Summary

Both matrix-based accounting, and database accounting and reporting represent great efforts devoted to applying IT in accounting. The former is successful in the sense that electronic spreadsheets are now widely used in accounting, but the attempts to replace the double-entry system is a failure. Although new ways to use the matrix approach have been proposed, they remain to be implemented and evaluated.

Both database accounting and database reporting have seen some primitive applications, for example, a database accounting package developed for the Apple Macintosh (Mayer, 1990) and EDGAR developed in SEC. However, a number of problems are associated with the published research in this area. Some (such as the over-emphasis on the storage and maintenance of disaggregated data, and the exclusion of aggregation from the scope of accounting) may have arisen from the inconsistencies of the "events" accounting theorists or from the approach being taken to its extreme. Others (such as the questionable assumptions concerning database disclosure, and the one-sided attempts to abandon the double entry system as a pure error-checking mechanism) may have stemmed from the over-emphasis on technological and technical issues. Most researchers were very much impressed by the power of IT, but less concerned with non-technological issues. Also, these studies took for granted that the "events" approach is superior to the value approach. However, depending on the particular circumstances, both approaches have some merits (Benbasat and Dexter, 1979).

Section 3: Empirical Evaluation

A number of empirical studies have been undertaken, mostly since the early 1980s (Table 2-1). The dominant focus has been the impact of IT on individual accountants and the accounting profession, reflecting an increased interest in human and social issues. The common aim has been to evaluate IT-made opportunities and threats to individual accountants and the profession, and to make recommendations accordingly. A range of topics has been covered, however, three have appeared dominant, namely (1) the use of IT in accounting, (2) the effects of IT use on accountants, accounting function and accounting firms, and (3) the benefits of IT use.

Table 2-1: Empirical Studies of the Impact of IT on Accounting

Study	Topics	Methods	Unit of Analysis
The GCA Study (Mantle, 1983)	Impact of IT on internal and external services	Unknown	Accounting firms
Collier (1984)	Involvement of MA with IT	Questionnaire, interviews	CIMA members
Barras and Swann (1984)	Adoption of IT in accounting firms	Case studies	Accounting firms
Clark and Cooper (1985)	IT use by accountants and the influence of accountants on IT use	Questionnaire, case studies	ICAEW members
Carr (1985)	Office automation, techno-behavioural implications of IT, technological future	Case studies, questionnaire, literature review	Large organisations, ACCA members, IT suppliers and users
McCosh (1986)	IT impact on MA	Consultancy, literature review	
Bhasker and Williams (1986)	Impact of IT on small accounting firms	Literature review, case studies & experiments	Small accounting firms
Carr (1987)	Changes since the 1985 study, comparison of UK, Hong Kong and Singapore	Questionnaire	ACCA members
King *et al.* (1991)	Impact of IT on MA	Longitudinal case studies	Industrial companies
Wilson and Sangster (1992)	Use of IT in accounting	Questionnaire	ICAS members and their companies

Note: MA stands for management accountants

IT use in accounting

Accounting has always been a front-runner in IT use. Carr (1985) observed that basic accounting systems such as payroll, sales and stock control were the first areas where computerisation was implemented. Moreover, the analytical aspects of accounting acquired increasing support from financial modelling packages which became available in the early 1970s.

The use of IT has now become all pervasive. Clark and Cooper (1985) found that all but the smallest businesses had computerised accounting systems, and that many other functions such as marketing, production, and inventory control also depended on IT. In industrial and commercial companies, direct data input became normal; the need for paper output was reduced; office automation became accepted; and PCs became popular. The use of IT by accounting firms was also substantial. Word processing, accounts preparation packages and spreadsheets were commonly used, and internal systems and time-recording were computerised in all but the smallest firms. However, common technologies were not simple, practical and effective enough to satisfy the accountants' needs; the software market was under-developed; and database technology was not yet widely used either internally or externally. The study also revealed that while all accounting firms made some use of IT, large ones with greater resources were not necessarily those with most extensive and advanced use of IT, and that the type and sophistication of the use of IT varied considerably among different sectors.

With an aim to assess the change of IT use; Carr's survey (1987) found a steady increase in the level of computerisation since 1984 which resulted in the accounting function being computerised in all but the smallest organisations. There was also a dramatic drop in the level of reluctance to change by management and workforce, and a more positive attitude towards the importance of IT knowledge. However, ill-defined systems requirements remained the major reason for IT development failure. The survey also showed that a number of companies achieved a workstation to staff ratio of one to one, and that financial modelling appeared to have dominated the accountants' application of their PCs with short term planning and budgeting being the main modelling areas, a similar observation by Powell *et al.* (1992). In small firms, there was a vital shortage of IT skills, a reluctance to train staff and involve staff, a lack of IT development strategy, and a reluctance to quantify IT benefit. Paradoxically, while large firms gained rapid growth in IT consultancy, they suffered from a lack of internal skills and expertise, and were sceptical of IT benefits.

Though the extent of computerisation is high, the quality and mode of IT use is not always satisfactory. King *et al.* (1991) made a number of interesting observations from industrial companies: (1) IT use had made significant improvements in book-keeping (in terms of comprehensiveness, accuracy, timeliness and frequency), although IT had not helped produce more focused and tailored information; (2) IT use had saved time in operating the book-keeping systems, but this saving was often absorbed by management accounting staff coping with growth; (3) the pace of systems integration had been slow, though it was speeding up; (4) IT was largely used to computerise existing systems; (5) only limited evidence was obtained concerning IT use for decision support to managers, and this evidence was related to those proactive management accountants; and (6) there was only limited evidence that IT had given greater access to and wider dissemination of information.

Several comparative studies of IT use have been undertaken. Carr (1985) observed that IT use in industrial and commercial companies was somewhat more advanced than in accounting firms. Barras and Swann (1984) found that the accounting profession was slow in adopting IT, compared with the insurance industry. At the time of the study, accounting firms were still at an experimental stage, and had no defined trajectory of innovation. They suggested that this was due to the accountants' propensity to look at the bottom line benefits, a reluctance to accept that accounting craft is capable of being automated, the unsuitable technology, and accounting firms' failure to search actively for alternative accounting methods more suitable for computer techniques. Wilson and Sangster (1992) observed that accountants in industry and commerce made more use of IT than those in accounting firms. They attributed this difference to the nature of the tasks performed: accounting tasks in industry and commerce are more algorithmically-based while those in accounting firms require more judgement and the processing of qualitative information.

In several aspects, differences were found among UK, Hong Kong and Singapore firms in the use of IT in accounting (Carr, 1987). Hong Kong and Singapore accountants appeared to undertake a wider variety of financial modelling applications than those in the UK; and smaller organisations in Hong Kong and Singapore seemed to be more likely to have an agreed IT development strategy.

Impact on accountants, accounting function and accounting firms

The use of IT in accounting provides opportunities for some accountants, but may endanger others. Collier (1984) found that there was unanimous agreement that the demand for clerical staff had fallen due to the increased use of IT, while the demand for management accountants would depend on factors such as economic prosperity, and the realisation of the benefits of employing management accountants. Carr's (1985) findings were similar to Collier's in the case of office support staff, but were more optimistic for qualified accountants since new job categories such as "systems accountants" would be created by IT use.

Clark and Cooper (1985) observed that the use of IT raised strategic issues requiring careful control and management, suggesting that accountants had the opportunity to contribute their financial and business management skills to the formulation of IT strategy and to the process of planning and implementing IT-based systems. As to accountants in accounting firms, IT could be used to run a competitive practice and provide IT-related services, though increasing IT investment would affect the firm's working capital requirements and result in automation of many tax and audit procedures which might have implications for staff training.

The role of accountants is also affected. Collier (1984) found that the role of management accountants was changing from accumulation, analysis and preparation of financial information towards interpretation, evaluation, control and involvement in decision making. McCosh (1986) observed that management accountants were losing their battle to IT and people with other skills in terms of the provision of control information. However, IT had not changed the core of the management accounting process and hence they could still play a role in designing reports and in the planning process. He called for a change in the management accountant's role from being interpretative to being consultative. King *et al.* (1991) discovered that IT use was facilitating management accountants to change from playing a historian-oriented role towards a role combining bookkeeping and decision support, such as adviser or decision team member.

The use of IT also affects the relationship between the accounting function and other organisational functions. Carr (1985) noticed that many organisations were experiencing changes toward a realignment of the relationship between the accounting function and the data processing function which were separated by the centralisation of data processing. The changes were evidenced by the creation of large scale databases, the use of fourth generation languages and the emergence of end-user computing. McCosh (1986) observed that management accounting reports had not satisfied the information needs of management mainly because of their financial nature. On the other hand, IT enabled people other than management accountants to inform top managers and allowed line managers to inform themselves since control information could be obtained either from management accountants or through IT.

The effect of IT use on the relationship between accounting and other functions may be complicated, politically or socially. King *et al.* (1991) found that in half of the companies which they studied, IT developments had increased the power of management accountants over systems and user managers or both. In particular, proactive and positive management accountants could gain more control of the company's IT facilities while passive ones might lose their control. Moreover, IT had reduced conflicts between management accountants and other managers when management accountants had IT skills and when the organisational culture was in favour of harmony. However, IT developments could result in other managers challenging existing accounting reports or systems and demanding more information.

The impact of IT on organisations, especially on accounting firms, has also been a line of enquiry in several studies. The GCA study (Mantle, 1983) investigated the extent of the impact. It identified 26 aspects of internal and external services in accounting firms, and found that 13 of them were affected by IT to a major degree, ten to some degree, and only three remained untouched.

Other studies examined the consequences of IT use. Barras and Swann (1984) found that the main impact of IT use on accounting firms was not so much to reduce the number of employees, but to boost the productivity and change the skills and training requirements of those in employment. Increased productivity was realised mainly through automating or deskilling high-level professional staff' work, and was assisted by flexibility in transferring from declining services to new IT-based ones. The most serious employment impact was a polarisation of skills between the highly qualified professional and clerical staff. Another effect was that IT use would increase large firms' market shares by competing with smaller firms, thus polarising the structure of the profession. Moreover, computerised accounts preparation services initiated a process towards fully automated audit at least for smaller clients.

Some of Carr's (1985) findings were quite similar to Barras and Swann's, for example, those concerning the competition between large firms and smaller ones, except that Carr argued that smaller firms could also take advantage of IT. However, in contrast to Barras and Swann, Carr found that the gains from computerisation varied from nil to about 30% in clerical savings.

The conclusion drawn by Bhasker and Williams (1986) was that IT would enable small accounting firms to reduce costs, increase efficiency, and provide new services such as data processing bureau, IT consultancy and computerised accounts preparation. However, IT use might make them vulnerable due to a shortage of expertise, the inability to offer a wider range of services and a lack of credibility.

The benefits of IT use

Almost all evaluative studies have tried to identify the benefits of IT use, though no study has attempted to evaluate its negative effects. A list of the benefits that have been identified is given in Table 2-2.

Table 2-2: Benefits from the Use of IT in Accounting

Benefit	Study
Better or new client services	Mantle, 1983; Barras & Swann, 1984; Clark & Cooper, 1985; Carr, 1985; McCosh, 1986; Wilson & Sangster, 1992
Cost reduction or displacement	Clark & Cooper, 1985; Carr, 1985; McCosh, 1986; Wilson & Sangster, 1992
Improved management information	Mantle, 1983; Barras & Swann, 1984; Clark & Cooper, 1985; Carr, 1985; Wilson & Sangster, 1992
Improved professional performance	Clark & Cooper, 1985
Improved work quality	Mantle, 1983; Carr, 1985; McCosh, 1986
Increase in profits	Mantle, 1983
Staff satisfaction	McCosh, 1986
Reliability of operations	McCosh, 1986
Speed of data transfer and operations	McCosh, 1986; Wilson & Sangster, 1992
Strengthening competitive position	Barras & Swann, 1984
Time savings	Carr, 1985

Table 2-2 clearly indicates that the economic benefits were of a major order, though other benefits such as staff satisfaction could also be expected. It should be pointed out that most studies did not distinguish between potential benefits and actual ones. Thus, in spite of so many benefits identified, Carr (1987) found that large organisations were rather sceptical about IT gains whereas small accounting firms often did not bother to quantify IT benefits.

Prior evaluative studies also covered a number of other aspects. Clark and Cooper (1985) observed that most accountants were reactive towards IT developments. Accountants in accounting firms, for example, had actually been forced to use IT by their competitors and clients. Clark and Cooper (1985) examined the influence that accountants might have on the use of IT and found that this was constrained by such factors as business nature, size, structure, access to the key decision makers, career aspirations, understanding of organisational change as well as personal qualities. Sangster (1994) investigated why the developments of management accounting-based expert systems appeared to be non-existent, and Powell *et al.* (1992) surveyed the practical use of DSS and ES in accounting.

Summary

The studies reviewed above have been useful in bringing IT-related issues into focus and increasing accountants' awareness of the opportunities and threats created by IT developments. Perhaps more importantly they have influenced the actions of individual accountants and the accounting profession by way of recommendations. For example, IT knowledge is now a part of examinations for professional qualifications, a recommendation made by several of these studies. It is clear that there are conflicts between the findings of different studies in almost every topic summarised. The reasons for this are multiple: different focuses, different times of study and different research methods.

A major advantage of all the above studies is that they touched on human and social issues. However, these studies largely neglected the users of accounting information, the organisational environment and the strategic dimension of accounting. The reason for this may be that they focused too much on accountants. According to Kaye (1986), this biased emphasis might have caused several studies (Collier, 1984; Carr, 1985; Clark and Cooper, 1985; Bhasker and Williams, 1986) to ignore the rate of adoption of IT in terms of leaders and laggards.

Most of these studies also suffered from several other weaknesses. For example, their findings were largely descriptive (characterised by univariate analysis) and they failed to obtain dynamic data and therefore could only provide a static picture. Although Carr (1985 & 1987) attempted to overcome this problem by undertaking two pieces of research at different times, the coherence of the two studies is questionable given the problem of loosely defined research objectives.

With the exception of Clark and Cooper's study (1985) which investigated both the use of IT made by accountants and the influence of accountants on IT use, they over-simplified the relationship between IT and accounting. They usually dealt with a one-way impact or relationship, i.e. IT impact on accounting, but neglected the possibility that this impact may be influenced by other factors including accounting itself.

Moreover, most studies took too simple an approach to data analysis, that is, they lacked rigorous statistical tests or sufficient data to allow testing. The most commonly used statistical technique was frequency analysis. In some cases, correlations between variables could have been investigated, but such an analysis was evidently not performed.

Finally, and perhaps most importantly, these studies seemed to lack theoretical guidance. They did not attempt to devise a theoretical framework, nor did they rely on theories in disciplines such as organisational studies and technological innovation. They also largely ignored much existing accounting knowledge and theories, such as positive accounting theory, agency theory and efficient market theory. Although the studies by Clark and Cooper (1985) and Carr (1985 & 1987) considered some conditional factors, it seems that they were largely based on intuition rather than existing theories. This situation is understandable, because most of the studies were sponsored or commissioned by professional bodies (Colliers, 1984; Clark and Cooper, 1985; Carr, 1985 & 1987; Bhasker and Williams, 1986) or by other non-academic institutions (for example, the GCA study (Mantle, 1983)), and thus they were expected to find solutions to practical problems rather than to contribute to theoretical developments. As a result, the findings of these studies were rather pragmatic, and fragmented in the sense that they are remote from other bodies of knowledge or theory.

Some of these problems were, however, identified and addressed by King *et al.* (1991). For example, their study adopted a longitudinal case study approach by visiting companies twice, so that the dynamic nature of IT development and its impact could be accommodated in a single study. It also followed a more rigid research process by formulating research questions, and deriving and testing hypotheses. Further, it was guided by a conceptual framework consisting of (1) a social interactionist perspective which sees people as the central feature in organisations, (2) a pluralist approach which accommodates both conflict and harmonisation between people, as opposed to the unitarist approach and radical approach, and (3) a managerialist view which believes that management has the right to determine objectives and manage to achieve them. The research focused on management accountants in industrial organisations, aiming to discern whether IT use was changing the nature of management accounting, affecting management accountants' activities and influencing their role relationships with other managers. However, although this research has many advantages, it is limited when it comes to generalising the findings due to the case study approach which was used.

Summary

The last three sections have provided a picture of the research undertaken into the impact of IT on accounting. Three research streams are distinguished: (1) the speculation and forecast of the potential impact of IT, (2) the empirical evaluation of the actual impact of IT, and (3) the experiments with and application of IT which transforms a potential impact of IT to an actual impact.

The picture reveals the areas of accounting where the impact of IT has been researched. These can be classified in two ways. One is by examining the components of an accounting system, by which accountants, accounting methods and procedures, the accounting function, and users of accounting information are identifiable. The other is based on the purpose of accounting, by which bookkeeping, internal accounting and reporting, external accounting and reporting, and auditing can be distinguished. All these areas have been touched by the previous studies. However, the extent of research in them varies considerably. For example, more attention has been paid to accountants than to users of accounting information, and more research efforts have been devoted to bookkeeping, internal accounting and reporting than to external accounting and reporting.

The topic of this study, an empirical evaluation of the impact of IT on corporate financial reporting, is generated from a consideration of the above two aspects: the research stream and the areas of accounting on which IT has or may have an impact. By combining the options of these two factors, a number of research projects can be generated, for example, "The Application of Hypertext and Hypermedia in Financial Reporting", "An Empirical Evaluation of Database Accounting", "A Forecast of Database Reporting", as well as the chosen one. An assessment of the alternatives in terms of feasibility, value and scope has resulted in the current choice. One of the major incentives for this choice is that research in this aspect is under-developed. Little research has been undertaken into the impact of IT on external reporting, and there has been virtually no empirical evaluation of the actual impact of IT on external reporting. Moreover, no attempt has been made to contrast the impact on internal reporting with that on external reporting, though information asymmetry has long been a major concern in information economics and agency theory. While the alternatives shown above may be equally novel and attractive, their exclusion is largely out of the consideration of feasibility.

Note that the approach that is adopted to select the topic broadly resembles the morphological analysis (Jantsch, 1967) which comprises three interlocking activities: (1) identifying the key factors or dimensions of a subject under consideration, (2) listing the various attributes of the key factors, and (3) making all feasible combinations of the attributes. A major advantage of this approach lies in the fact that alternative topics can be identified, thus allowing a rational selection of a topic.

Apart from showing what has already been done, the literature review has also discussed the conceptual and methodological issues associated with the previous studies. Clearly, there is a general lack of theoretical guidance and of rigorous attention to methodology in the research theme concerning speculation and forecast, though more recent studies have shown signs of improvement. In the stream of experiment and application, it is plausible that most studies concerning database accounting and reporting flowed from a convergence of database theory and the "events" accounting theory. However, where research was motivated by the more efficient utilisation of IT, there was often a lack of conceptual clarity. As to the research line of empirical evaluation, most studies neither showed any interest in theoretical development, nor were guided by any conceptual framework. This lack of theoretical guidance rendered many studies to be guided by intuition, and thus the relationship between IT and accounting or accountant was often perceived as one-way. There are also methodological problems. It is encouraging that King *et al.* (1991) finally addressed some of these problems, though their study was also somewhat limited by its case study approach, leading to difficulties with generalisation.

Note that some of these methodological problems faced by empiricists might be alleviated by theoretical endeavours. For example, a major problem is the difficulty in portraying the dynamic nature of the impact of IT, given the fact that IT develops so fast. The general approach to this issue has been an attempt to conduct numerous studies at intervals, with a view that a dynamic picture can be reconstructed (Kaye, 1986). However, its effectiveness is doubtful if the series of studies is conducted on an ad hoc basis as has been the case. It is difficult to perceive that the facts or artefacts from different studies are integrative in any sensible way. Probably a better approach is to organise the studies under a theory so that their findings can be generalised, and the knowledge so derived can be used to predict the future impact as well as describe the current impact.

This consideration is further elaborated in the next chapter which attempts to formulate a contingency framework and refine the research topic in the form of hypotheses.

Chapter 3: Towards a Contingency Perspective

The topic of this research, an empirical evaluation of the impact of IT on CFR, was identified from a substantial literature review in the last chapter. However, the question of how to carry out this research has not been addressed. This essentially involves three aspects: (1) defining a theoretical perspective to guide the study, (2) operationalising the topic in the form of specific research questions or hypotheses, and (3) selecting a methodology for carrying out the study. Undoubtedly, these aspects are interwoven. For example, the operationalisation of the research topic is very much dependent upon the theoretical framework that is used. Similarly, the methodology to be selected will be largely dependent on the way the study topic is operationalised. On the other hand, methodological issues must be borne in mind in defining specific research questions or hypotheses so that they are answerable or testable. The first two aspects will be dealt with in Sections 2 and 3 respectively, while the last will be left to the next chapter.

The literature review clearly indicates that most studies in the stratum of empirical evaluation of the impact of IT on accounting suffered from a lack of theoretical guidance. To avoid such a problem, this study proposes a contingency perspective, analogous to the contingency theory of organisation (CTO). However, this is not a discretionary choice. Rather it results from a careful examination of the nature of IT and CFR, as presented in Section 1.

Section 1: The Nature of IT and Corporate Financial Reporting

The discussion of the nature of IT and CFR is expected to produce some principles or criteria for defining an appropriate theoretical framework.

The nature of IT

IT is a branch of technology, the function of which is to process and communicate information. Some instances of IT only transmit information, such as telephone, facsimile, printing and broadcasting. Others also process information in addition to transmission. Computer-based information technologies are an example of the latter and they are the focus of this thesis. To understand better the nature of IT, it is desirable to consider both technical and social characteristics of IT.

IT as a tool. IT may be thought of as a kind of tool. As such, IT shares some fundamental characteristics of tools. A new tool is, first, an extension of the capabilities of existing tools and/or human capabilities. For example, IT enhances the information processing and communication capabilities of individuals and organisations in terms of speed, accuracy, memory and tolerance. At the very least, IT represents an addition to the existing manual and mechanical information systems. Moreover, with greater capability, IT use provides more possibilities and options in processing and communicating information. One implication arising here is that IT presents itself as a technological attraction in terms of power and technological advantages. Because of this, once IT is wisely chosen and applied, it may constitute an irreversible commitment just as with other technologies (Weizenbaum, 1984). Another implication is that the impact of IT can be studied at two different yet interrelated levels. That is, the influence of IT availability on possible users in choosing information processing systems, and the effect of IT use on users' activities, behaviours and other aspects.

On the other hand, the choice and use of a tool in general, and of an instance of IT in particular, is determined not only by the technological attraction, but also by non-technical factors such as information needs, and social, political and economic influences (Langrish *et al.*, 1972). This implies that the impact of IT is, to a certain degree, subject to users' control, although rational human intentions and choices cannot always determine the consequences of IT use. Indeed, IT is sometimes subject to misuse and abuse (Chambers and Court, 1987; Xiao, 1990). This also means that a unilateral and determinist view of the relationships between IT and social or organisational change, whether human intention determinism or technological attraction determinism, is not appropriate.

It should be pointed out that IT is not an ordinary tool such as a spade. It can be a control tool because it processes and communicates information which is vital for decision making, organising and controlling. Beniger (1986) argues that both information processing and communication are inseparable components of the control function, and thus a society's ability to maintain control will be directly proportional to the development of its information technologies. However, its negative effect should also be recognised. IT could result in the loss of control as it would be difficult to restrain information flows resulting from the widespread use of IT.

IT as a model. IT can also be seen as a type of model. A model captures the essential features of the system being modelled. The model building process enables a better understanding of the system and allows experimentation. Computers and computer-based systems simulate the processes of information production and communication. Advanced computer systems such as knowledge-based systems, neural networks and other artificial intelligence (AI) systems try to simulate human cognitive processes.

By definition, all models have limitations. Some limitations are deliberately imposed by the modeller by simplifying the complexity of what is modelled. Some others result from limited resources, the modeller's ability and other limiting factors. IT as a kind of model shares this characteristic. Weizenbaum (1984) argued that the development of AI was constrained by the limited capacity of existing computers, and by some not encodeable, communicable and understandable human knowledge. Similarly, Monk (1986) summarised the limitations of IT in four types, i.e. physical limits, non-computable information, unmanageable and thus unacceptable IT, and the availability of theoretical knowledge. Of course, the impact of IT is constrained by the limitations of IT. A research implication related to the dynamic limitations of IT is that it is difficult, if not impossible, to predict IT impact on the basis of past or existing knowledge.

It should be pointed out that the IT limitations mentioned above are not necessarily technological. For example, Weizenbaum (1984) argued that some issues relating to the debate on the computer and people are neither technological nor even mathematical, they are ethical, which is not a question of IT capability but a matter of whether or not IT should be applied. It seems that Weizenbaum's discussion on ethical issues also applies to some non-ethical situations where decisions on IT use may be a question of whether the decision-maker is willing to use it. This is likely to be the case in applying IT in external financial reporting.

Because the builder must select the features for inclusion into the model, and because users must decide which parameters to be used and must assign values to the parameters in using the model to solve a particular problem, the model represents human purposes and judgement. The selection of features and the use of the model must be at least in part an act of judgement (in complex situations often political and cultural judgement) (Weizenbaum, 1984). IT as a model also bears this characteristic.

In summary, if IT has an impact on, say, corporate financial reporting [CFR], the impact is likely to be constrained by its social and political as well as technological limitations, and to be subject to human judgement and intentions.

IT as information and knowledge. IT is essentially information and a body of knowledge. "... tools and machinery may be stored-up labour, but they are also, and more significantly, stored-up information! ... at the base of advanced technology is knowledge..." (Stonier, 1983, p.11). As information and knowledge, IT is accumulative and interrelated among its specific instances. This means that any new instance of IT is built upon existing knowledge and technologies. Technological progress is essentially a process of knowledge absorption, application, recreation and growth. One implication of this characteristic is that IT impact should also be cumulative. Hence, three issues need to be addressed in studying IT impact. (1) Can IT impact be studied in isolation? If it were possible, the researcher must then have a strategy as to whether to investigate IT impact at a macro level, at a micro level, or at a level in between. (2) Is it possible to isolate the impact of a new generation from that of an old one? This seems extremely difficult, if not impossible. (3) What time-frame is appropriate for the study of the impact of IT? There is a danger that IT potential is yet to be exploited if the time-frame of the research is too short. On the other hand, if one tries to study a long-run impact, practical problems such as data availability may arise.

As information and knowledge, IT is context dependent. The use value and exchange value of information and knowledge are partly determined by factors outside the information and knowledge sets (Monk, 1989). A different context will give a set of information and knowledge different functions and meanings. This is also true for IT. For example, the value of software is determined by its application environment (technical, economic, political and social). This implies that studying IT impact requires both technological analysis and non-technological analysis, and a study should be put into the actual context of IT use. In studying IT impact on CFR, the political, economic and organisational context must be taken into account.

Finally, IT as information and knowledge is able to substitute for physical resources and physical flows in economic activities. For instance, IT can be used to replace manpower in information processing and communication. This provides a potential for lower cost, and higher operational and managerial efficiency.

The nature of financial information

Although there has been a growing demand for non-financial information (AAA, 1966; ICAS, 1988), the main product of a CFR system is still financial information. It is therefore necessary to discuss the nature of financial information in order to understand CFR better. One approach to this is to observe the role of financial information in economic activities. An alternative is to study its characteristics in relation to its ownership and value.

The role of financial information. Three major roles of financial information for external users have been perceived (ICAS, 1988): (1) assisting the overall governance of corporations, i.e. allowing companies and their managers to be seen to be discharging specific and stated responsibilities; (2) allowing various interested individuals and organisations to judge the performance of corporate management; and (3) aiding decision-making by various users. Lee (1987) concluded that the major role of financial information to management is to facilitate organisational control. Beaver (1986) described two distinct but related roles of financial information: (1) pre-contracting role, i.e. facilitating decision makers in selecting an action among the available alternatives such as investment portfolios, and (2) post-contracting role, i.e. enabling contracting between parties relating to a reporting entity. Beaver's classification is appropriate for both internal and external users of financial information. In addition, financial information also acts as a factor that influences share prices as perceived in market-based accounting research (Skerratt, 1990), and as a basis for taxation and price control (Cook, 1990).

Because of these important roles, financial information often means wealth either directly or indirectly. Financial information derived from alternative accounting methods is different and this difference is directly reflected in asset values, incomes, dividends and taxation expenses (Xiao, 1994). Moreover, the disclosure of financial information can have effects on the distribution or transfer of wealth among individuals or organisations (Beaver, 1986).

Besides, financial information also means power. One source of power is the ability to cope with uncertainty. Because information is some tangible or intangible entity that reduces uncertainty about a state or event, information means an ability to control uncertainty. Financial information thus enables some individuals or units within and outside an organisation to have more power. King *et al.* (1991) suggested that some dissatisfaction shown by internal users of financial information may be seen as politically motivated.

Ownership of financial information. The ownership of financial information has never been made clear. Are the shareholders the owner? Or should it be the firm? Or the managers of a firm? Or the regulatory bodies? In practice, it is the management of a firm which decides what information is to be disclosed, how and when, and it is the management which has the most access to financial information.

Information economics identifies several characteristics of information regarding the ownership issue (Monk, 1989). The first is *non-appropriability*, i.e. information is essentially a "public good". In practice, this means that various property rights laws cover only a subset of information. The second is *indivisibility* in production. That is, the effort needed to produce a set of information is the same no matter how many users purchase or consume it. A third characteristic is *non-deprivality*. This means that the producer or seller of information is not deprived of its possession by trade, exchange or communication.

However, these characteristics do not seem to fit financial information very well. First of all, only after financial information is disclosed does it become a public good. Before that, it is proprietary or private. Also, the regulations and professional standards can make it compulsory for companies to disclose only a subset of financial information. Furthermore, although the provider of financial information will not be deprived of the information, the opportunities represented by the information may be transferred to the recipients.

Value of financial information. Financial information has been seen as a useful resource. The use value of financial information has extensively been discussed in terms of qualitative characteristics in the accounting literature (AICPA, 1973; ASSC, 1975; FASB, 1978-1985; Solomons, 1989; IASC, 1989; ASB, 1991).

However, financial information can hardly be treated as a kind of commodity with exchange value. This is because users enjoy it as a public good. They can get it free after it is published without even referring to the provider. The provider may benefit from information disclosure, but the benefits are not certain and not explicit. More importantly, because there is no established quantity measure for information, it has not been possible to develop a practical price system (Boulding, 1966). Therefore the exchange value is difficult to establish. In practice, corporations have to provide free financial information to external users.

Two dilemmas are revealed from the description of the nature of financial information: while financial information is proprietary (at least before it is published), it is not clear who is its owner; and although financial information means wealth and power, it is not tradable and is not valued in exchange. These two issues complicate the nature of CFR. They provide a partial explanation for a later argument that the major issue of external reporting may not be how to supply financial information, but whether or not to provide certain information. An implication is that IT impact on CFR may be rather complicated, economically or politically.

The nature of CFR

CFR is a process of communicating financial information about the resources and performance of the reporting entity which is useful to users in their decision making and performance monitoring (AICPA, 1973; ASSC, 1975; FASB, 1978-1985; ICAS, 1988). There are a number of perspectives on CFR which need consideration and are explored below.

Technical versus non-technical system. Technically, CFR may be seen as a set of accounting methods and procedures, data processing and communication devices and machines, and accountants acting as system operators. Thus the system is the same as a public library except that a library does not usually process information and its main issue is a matter of how to meet users' information needs.

Viewing CFR as such a system, it would be possible to think that the supply of financial information is largely determined by its capacity. Because the use of a powerful information technology may increase the overall capacity of CFR, it would be possible to hypothesise that IT use will improve the supply of financial information (Bedford, 1973). A further hypothesis might be that an upgrade of information technology would lead to the use of more sophisticated and mathematically complicated accounting methods (McRae, 1964). In short, IT use would be a major determinant of financial information disclosure and accounting choice.

However, apart from the components mentioned above, CFR also comprises users with conflicting interests, sets of CFR regulations, corporate CFR strategies and accounting policies, and auditors. In such a system, the supply of financial information is unlikely to depend merely on the capacity of the system. Instead it is determined by a complex mixture of factors such as regulatory forces, market forces (e.g. capital and labour market forces), and costs associated with disclosure (e.g. litigation, information and political costs and competitive disadvantage) (Foster, 1986). Similarly, accounting choices are determined by many non-technical factors, for instance, regulations, industrial convention, economic consequences to management, and economic consequences to the firm (e.g. taxation expense, data processing cost and financing cost) (Foster, 1986). In addition, positive accounting theory has identified size, management incentive plan and gearing, among others, as factors affecting accounting choices (Watts and Zimmerman, 1990).

By taking a non-technical view of CFR, the essential issue of external reporting would be what information is to be supplied and to whom it is to be provided. This means that the use of IT may produce more and better information, but it is not certain whether this information will reach the hands of certain users.

Internal versus external reporting. According to ICAS (1988) and Lee (1987), the information needs of external users are similar to those of corporate management, except for reporting frequency and the level of aggregation. Unlike external reporting, internal reporting is not subject to regulation. The confidentiality issue also poses fewer problems in internal reporting. However, this does not mean that internal reporting is a pure technical issue and is free from any economic, political or other influence. In reality, management frequently has to settle for compromises in the key indicators used for internal reporting purposes. There are also conflicts between senior management and divisional management. For example, Markus (1983) documented a case of political confrontations over the implementation of a new accounting system between group accountants and divisional accountants. In addition, the ownership or control of information is a major source of power in organisations, and therefore whether or not one is informed makes a difference. Finally, different accounting methods give varying performance that is measured and this influences not only the economic interests of individuals but also affects their promotion and other sensitive matters. Therefore, an accounting choice in internal reporting represents a political process just as in external reporting.

In contrasting internal reporting with external reporting, the dual role of management should not be ignored. Management is the user of financial information internally, but a provider of financial information externally. This dual role is the root of many issues related to CFR, such as information asymmetry and moral hazard. Management self-interests are often cited as one rationale for financial reporting regulation (Beaver, 1986). On the other hand, Emmanuel and Otley (1985) differentiated individual managers from management. Following this, Lee (1987) suggested that the interests of collective management and shareholder groupings may be close in terms of the survival of the company and its long-term health and progress, although the interests of an individual manager and those of an individual shareholder may well be different. However, this argument does not deny the information asymmetry between management and external users.

This discussion suggests that a researcher should distinguish internal reporting from external reporting when investigating IT impact, and consider whether the management self-interest influences the impact of IT.

Procedural versus decisional systems. At the low level, CFR consists of transaction systems. Information processing in such systems is well structured, and easily programmable. The required data, the processing to be performed and the output can be specified unambiguously in advance. There is little uncertainty and few exceptions involved. On the other hand, at the high level, CFR involves formulating reporting strategies and accounting polices, making accounting choices and estimates, simulating accounting changes and forecasting earnings and cash flows, and so on. Information processing at this level requires much human judgement and knowledge, and is only semi-structured or even unstructured. The data required, the processing and the output are often difficult to pre-specify. This mapping of CFR systems is consistent with Ginzberg's (1980) classification. Using his terms CFR systems at the low level are procedural systems and those at the high level decisional systems. An implication of this distinction for studying IT impact on CFR is that IT may play a different role in the two types of system. In the former, IT can easily substitute manual operations, while in the latter IT may play only a supporting role.

Efficiency, effectiveness and strategic significance. The performance of CFR can be evaluated at three levels, i.e. efficiency, effectiveness and strategic significance. Efficiency can be interpreted as time savings and labour savings while producing the same financial information. Effectiveness can be seen as an improvement to financial reporting by producing more and better information.

Strategic significance involves the long-term effects of CFR on users of financial information. For example, CFR can provide strategy-specific information to management and thus influence the formulation and implementation of some business strategies, e.g. cost leadership, differentiation and focusing strategy. This can be accomplished by undertaking strategic cost analysis in relation to a specific strategy. In addition, financial information disclosed by companies is an important factor which determines or affects share prices. Adequate disclosure may result in a narrower dispersion between intrinsic value and market price of a security (Friend and Herman, 1964; Singhvi and Desai, 1971). The reduction of information asymmetry by more public reporting may also increase the liquidity of the market for a company's securities which leads to reduced cost of capital (Diamond and Verrecchia, 1991). In many companies, CFR is being used as a means of increasing investors' confidence, gaining financing benefits from financial markets, promoting public image, getting more participation by employees and strengthening business contacts (Hussey and Everitt, 1991).

IT use is very likely to improve CFR efficiency and effectiveness in terms of time and labour savings, and more and better information. But the question remains as to the ability of IT use to enhance CFR strategic significance[1].

The discussion on the nature of CFR shows that CFR is not purely a technical matter. Rather it is a social, economic and political process. It follows that the use of IT in such a process also bears social, economic and political implications. On the other hand, IT is only one of many factors which play a role in CFR. Its impact may be constrained by other factors and thus should not be overstated. Finally, because CFR consists of different dimensions, the researcher should bear in mind that if IT has an impact, the impact on the different dimensions is unlikely to be of similar magnitude.

Section 2: A Contingency Perspective

The above discussion on the nature of IT, financial information and CFR makes explicit two major points which are particularly relevant for defining a theoretical framework for studying IT impact on CFR: (1) A simplistic and deterministic view of IT impact on CFR is not justifiable, whether this is approached from the nature of IT

[1]See Powell (1993) for a review of the literature on IT as a strategic tool, and a discussion of the relationship between IT and efficiency, effectiveness and strategic significance.

or from that of CFR. From the former, it is shown that IT is a combination of technological attraction and human intentions. From the latter, it has been found that CFR is not merely a technical system, but rather is a system with economic, social and political as well as technological implications. This indicates that the evaluation of IT impact on CFR requires a theoretical framework which allows both technical and non-technical analysis. (2) On the one hand, IT has ethical, social, political, and economic limitations as well as technological limitations, and IT impact is likely to be constrained by these limitations. On the other, CFR consists of several different facets and the impact of IT on them is unlikely to be the same. This demands a theoretical framework which is general yet adaptive and flexible enough to enable researchers to delineate the degree and pattern of the impact.

Existing approaches

As there is no available theoretical framework in the accounting literature which can be used for the current purpose, a more substantial but relevant research area, i.e. IT and organisational change has been investigated. Research in this area, however, has not established reliable generalisations about the relationships between IT and organisational change (Markus and Robey, 1988). This has largely resulted from the use of conflicting, narrow, inflexible and often extremist theoretical approaches. Kling (1980) identified and defined six such approaches. Three were labelled system rationalism including rational, structural and human relations approaches, and the rest were named segmented institutionalism including interactionism, organisational politics and class politics. Markus and Robey (1988) distinguished three approaches which explain the relationships between IT and organisational changes, i.e. technological imperative, organisational imperative and emergent theory. Markus (1983), and Markus and Pfeffer (1983) further distinguished two variants of emergent theory, i.e. socio-technical system theory and organisational politics.

These theories are conflicting. System rationalism emphasises the positive roles that IT plays in social life, assuming that there is a marked consensus on major social goals relevant to IT use, placing efficiency as a dominant value. Segmented institutionalism in contrast, examines the consequences of IT on many aspects of social life both legitimate and illegitimate, assuming that inter-group conflict is as likely as co-operation, identifying as dominant values the sovereignty of individuals and groups over critical aspects of their lives, the integrity of individuals and social equity. On the one hand, technological imperative sees IT as an exogenous force which determines or strongly constrains the behaviour of individuals or organisations. On the other, organisational imperative assumes almost unlimited choices over technological options and almost unlimited control over the consequences. While these two imperative approaches start from extreme angles, and take a universalism view, emergent theories pursue a particularism approach. They hold that the use and consequences of IT emerge unpredictably from complex social or political interactions (Markus and Robey, 1988). In addition, each variant of this approach only focuses on one aspect, either social or political. Because of this, the emergent theories may have only limited capability of guiding policy making in practice.

Interesting work is, however, beginning to emerge on the relationship between IT and organisational structure, which takes a contingency perspective. For instance, Raymond, Paré and Bergeron (1993), investigating the relationship between the sophistication of organisational structure, sophistication of IT use and organisational performance, conclude that, for small and medium sized firms, structural sophistication (decentralisation, formalisation and complexity) and IT sophistication are related irrespective of the contingent variables of organisational size and environmental uncertainty. However, IT and performance are only related when size, uncertainty and structure effects are removed. Similarly, Sabherwal and King (1992) identify the need for a contingency approach to the issues of strategic information systems development. They consider contextual factors such as industry environment (stability, information intensity), organisational structure (centralisation, formalisation) and the state of the information systems function (maturity). While the development of such contingency models is to be welcomed, they are of restricted use here, and judging from the criteria derived from the discussion on the nature of IT, financial information and CFR, the approaches outlined both here and above do not seem appropriate for evaluating the impact of IT on CFR.

Contingency theory of organisation

To guide this study, a contingency perspective is proposed, analogous to the contingency theory of organisation (CTO). It may be relevant to give a discussion of CTO before the proposed framework is detailed. The theory attempts to explain structural and process differences among organisations and it has found that environment, technology, size, strategy, culture and so forth are factors or contingencies that shape organisations. Its key concept is the "fit" between organisational structure and contingencies. The effectiveness of the organisation depends on this fit. The theory has three general principles: (1) there is no one best way to organise; (2) different ways to organise are not equally effective; and (3) the best way to organise depends on the nature of the environment to which the organisation relates (Lawrence & Lorsch, 1967; Galbraith, 1973; Scott, 1987). The first one challenges the universalist wisdom that general principles applicable to organisations in all times and places can be developed. The second challenges the view that organisational structure is irrelevant to organisational performance, while the third challenges the particularist "know-nothing" position, given the complexity and variety of organisations, that it is futile to search for any underlying principles to guide their design.

The theory is largely grounded in open systems theory which views a complex organisation as a set of inter-dependent parts that together constitute a whole which in turn is interdependent with some larger environment. From this perspective, a system has two characteristics: (1) adaptation, elements within the system adapt to each other to preserve the basic characters of the system, and the system adapts to its environment to survive; (2) equifinality, a system can reach the same final state from differing initial condition and by a variety of paths. Early theorists only incorporated the first characteristic into the contingency theory and thus the theory smacks of deterministic assumptions, but more recently the second one is taken into consideration (Drasin and Van De Ven, 1985). Another root of the theory lies in the behavioural theory of organisations which sees organisations as problem-facing and problem-solving entities attempting to achieve a satisfactory level of performance under norms of bounded rationality (Simon 1957; March and Simon 1958; Cyert and March 1963). Lawrence and Lorsch (1967) coin the label "contingency theory" and argue that different environments have different requirements on organisations. Thompson (1967) makes a major contribution to the formation of contingency theory. He sees organisations as open systems that are both surrounded by uncertainty and subject to a rationality criterion. He argues that differences in technology and environment result in variations in structure, strategies, and decision making.

The theory has met some criticisms. These criticisms can be used for the evaluation of the proposed framework, and thus are summarised here. Schoonhoven (1981) argues that it lacks theoretical clarity in presenting the relationships between structure and contingencies. Another problem is that many studies using CTO adopt linear regression model, assuming unquestioningly a linear relationship between a contingency and organisational structure while in fact their relationship may be non-linear. Further, when formulating hypotheses, the symmetrical effect of contingencies are usually neglected. For example, while assuming that decentralisation coupled with high environmental uncertainty enhances performance, the other side is often overlooked: decentralisation with low environmental uncertainty may have a negative effect. Child (1972) criticises this theory on the grounds that it underplays the significance of choice in structuring organisations. Child (1977) further condemns it for neglecting the importance of internal consistency of organisational design. Miller (1981), criticising its environment deterministic position, also points out its failure in recognising the equifinality characteristic of open systems, its limitations of investigating bivariate relationships only, and the necessity of segmenting the sample to find out the relationship in subsamples. Tosi and Slocum (1984) argues for more clarification of key concepts of the theory. They notice the inconsistencies in defining effectiveness; some define it as profitability while others adaptation and survival. Research often fails to recognise the fact that there are several environments rather than just one measured in terms of uncertainty or complexity. Moreover, closely related to these two problems, organisational congruency or fit is also ill-defined. Often neglected is the fact that one contingency alone may change the organisational structure while the joint occurrence of two or more factors may not give rise to any change. A broader theoretical scope is proposed to incorporate cultural consideration, strategic and design choice, and the integration of individual and group concept.

While the above critics attempt to improve the theory, Wood (1979) proposes a break away from it. He argues that, stemming from the systems theory, it has a problematic conception of change (seeing change as unproblematic, evolutionary, and progressive), politics (a matter of gaining acceptance of change), and power (residing in knowledge and skills, a technocratic view). Its deterministic view renders organisational choice redundant, not just underplaying organisational choice. It treats the organisation as a structured system managed by a homogeneous team, rather than a "negotiated order". Finally, it exaggerates the role of social scientists who, instead of being just informants, are seen as theorists, promoters of new ideas, and participants of organisational structuring.

Some problems have been or are being overcome to various degrees, or at least have drawn some attention. In response to the criticisms toward the environmental deterministic view, a strategic choice view has been developed (Donaldson, 1987). Strategy is now seen as an important contingency. Chandler (1962 & 1977) finds that structure follows managerial strategies, though management often need a crisis before they make a structural change. Following Child's criticisms, internal consistency is sometimes considered along with external factors. Mak (1989) investigates the impact of both perceived environment uncertainty and internal consistency of strategic planning systems, management control systems and operational control systems on financial performance. He finds little support for the contingency proposition and a strong support for the internal consistency proposition. Schoonhoven's criticisms have stimulated the differentiation of three different approaches to the concept of "fit": selection, interaction and systems approaches (Drasin and Van De Ven, 1985), the investigation of two-way or three-way interactions between contingencies and structural variables (Gul and Chia, 1994), and the use of non-monotonic assumptions (Brownell and Dunk, 1991).

Despite these developments, contingency theory based studies still face some charges such as the inconsistent definitions and measures of effectiveness and contingencies, the dubious assumption of linear relationships, the carelessness toward the interdependence of contingent factors, the use of static models built upon cross-sectional studies, and the inconsistent units of analysis (Zeithaml *et al.*, 1988). Moreover, studies undertaken within this framework tend to investigate the impact of contextual variables on organisational structure one by one, thus neglecting the impact of other factors and their combined effects (Tayeb, 1988). In some cases only two-way interactions are investigated (Gul and Chia, 1994), the samples are too small for any sensible segmental or contingent analysis (Haka, 1987; Mak, 1989; Gul and

Chia, 1994), or the samples are not drawn at random (Brownell and Dunk, 1991).

Nonetheless, the theory has been seen as a unifying and general framework which occupies an important position in the jungle of modern organisation theories (Luthans and Stewart, 1977; Kast and Rosenzweig, 1985; Ford *et al.* 1988). This point is elaborated below. There have been three perspectives of organisations: rational systems, natural systems and open systems (Scott, 1987). The rational systems perspective sees organisations as collectives oriented to relatively specific goals and exhibiting relatively formalised social structures. It is represented by classical theories (scientific management school, decision making theory, bureaucratic theory, administrative management theory, and economic theory of the firm). The perspective seeks but fails to provide a set of universal principle of organisational effectiveness. It is also criticised for its unrealistic assumption of the economic rational person and its problematic notion of authority. In contrast, under the natural systems view (characterised by the human relations school and cooperative systems theory), organisations are collectives whose participants share common interest in the survival of the system and who engage in collective activities, informally structured, to pursue this goal. While its emphasis on human needs and behavioural aspects and its view of organisations as social systems are plausible, this perspective still implies that there is a "best way" to organise. Besides, its assumption that goals are given and unproblematic has been challenged. A common feature of rational and natural systems perspectives is that they treat organisations as closed systems having no interaction with their environments.

The open systems perspective, however, sees organisations as systems consisting of interdependent activities linking shifting coalitions of participants and exchanging information, energy or material with its environments. This perspective reflects a search for patterns of relationships between the organisation and its environments, and among its internal parts. This systems view provides a broad framework for understanding *all organisations* and is intuitively simple. However, it has been difficult to put into practical use because it involves concepts of a relatively high degree of generalisation. Consequently, "we still find ourselves ignore the tenets of the open-system view, possibly because of the cognitive limits on our rationality" (Perrow, 1973, p. 48).

Taking an open systems perspective, CTO tends to be more concrete and to emphasise more explicit characteristics and patterns of interrelationships among systems. If theory is to facilitate and improve management practice, then the more explicit understanding of organisational variables is essential. CTO is thus seen as an operational vehicle of the open systems perspective. Moreover, contingency theory can be used as a global framework to reconcile the seemingly conflicting perspectives. Lawrence and Lorsch (1967), for example, use a contingency framework to reconcile the rational and natural systems perspectives. They argue that these two views may be seen to identify different organisational types which vary because they face different environments. The rational systems view describes organisations which are highly formalised and centralised, and pursue clearly defined goals, whereas the natural systems perspective focuses on less formalised organisations which may not have clear goals because they rely largely on personal qualities and initiatives of participants. These two types of organisations adapt to two different environment: homogeneous and stable for the former, and diverse and changing for the latter.

Moreover, many other organisational models can comfortably be incorporated into CTO. Examples include population ecology (Hannan and Freeman, 1977; Aldrich, 1979), the resource dependency model (Pfeffer and Salancik, 1978), and the strategic contingencies model (Chandler, 1962; Child, 1972). Each of these models suggests a particular way of understanding the relationships between organisations and their environments, and thus can be seen as an operational model of CTO. Population ecology holds that environments differentially select organisations for survival on the basis of fit between organisational forms and environmental characteristics. The resource dependency model suggests that organisations can adopt different strategies corresponding to the extent of resource dependency to change and adapt to the environment. The strategic contingency model argues that organisations confront and respond to various environmental challenges and opportunities, emphasising that managers can choose organisational structures and processes.

Largely because it is general and flexible and therefore can be used as a global and unifying framework, CTO has been widely accepted in spite of its problems. In addition, it is intuitively appealing and is used to reconcile seemingly disparate empirical findings (Otely 1980; Mak, 1989). This may explain why this theory has been applied in many other areas such as management accounting systems design (Otley, 1980), compensation scheme design (Balkin and Gomez-Mejia, 1987), marketing (Zeithaml *et al.* 1988), and strategic planning (Miller and Cardinal, 1994). Since the evaluation of the impact of IT on CFR requires a flexible and general framework as shown by the discussion of the nature of IT and CFR, the basic principles of CTO presented above provide a starting point to develop such a framework.

The proposed perspective

This study is concerned with the impact of IT on CFR rather than organisational design, and thus the CTO is not directly used; neither its three principles nor its key concepts or variables are directly used. However, the three principles of the theory provides the following analogies to form a perspective on the relationships between IT and CFR in this study:

- IT use does not have a universal effect on CFR;

- the pattern and degree of IT impact on CFR differ among organisations and among different aspects of CFR; and
- the pattern and degree of the impact depend on some key contingent factors.

These analogies suggest that the impact of IT on different aspects of CFR varies, and the degree and pattern of the impact in different organisations are conditional on, among others, environmental, and organisational, management characteristics. Thus the proposed perspective requires an identification of contingent factors when investigating the relationship between IT and CFR. It is not intended to find a universal effect of IT use, but to determine the pattern and degree of IT use in different situations.

The perspective so formulated is hoped to be flexible, adaptive and general so that it can avoid the pitfalls, but incorporate the merits, of the above mentioned theoretical perspectives. It admits the impact of IT, but it does not follow the technological imperative view that IT is universally deterministic. Rather, IT impact is constrained and modified by other factors. It appreciates the importance of individual and organisational choices, but it differs from the organisational imperative in that the rational intentions of individuals and organisations cannot always determine the consequences of IT use. Unexpected and undesirable results from IT use may occur.

The perspective recognises the conflicts among individuals or organisations, but it does not agree with emergent theories which argues that IT consequences are impossible to anticipate. It holds that it is possible to predict the pattern and degree, to some extent, of the impact of IT on CFR and the difference of this impact on different aspects of CFR. One of the reasons for this is that IT represents a technological attraction as discussed in Section 1. This attraction provides incentives for people to use IT in order to meet their needs and purposes. Therefore, people who use IT must have some understanding of the possible consequences of IT use. Also, as detailed in Section 1, CFR has many facets with different characteristics. For example, some aspects may be more technically oriented while others may be more politically or socially complicated. This being the case, it is possible to foresee that IT may play a different role in different aspects of CFR. Another reason lies in the fact that contingent factors can be made known through organisational learning and research. The ability of organisations to predict the impact of IT can thus be enhanced. The emergent theories also suffer from their narrow focus on either political issues or social issues. In contrast, the contingency perspective does not confine itself to social, political or economic analysis. Rather, it allows the analysis of IT impact from different angles. This echoes Powell's (1992) call for the integration of the implications of research in different disciplines into a global perspective, given that organisations are influenced by multiple types of force such as social, economic, technical and managerial factors.

The contingency perspective can be seen as having three components: information technology, CFR and contingent factors. Each of these components, their relationship and their related research implications are discussed below.

Information Technology. For the purpose of this study, IT is defined as computer-based information processing, storage and communication technologies. This excludes both conventional mechanical technologies such the abacus and the typewriter, and modern non-computer-based ones such as facsimile and the photocopier. IT can be considered as comprising three dimensions, IT availability, future developments of IT and IT use. This study focuses on IT use. The sophistication of IT use will be captured by an index consisting of multiple indicators, such as the extent of computerisation, the time-span of computerisation, the types of computer-based technologies used, the types of computer-based applications, the qualitative features of IT use, and the level of integration. The approach to formulating this IT use index will be discussed in the next chapter.

There are at least three strategies for the investigation of the impact of IT on CFR: (1) to study the aggregated impact of all types of IT, (2) to investigate the impact of a particular type of IT, or (3) to examine the impact of a particular instance of IT. In this study, the second strategy is adopted, and thus only computer-based technologies are examined. One reason is that this type of IT is dominant in accounting and is readily identifiable. Further, an investigation of the impact of all-inclusive IT on accounting is too large a task and does not fit the aims of this thesis, even if it is worthwhile. However, as pointed in the last section, it is difficult to isolate the impact of specific instances of IT if one instance of IT is focused.

Corporate financial reporting. CFR can be examined along several dimensions as described in the previous section: (1) components of CFR, (2) CFR output, i.e. financial information, (3) performance of CFR, in terms of efficiency, effectiveness and strategic significance, and (4) CFR as procedural systems and decisional systems.

This study focuses on CFR outputs which directly relate to users, and compares internally reported information with externally reported information. In so doing, it is possible to relate the study of IT impact on CFR to information economics and agency theory since these two bodies of research are concerned with information asymmetry. Information economics studies "information in addition to market prices which may affect economic behaviour. An important aspect of this research involves the study of information supplied by agents, accountants, and others, for its possible value in dealing with risk and uncertainty" (Cooper and Ijiri, 1983). More specifically, information economics considers two broad sources of demand for financial information: decision making and stewardship (Atkinson and Feltham, 1982). The decision making value of financial information is the subject of statistical decision theory. In this theory, information received prior to decision making is valuable if it reduces the expected opportunity losses of decision making under uncertainty.

The stewardship demand for financial information is dealt with by a line of research called agency theory[2]. An agency is a contractual relationship where the principal (such as shareholders) engages the agent (such as managers) to carry out some service on his behalf which involves the delegation of decision making autonomy to the agent (Jensen and Meckling, 1976). Assuming that the agent is self-interested, agency theory basically deals with the issues of how to motivate the agent to act in the interests of the principal and how to distribute risk efficiently between the principal and the agent (Atkinson and Feltham, 1982).

Information economics, and agency theory in particular, recognise two types of information asymmetry, one between corporate management and outside interested parties such as investors and creditors, the other among external interested parties. This thesis will focus on the first type which is approximated by contrasting internal reporting with external reporting. The issue of information asymmetry is important because information asymmetry combined with unconstrained opportunism results in moral hazard and adverse selection problems. In an agency setting, moral hazard arises when the agent's action is unobservable by the principal, and has a different value to the agent as compared to the principal. Since the principal cannot observe the agent's performance and its outcome, a self-interested agent may pursue her own utility-maximisation at the expense of the principal by means of shirking, duty evasion, and insider dealing using private information about the firm. Adverse selection refers to the likelihood that, due to information asymmetry, one may choose

[2] Agency theory has been developed along two lines: (1) the principal-agent literature, and (2) the positive agency literature. For details, see Walker (1987).

an inferior option (service, security or investment project) while superior options exist. For example, a self-interested manager may choose to continue an investment project although she already knows that the project is failing and that discontinuation should benefit the shareholders. Another example is where a shareholder sells her shares of the company and buys shares of another despite the fact that the shares sold were superior to those she bought. Note that these two examples indicate that adverse selection can occur to both the agent and the principal.

These two problems could have severe consequences. The moral hazard problem could destroy the agency, and thus lead to the destruction of the firm (Duska, 1992), while the adverse selection problem could lead to the collapse of markets and/or costly investigation (Noreen, 1988). Various mechanisms have been proposed to overcome or prevent these problems. Some are designed assuming the existence of asymmetrical information, such as third party monitoring, efficient contracting, incentive schemes, and management labour market development. Another approach is the development of more complete information systems in order to reduce or eliminate information asymmetry. This approach is perhaps more effective and positive. It is easy to conceive that when all information is public, the agent would not shirk even if she had an incentive to do so, because the principal knows she is shirking and will penalise her. In a similar vein, shareholders and potential investors would not choose to hold or buy a poor quality security because they know the intrinsic values of all the securities available. This approach is advocated by information economics and agency theory (Beaver, 1986; Walker, 1987).

An important function of financial reporting is the reduction of information asymmetry. Increasing financial disclosure can narrow the information gap between managers and outside interested parties, and is essential in motivating management to make decisions consistent with claimholders' interests, and enforcing claimholders' rights to their respective shares of organisations cashflows. However, financial reporting is largely in the hands of managers, and managers may have an incentive to give distorted information or not to disclose information. Therefore, an independent party (auditors) is also needed to verify this information, and regulation is needed to force managers to disclose some information. Research in information economics and agency theory has argued for the reduction of information asymmetry by increasing financial disclosure and imposing regulation, because this can generate at least three social benefits: (1) a reduction of wasteful private information production and search, (2) an improvement in the control of external investors over managers, and (3) a reduction of the costs involved in signalling inside information by the managers to the market (Walker, 1987).

In the light of the information asymmetry issue exposed in information economics and agency theory, a related research question can be derived: does IT enlarge or reduce the information asymmetry between managers and external users? or does it amplify or narrow the gap between internal reporting and external reporting? If it enlarges the asymmetry, then it may worsen the above moral hazard and adverse selection problems, or it may help realise the social values of financial reporting.

The relationship between IT and CFR. The term "impact" means "strong effect or influence". An impact usually results in a change to what is impinged. A change in CFR may be an improvement and/or a deterioration. For example, IT use may lead to more timely reporting but may also result in information overload.

The term "impact" also implies a causal relationship. However, it must be understood that a change in CFR may not be caused by IT use, and yet IT may have still played an important role in it. For instance, IT may facilitate or enable a change of an accounting method, but the change is the result of new regulations. However, although it may be extremely desirable to distinguish different roles of IT in changes to CFR (as a cause or as a facilitator), this seems very difficult if not altogether impractical[3]. An alternative approach to this is to re-define the term "impact" to include both causal relationships and non-causal ones. This approach is adopted in this study and IT impact on CFR is defined as IT related CFR changes. In effect, "IT impact" embraces both roles of IT: as a cause of change and as a facilitator of change.

It should be noted that the relationships between IT use and CFR may be two-way: IT use and CFR influence each other. For example, an accounting policy change may require additional use of IT into CFR and, as a result, information quality may be improved, leading to further changes in CFR. In the former case, IT is a facilitator, whereas in the latter IT is a cause.

IT related changes can be observed in several ways: (1) by directly investigating what changes have been caused by IT use, (2) by examining the importance of IT use in any changes that have occurred, or (3) by statistically correlating IT use and CFR changes. The first approach requires the isolation of the impact of IT if a change is caused by multiple factors, while the second one requires a knowledge of all factors, and their relative importance in a change. Both these requirements are difficult to meet practically, hence the third approach is adopted in this study.

Contingent factors. These are factors which can differentiate the association between IT use and CFR, and thus can be used to determine the pattern and degree of any impact of IT. They could be a characteristic of business environment, organisation, and management. They could be political, social, economic, as well as technological.

[3] This dual role of IT is also recognised in the literature on the impact of IT on organisational structures (Powell, 1992).

In search of contingent factors, it is possible to establish a link between studies of IT impact on CFR and studies of CFR under agency theory and positive accounting theory. The core assumption of agency theory is that both the principal and the agent are rational self-interest maximisers. This self-interest motivation gives rise to agency costs which include residual loss, bonding costs, and monitoring costs (Jensen and Meckling, 1976). Residual loss results from the discount on the price at which the shareholders and bond-holders are willing to pay for the firms' shares or debentures. This loss incurs because shareholders and bond-holders anticipate that the managers will not always make decisions that are optimal for them. Because managers have to bear this loss in the form of a higher cost of capital, they may contract to ensure that the principal's interests will not be harmed in order to mitigate the residual loss. The costs arising from the preparation and implementation of this type of contract are called bonding costs. In addition, the principal may exert monitoring over managers' actions and this monitoring cost will also be borne by the managers.

Some studies use agency theory to find factors that affect management's strategies and policies towards financial disclosure. Financial reporting involves agency costs. For example, the cost of voluntary disclosure may be seen as a bonding cost, while auditing fees may be seen as a monitoring cost. The extent, frequency, timeliness and other quality aspects of financial reporting may thus be posited as being partly determined by agency costs. Those studies using this theory then look for firm-specific characteristics that influence agency costs and eventually affect financial reporting. Salamon and Dhaliwal (1980) studied the relationship between company size (a proxy for the need for external finance) and the voluntary disclosure of segmental information. Leftwich *et al.* (1981) investigated the relationships between the frequency of external reporting and a number of firm-specific variables including capital structure, assets structure, size, listing status and outside directors. In a similar vein, Chow (1982) used the concept of agency cost to examine management's incentives to employ external auditors voluntarily. For this purpose, manager's share ownership, size, leverage, listing status and the number of accounting measures used in debt contracts were assumed to influence monitoring costs. The results from these and other similar studies vary, but some variables have been found frequently to be factors that affect financial reporting, such as size, listing status (Singhvi and Desai, 1971; Buzby, 1975; Firth, 1979; Cooke, 1989 & 1991), and leverage (Chow, 1982; Holthausen and Leftwich, 1983; Chow and Wong-Boren, 1987).

Positive accounting theory is a theory of accounting method choice (Whittington, 1987). It is also grounded in agency theory (Williams, 1989). Initially, it used the self-interest assumption and the concept of agency cost to explain why mangers choose certain accounting methods. More recently, three competing assumptions have been developed, namely opportunism (choices are motivated by self-interests), efficiency view (choices are made to maximise the value of the firm or all parties) and information perspective (choices are made to inform the investors of the future cashflows of the firm) (Holthausen, 1990). Given that the firm can be seen as a nexus of contracts, the agency cost concept has also been replaced by the concept of contracting cost which include transaction costs, agency costs, information costs, re-negotiation costs and bankruptcy costs (Watts and Zimmerman, 1990). The task faced by studies following positive accounting theory is to identify managerial and organisational characteristics which affect contracting costs, and investigate the relationship between these characteristics and managers' choices of accounting methods. As a result, management compensation plan, leverage and size (as a measure of political costs) etc. have been found empirically to be associated with accounting choice (Watts and Zimmerman, 1990).

Because IT is instrumental to financial reporting, it is possible that the factors that influence financial disclosure and accounting choice also affect IT impact on CFR. If this is the case, findings from studies under agency theory and positive accounting theory can be used as a starting point in selecting contingent factors for this study. The two theories may also be used as a reasoning basis in examining contingent relationships as described below.

Contingent relationship. A relationship between IT use and a change in CFR may be conditional upon one or more contingent factors. In other words, the association between IT use and a change in CFR may be strong at one level, but weak at another level of the contingent factor(s). Further it may be positive at one level but negative at another level of the contingent factor(s). Thus, a contingent factor may specify, clarify, or modify a relationship between two variables. By way of this, the pattern and degree of IT impact on CFR may be made clear. In addition, the impact may be better predicted because the contingent factors are made known. When the relationship between two variables varies in relation to different levels of a factor, these sub-associations are referred to as *contingent* or *conditional relationships*, and the process of examining such relationships is called *specification* (Rosenberg, 1968). This study seeks to identify contingent factors and determine which factors the relationship between IT use and CFR change is conditional upon.

When only the relationship between IT use and CFR change is considered, the research is a two-dimensional design. A fatal disadvantage of this design is that a real relationship may be hidden while a spurious association may present itself. By taking consideration of the contingent factors, another dimension is added to the design. This, of course, complicates the research, but the traps encountered by the two-dimensional design may be avoided. That is, a greater possibility is offered to find the true relationship between IT and CFR. Furthermore, where no overall association is found between the two original variables, say IT use and CFR change, the researcher can see if the two variables have an association at one or more levels of a third dimension, the contingent factor(s).

Section 3: Hypothesis Development

The research topic can now be made more specific under the contingency framework in the form of hypotheses. As shown above, the proposed framework provides an opportunity to make use of existing accounting knowledge such as information economics, agency theory and positive accounting theory. Informed by these theories, user type, company size, listing status, financial reporting strategy, and management compensation plan are considered as contingent or conditional factors, and are used to formulate hypotheses.

One aspect of the contingency perspective is that it restricts the form of hypothesis. Since the perspective sees the impact of IT on CFR as being conditional, it generally prohibits the prediction of the impact of IT without specifying a condition or contingency. When a condition is specified, a hypothesis may take one of the following two forms. One presents the relationship between variable A and variable B as being conditional upon factor C. A stronger hypothesis, however, also specifies the strength or direction of the relationship between A and B in relation to factor C (for example, "the relationship between A and B is stronger at one level of C than at another level of C", or "the relationship between A and B is positive at one level of C but negative at another level of C"). Both forms are used in this study, depending upon the strength of the underlying arguments. Compared with the problems of CTO identified by Schoonhoven (1981), these two forms do not assume a linear relationship between the contingent factors and IT use or CFR. Non-monotonic hypotheses could also be derived as shown below.

Hypothesis 1: IT use is associated more with internal reporting change (IRC) than with external reporting change (ERC). Information asymmetry between corporate managers and external users such as shareholders has long been a concern in economic literature. In general terms, the asymmetry means that managers have superior access to financial information compared with external users. In a narrower sense, it means that shareholders and other stakeholders are not always able to observe managers' behaviour and level of effort. According to information economics and agency theory, social benefits can arise from removing or reducing such asymmetry by increasing public disclosure of financial information. This has been seen as a major rationale for financial reporting and the regulation of financial reporting (Beaver, 1986; Walker, 1987). Since IT is instrumental to CFR, its use further complicates the problem of information asymmetry: has IT use reduced or increased the asymmetry?

The use of IT has been seen as having automated basic accounting systems in most organisations (Clark and Cooper, 1985; Carr, 1987). IT has also offered support to accountants in their analytical work and decision-oriented tasks and allowed them to change from accumulation, analysis and preparation of financial information towards interpretation, evaluation, control and involvement in decision making (Collier, 1984; Clark and Cooper, 1985; Carr, 1987). As a result, information quality has been improved in terms of comprehensiveness, accuracy, timeliness and frequency (Mantle, 1983; Clark and Cooper, 1985; King *et al.*, 1991) and relevance (Banyard, 1982). Legitimately, management can have full access to this improved information. However, this is not the case for external users. While the central issue in internal reporting is how to meet managers' information requirements, the major problem in external reporting seems to be whether or not to disclose certain information.

In the long run, IT use may benefit external users. A study by the Information

Technology Group [ITG] of the Institute of Chartered Accountants in England and Wales [ICAEW] has predicted that the cumulative use of IT will lead to more sophisticated computerised networks, and thus allow more frequent and on-line reporting to external users (ITG, 1989). Moreover, IT availability and IT use will increase the expectations of external users and regulators regarding corporate financial reporting. These expectations may result in increased minimum legal requirements. Evidence is already emerging. For example, the Securities and Exchange Commission (SEC) in the USA has implemented the EDGAR [Electronic Data Gathering, Analysis and Retrieval] system (Keyes, 1990; Coffey, 1994). It requires listed companies to file financial reports to SEC electronically, either on tape or floppy disks or via networks. When the system is fully operational, it will be able to disseminate information to users on a more timely and/or on-line basis.

However, several barriers may prevent external users from enjoying as many benefits as corporate managers. Managers have to protect proprietary information so that they do not lose any market advantage they hold over their competitors. They are also both able to, and have incentives to, suppress some non-proprietary information, especially bad news for their own or their company's interest (Dye, 1985). Moreover, as discussed in the first section, while financial reporting is costly, an accepted price system for exchanging financial information does not exist, and this makes it difficult for the provider to identify any benefits from a disclosure. Therefore, unless there are foreseen benefits such as where the managers believe that their company may be undervalued (Verrecchia, 1983), managers are reluctant to disclose additional information beyond minimum requirements. Even if the management is willing to share all the improved information obtained through IT use with external users, the cost and complexity of the technology required to deliver the information to a large number of external users in a similar way to that provided to managers is prohibitive. Consequently, increasing amounts of information being generated for internal financial reporting through greater use of IT are not likely to be incorporated on the same scale in external financial reporting and, as a result, not only is it likely that the asymmetry exists, but it is also likely to have been enlarged. It is therefore predicted that IT use is more correlated with IRC than with ERC.

Hypothesis 2: The relationship between IT use and internal reporting change (IRC) is stronger in small companies than in large ones. *Company size* can be seen as a proxy for the degree of complexity of an organisation. The larger the organisation, the greater its complexity, the greater the control and co-ordination needed, and the greater the volume of information that needs to be handled. It is likely that IT is used to cope with this complexity in large companies. By implication, information systems are more complex in large companies than in smaller ones. Hence any change or improvement to their existing systems tends to be more difficult than for smaller companies. However, although large companies have more resources than smaller ones, in terms of finance and expertise to be invested in IT applications, this advantage may not be as significant as might be thought.

Smaller companies may not be able to use a mainframe or even a minicomputer, but they can afford PCs. They may not need or may be unable to implement a wide area network (WAN), but a local area network (LAN) may be appropriate and sufficient for their needs. They may not be able to develop in-house software, but their needs can be met by external services or they can choose from a variety of software on the market. Therefore, these smaller companies may no longer feel constrained by limited resources and thus a greater relative improvement on internal reporting may be obtained by them from the use of IT.

Finally, empirical evidence suggests that large companies are quite sceptical about the benefits from IT use (Carr, 1987). Consequently, it is expected that the relationship between IT use and IRC becomes stronger in small companies than in large ones.

Hypothesis 3: the relationship between IT use and external reporting change (ERC) is stronger in large companies than in small ones. Large firms have been observed to disclose more information to external users than smaller ones (Singhvi and Desai, 1971; Buzby, 1975; Firth, 1979; Salamon and Dhaliwal, 1980; Chow and Wong-Boren, 1987; Cooke, 1989 & 1991). Reasons suggested by the cited authors include: (1) Large companies enjoy the economy of scale in information production and in the use of IT; in contrast, processing and communicating information is more costly for smaller firms. (2) Large firms are financed more through financial markets, and more disclosure will increase financing benefits. (3) Large companies are more closely scrutinised by the public and government agencies, and therefore greater and better disclosure may reduce public criticism and undesired pressure or intervention from the government. (4) Smaller companies are likely to feel more than large ones that a full disclosure could endanger their competitive position. Size, therefore, can be seen as affecting demand for information, intention of information supply, and capacity for processing and communicating information.

From the perspective of agency theory, if the company does not disclose information or sufficient information, a number of agency costs will occur. First, potential investors will have to obtain their own information, and they will seek compensation for this information cost by discounting the price of the company's security which will increase financing costs. Second, by adverse selection existing claimholders may choose to withdraw their investments and potential investors may opt for other securities, resulting in the firm's loss of investing opportunities or leaving the firm under-financed. Moreover, inadequate reporting may leads to a qualified audit report, or draw great attention from the public at large, the government and other political institutions. Since large companies depend more on external finance and tend to draw more political attention, potential agency costs are higher than smaller ones. According to Chow (1982), the amount of potential wealth transfer increases with firm size, thus the benefits of monitoring and bonding (including financial reporting) to the agent are positively related to firm size. On the other hand, many costs in establishing a monitoring or bonding mechanism appear to be fixed and once the mechanism is established, the marginal cost of its operation is likely to decrease with firm size.

For these reasons, and in view of the likely resistance to increasing external reporting as discussed in Hypothesis 1, large companies are more likely than smaller ones to use IT to improve financial reporting in order to meet the greater demand for information. It is thus expected that the relationship between IT use and ERC is stronger in large companies than in small ones.

Hypothesis 4: The relationship between IT use and external reporting change (ERC) is stronger in listed companies than in unlisted ones. *Listing status* has been found to be associated with the extent and quality of financial disclosure to external users in studies undertaken by Singhvi and Desai (1971), Firth (1979), Chow and Wong-Boren (1987), and Cooke (1989 & 1991). Two reasons have been suggested in these studies: (1) Listed firms are aware of financing benefits from adequate disclosure, and thus have more incentive to use IT to improve external reporting than unlisted ones; (2) Listed companies have to comply with certain stock exchange regulations, which means that the minimum requirements are more stringent than for non-listed companies.

From the perspective of agency theory, stock exchange listing is an externally institutionalised monitoring/bonding device (Hill and Jones, 1992). To comply with listing rules and additional reporting requirements, listed companies may incur certain monitoring/bonding costs, but this should be outweighed by great capital liquidity and a low financing cost arising from more extensive reporting. Moreover, given limited financial resources and market capacity, listed companies have to compete with each other for greater capital liquidity and lower capital cost. This gives them an incentive to improve financial reporting. The incentive is further maintained because of adverse selection. Companies with high quality securities have to signal their performance to the market, otherwise the market may undervalue them.

Moreover, financial market regulators may promote IT use for external reporting purposes by either requiring listed companies to implement a type of IT or by directly implementing IT-based reporting systems and requiring companies to use them. This is evidenced by the SEC's development of the EDGAR system. For these reasons, it is predicted that the relationship between IT use and ERC is stronger in listed companies than in unlisted ones.

Hypothesis 5: The relationship between IT use and ERC is conditional upon financial reporting strategy. Although external reporting can reduce information asymmetry, it can also have negative effects on the interests of both managers and other stakeholders, such as leakage of commercial secrets and lawsuits. Moreover, since many agency monitoring/bonding mechanisms are based on or influenced by accounting data, managers have an incentive to manipulate financial reporting. Therefore, companies often have a reporting strategy. This strategy may determine the role of IT in external reporting.

Gibbins *et al.* (1990) developed a theoretical framework for CFR following the grounded theory approach. The framework consists of five categories of independent variables which influence the set of disclosure outputs. One category is *disclosure strategy* or position. It is defined as a relatively stable preference for the way disclosure is managed. There are two dimensions to a firm's disclosure strategy: (1) *ritualism*, described as a propensity towards uncritical adherence to prescribed disclosure norms such as rules and standards; and (2) *opportunism*, defined as the propensity to seek firm specific advantage in financial reporting. Gibbins *et al.* also demonstrated that the variable is measurable and that its two dimensions are distinct and can be coded separately for each company. This distinction is also made by Hussey and Everitt (1991).

The *disclosure strategy* variable is used in the present study. Its second dimension can be thought of as taking two different directions i.e. suppressing information versus disclosing additional information beyond the minimum requirements. This amendment creates an ordinal variable with three levels: (1) suppressing information, especially unfavourable information; (2) strictly complying with the minimum disclosure requirements; and (3) reporting additional information where confidentiality allows.

Companies with different strategies exhibit different financial reporting behaviour. As a result, the extent and quality of information reported by them are not the same. It is also unlikely that these different companies have the same attitudes and behaviour towards the use of IT in external reporting. Companies adopting the strategy of suppressing information may not be interested in using IT to improve external reporting. On the contrary, it is possible that they use IT to implement their suppressing strategies or even to deceive external users as evidenced by the management of Equity Funding Corporation of America from 1967 to 1973 (Singleton *et al.*, 1993). Companies using the adherence or ritualism strategy may passively use IT for this purpose driven by legal or professional requirements. In contrast, companies pursuing additional disclosure may actively seek IT-derived advantage and exploit its potential for improving external reporting, or even use IT as a strategic weapon in reinforcing a specific financial reporting strategy such as preemptive disclosure before rumours prevail. Therefore, it is likely that the relationship between IT use and ERC is conditional upon *financial reporting strategy*.

Hypothesis 6: The relationship between IT use and ERC is conditional upon management compensation plans. A central issue in agency theory is the moral hazard problem. An approach to this is the use of *management compensation plans* which aim to induce management to act in the interests of stakeholders. Without such plans, managers (the agent) of a company would adopt short-term horizons and would be risk averse in decision making for their own benefits.

There are two types of *management compensation plan*, short-term and long-term schemes (see Smith and Watts, 1982). Bonus plans are predominantly short-term incentive plans. They are usually based on annual earnings. With a simple bonus plan, a proportion of annual profits is paid to the managers. In its complex form, a bonus plan has low and upper bounds with additional terms such as deferring the payment or payment by instalment. On the other hand, share options are a major type of long-term compensation plan. Managers are provided with options to buy a given number of the company's shares at any time within a given period at a prescribed price. The option can be terminated if a manager leaves the company during the option exercise period. In this way, the wealth of managers and their personal interest is tied to share price which determines the value of the firm or the wealth of the stakeholders. Clearly, this has a long-term horizon compared with the bonus plans.

In addition to the short-time horizon problem, bonus plans are potentially subject to managers' manipulation since they are based on accounting numbers. Since a share option scheme is not directly associated with accounting numbers, the incentives for manipulation are reduced. In addition, such a plan can control managers' natural risk aversion and short-time horizon. However, just as in the case of bonus plans, the schemes need to be adjusted continuously as the firm's market value changes. This process is costly. Moreover, because the options are non-negotiable and are subject to forfeiture, managers' portfolios of investment are under great exposure to risk. This leads the managers to demand extra compensation. The cost of a share option plan may, therefore, offset its benefits, and may even deter its implementation in some companies. This may be why accounting-number-based bonus plans are becoming more acceptable in the UK (Buck and Bruce, 1991).

Two links between *management compensation plans* and the relationship between IT use and CFR can be identified. Firstly, the adoption of different incentive plans may influence management's decisions on IT use, especially when an IT implementation requires a great deal of resources. When an IT project is large, it is possible that the project will have negative cash flows in early years but positive earnings later and a positive overall net present value. Given that managers are naturally risk averse and self-interested, they may not be keen on such an investment (thus an adverse selection problem arises) if no incentive plans exist or if a bonus plan is in use. However, the managers are more likely to accept such a project if a long-term compensation plan is adopted. Larcker (1983) obtained empirical results which support this argument.

The second link concerns how the presence of different incentive plans may influence managerial decisions on financial reporting. According to agency theory, the optimum level of monitoring by stakeholders increases as the ratio of managers' share of equity to outside equity falls (Jensen and Meckling, 1976). Following this, Watts (1977) hypothesised that the smaller the managers' relative share of the corporation's equity, the greater the likelihood, in the case of an unregulated economy, that the corporation presented financial statements. This can be logically extended to voluntary disclosure in a regulated economy at the present time. If this hypothesis holds, the adoption of a share option plan will have a negative effect on voluntary disclosure.

However, other studies indicate that full disclosure will reduce the difference between market price and the intrinsic value of a security (Friend and Herman, 1964). In particular, when the firm is believed by the managers to be undervalued by the market, managers have incentives to disclose more information (Verrecchia, 1983). Moreover, an increase in financial disclosure can increase the liquidity of the company's shares and reduce the cost of capital by attracting increased demand from large investors (Diamond and Verrecchia, 1991). For these reasons, the managers who have more of a stake in the company will disclose more in order to maximise the value of the firm and to realise their own benefits. Following this, the presence of a share option scheme should give management more incentive to disclose more and better information.

Consequently, it is expected that the relationship between IT use and ERC are affected by the adoption of *management compensation plans*. However, due to the lack of theoretical clarity, the direction of this specification will have to be estimated from the data.

Summary

In the light of the research into the impact of IT on accounting, and drawing upon an exposure to the nature of IT, financial information and CFR, this chapter proposes a contingency framework for investigating the relationships between IT and CFR, analogous to contingency theory of organisation (CTO). Instead of taking either an deterministic view or an emergent pessimist view, the framework assumes that the degree and pattern of this impact is conditional upon certain contingent factors, and this impact on different aspects of CFR varies. The perspective invites an investigation into not only the impact of IT on CFR, but also the influence of contingent factors on this impact. It does not seek to explore a universal effect of IT use, but to determine the pattern and degree of IT use in different situations.

The proposed perspective is hoped to be flexible and adaptive. It allows researchers in a single study to evaluate the impact of IT on CFR from different angles, and to take into account different issues, social, political, economic as well as technological. Being so, it provides some interfaces between the study of IT impact on CFR and studies of CFR under traditional theories such as information economics, agency theory and positive accounting theory. Moreover, it requires a three-dimensional research design which may overcome some problems associated with a two-dimensional design. A full evaluation will be undertaken in the concluding chapter after the empirical work is presented. However it should be warned here that some of the problems of CTO may have been inherited in the proposed framework.

Based on this proposed perspective, six hypotheses have been developed with reference to information economics, agency theory, positive accounting theory, and other studies related to CFR. The formulated framework and these hypotheses provide the basis for determining the kind of data to be collected, and choosing a research design and data collection method in the next chapter.

Chapter 4: Research Design and Implementation

The last chapter presented the contingency perspective as the theoretical basis for this study and the set of hypotheses developed on that basis. The hypotheses allow empirical testing of the suggested theory and the evaluation of the impact of IT on CFR. However, hypothesis testing requires the choice of research design and data collection method. Dictated by the purpose of the research and taking into account the characteristics of various research strategies, the survey design and the questionnaire method were chosen for this study. To overcome the inherent weaknesses of the questionnaire survey, the face-to-face interview approach was chosen as a supplementary data collection method.

Section 1 deals with the rationale for the chosen design and data collection methods, which is followed by an account of the survey design in Section 2. The next section gives a description of the survey implementation process and an analysis of the survey responses, and Section 4 presents the construction and implementation of face-to-face interviews.

Section 1: Methodological Considerations

Although they are interrelated (Marshall and Rossman, 1989), separate decisions must be made in choosing a research design and a data collection method. For some, a research design means a data collection method, but research design is, in fact, a broader issue. A research design is a "blueprint" of research, dealing with at least four problems: what questions to study, what data are relevant, what data to collect, and how to analyse the results (Philliber *et al.*, 1980), whereas a data collection method is mainly concerned with how to collect data. This difference was borne in mind when making the methodological decisions for this study.

Choice of research design

As the programme that guides the investigator in the process of collecting, analysing, and interpreting observations, a research design involves two major issues: enabling causal inferences and defining the domain of generalisation (Frankfort-Nachmias and Nachmias, 1992). All prevailing research designs revolve around these two issues. Some are strong in relation to the first (such as experimental design), others are strong with respect to the second (for instance survey design). Thus, a choice has to be made for a specific study.

It is often held that the choice is dictated by the nature of a study. In practice, however, this essentially means a matching exercise, that is, to match the requirements or conditions of a specific study with the characteristics of a particular design. The approach suggested by Yin (1989) exemplifies this point. He contrasted five designs or strategies (experiment, survey, archival analysis, history and case study) and specified three conditions for selecting one for use: (1) the type of research question (how, why, who, what, where, how many and how much), (2) the extent of control an investigator has over behavioural events, and (3) the degree of focus on contemporary as opposed to historical events. The first condition reflects the nature of a study. Experiments, history studies and case studies are suitable for research with "why" and "how" questions, whereas survey and archival analysis are more appropriate for studies with "who", "what", "where", "how many" and "how much" questions. The second condition is related to the ability of a design to enable causal inferences. Where the investigator can control and manipulate behavioural events, experimental designs can be used. Otherwise other strategies should be adopted. As to the third condition, only historical studies, and sometimes archival analysis, can be used for the investigation of historical events, while other designs, together with archival analysis, are suitable for contemporary events.

Although this decision-making approach is operational, it fails to include one important dimension of research design, that is, the domain of generalisation. There are two types of generalisation, statistical (or descriptive), and theoretical (or analytical). The former is concerned with generalising findings from a sample to a population, whereas the latter involves generating a principle or a broader concept based on a variety of situations or indicators (Rosenberg, 1968). All designs enable some sort of theoretical generalisation, but the sample-based survey design is particularly strong when it comes to the statistical generalisation, although experimental design also allows this generalisation. Yin's approach (1989) was taken to select the research design for this study along with the additional consideration of the domain of generalisation.

This study aims to investigate the relationships between IT use and CFR changes under various conditions in UK public companies. The primary concern is the strength of the relationships, which is a question of "how much", given that the specific relationships to be examined are already defined and the contingent factors specified. According to Yin (1989), this type of inquiry could be addressed by survey research or archival analysis. However, the study requires information regarding the sophistication of IT use in accounting, the types and extent of CFR changes, and the contingent factors which specify the conditions under which the relationships might be more or less profound. Since this information is not readily available, archival analysis should be excluded.

The relationships between IT use and CFR changes may be reciprocal. Either variable can be the cause or the effect. This type of two-way relationship poses no problem for the choice of a research design. What is important is that neither is subject to the investigator's control or manipulation. Because of this, the use of experimental design is inappropriate[1].

The case study approach might be suitable, but the consideration of descriptive generalisation prevents it from being chosen. This study intends to cover UK public companies, and it is obviously impossible to investigate all companies one by one, and hence some statistical generalisation is inevitable so that the relationship between IT and CFR can be established. However, if only one or a few companies were examined, the representativeness of the case(s) would be a problem and any statistical generalisation would be impossible. Consequently, survey research remains the only viable design.

A major ingredient of a survey design is a sample which represents the population under investigation. Findings obtained from the sample can then be generalised to the population. This is a major advantage over other types of design since the use of sampling techniques strengthens the external validity of a study (Frankfort-Nachmias and Nachmias, 1992). A further merit lies in the fact that survey studies are carried out in real life settings and the findings obtained often have direct applications.

Survey designs are also referred to as correlational designs. Since the investigator cannot manipulate the independent variable or control intervention by other factors, it is difficult to draw causal inferences. Frequently, it is only possible to establish correlations. This inherent weakness may, to some extent, be overcome by using statistical control or elaboration via multivariate statistical procedures such as multiple regression, partial correlation analysis, stratified Spearman correlation analysis (contingent analysis), and contingency table analysis. Even so, it is still

[1] Given the complicated nature of IT use and CFR, experimental designs are also not desirable since the results from such research are hardly applicable in real life situations.

difficult to establish any temporal effect for the variables involved, for which the researcher must rely upon theoretical knowledge and logical reasoning (Minium and Clarke, 1982).

Choice of data collection method

Using a survey design, there are three main methods for gathering data, namely, personal interview, telephone interview and mail questionnaire. Each has merits and shortcomings. Again, a decision has to be made on the selection of a method for the current study.

The characteristics of the three methods are well documented. Frankfort-Nachmias and Nachmias (1992) contrasted the three methods in seven aspects as shown in Table 4-1. They found that the personal interview approach is advantageous in terms of response rate, interview situation control, applicability to heterogeneous populations and the collection of detailed information, but it suffers from high cost and low speed. In contrast, the mail questionnaire method has the merit of low cost and high applicability to geographically dispersed populations, but it is more likely to suffer from low response rate, low speed, low applicability to heterogeneous populations and the collection of less detailed information. The telephone interview method is most desirable in terms of response rate, speed and applicability to heterogeneous populations. However, it is moderate in all other aspects.

While these comparisons are informative, it should be pointed out that some results need further consideration. For example, whether a personal interview allows more detailed information to be collected is dependent upon the form of interview. A structured interview is unlikely to yield more detailed information than a mail questionnaire survey. The higher response rates with personal interviews and telephone interviews are also questionable, because the respondents are more difficult to locate for personal and telephone interviews than for mail questionnaire surveys. It is unlikely that a subject is more willing to be interviewed than to complete a questionnaire. Taking this factor into consideration, it is clear that the response rates corresponding to the two forms of interviews depend on how the rate is arrived at[2]. Consequently, it is difficult to anticipate which survey technique will yield a higher response rate.

Table 4-1: A Comparison of Personal Interview, Mail Questionnaire and Telephone Interview

	P-I	M-Q	T-I
Frankfort-Nachmias and Nachmias' Scheme			
(1) response rate	H	L	H
(2) success in controlling interview situation	H	L	M
(3) applicability to heterogeneous populations	H	L	H
(4) applicability to geographically dispersed populations	M	H	M
(5) likelihood of collecting detailed information	H	M	M
(6) success with cost control	L	H	M
(7) speed	L	L	H
Dillman's Scheme			
(1) likelihood that selected respondents will be located	M	H	H
(2) likelihood that unknown bias from refusal will be avoided	H	L	H
(3) allowable length of questionnaire	H	M	L
(4) allowable complexity of questions	H	M	L
(5) success with open-ended questions	H	L	H
(6) success with tedious questions	H	L	M
(7) success with controlling sequence	H	L	H
(8) success in avoiding item non-response	H	M	H
(9) likelihood that social desirability bias can be avoided	L	H	M
(10) likelihood of avoiding interview distortion & subversion	L	H	M
(11) likelihood that contamination by others can be avoided	M	M	H
(12) likelihood that consultation will be obtained	M	M	L
(13) likelihood that personnel requirements can be met	L	H	H

Note: P-I: personal interview, M-Q: mail questionnaire, T-I: telephone interview, H: high, M: medium, and L: low

Dillman (1978) provided a more comprehensive comparison in terms of 24 aspects under four dimensions headed "Obtaining a Representative Sample", "Questionnaire Construction and Question Design", "Obtaining Accurate Answers" and

[2]There are two ways to calculate the response rate, one using the total number in the sample as the denominator while in the other method, the denominator consisting only eligible and reachable subjects in the sample.

"Administrative Requirements". This scheme can be seen as complementary to Frankfort-Nachmias and Nachmias' scheme (1992) described above. Some aspects are the same or similar in both schemes, and in those aspects, the comparison ratings are also the same. However, the two aspects related to applicability in Frankfort-Nachmias and Nachmias' scheme are not available in Dillman's analysis, while on the other hand, the aspects shown in Table 4-1, among others, are not mentioned by Frankfort-Nachmias and Nachmias. Note that the problems of the Frankfort-Nachmias and Nachmias' comparison also exist with Dillman's results. For example, the ratings for personal interviews on items (4) and (5) are only adequate when non-structured interviews are under consideration.

Although the above two cited schemes have some problems, they are sufficient for making an informed choice of method for this study. In view of the characteristics of the three methods, and the requirements and constraints of the current study, a two-stage data collection strategy was formulated, combining the mail questionnaire approach with a limited number of semi-structured face-to-face interviews. The mail questionnaire survey was used as the prime means of data collection. This decision was made in order to control costs and to collect information in a relatively short period. The personal interview method was not used as the prime means mainly because of cost. Moreover, although unstructured personal interviews seem to be advantageous over mail questionnaire surveys in that they enable detailed and perhaps more information to be obtained, the lack of comparability of the information so obtained prevents any reliable data aggregation and hence statistical testing of the hypotheses. The telephone interview method was also rejected partly because it does not allow a lengthy questionnaire or a questionnaire with somewhat complex questions to be completed, and partly because it does not allow the respondents to consult other sources of information than their memory.

It should be realised that the choice of the mail-questionnaire approach bears another risk, delegation, which is not discussed by either Nachmias and Nachmias or Dillman. There are two types of delegation. The first is acknowledged delegation; the completed questionnaire is not filled out by the targeted respondent but the position of the respondent is revealed in the questionnaire. The second is hidden delegation, where the questionnaire appears to be completed by the targeted respondent indicated by his name or position given in the questionnaire, it has actually been done by someone else, in the worst situations by someone totally inappropriate. Although there are techniques for determining whether there is non-response bias, no effective method is available for hidden delegation.

The semi-structured personal interviews were limited in number so that the cost could be reduced. The number of interviews was of course constrained by whether the participants of the mail questionnaire survey were willing to be interviewed. The main purpose of using this supplementary means of data gathering was to compensate for the weakness possessed by the mail questionnaire survey in collecting in-depth information. The rationale for pursuing semi-structured interviews and the construction of the interview schedule is described in Section 4.

Section 2: Survey Design

A survey design mainly consists of the design of a sample, the construction of a data collection instrument (a questionnaire in the case of a mail questionnaire survey), and the selection of survey respondents, the choice of statistical procedures for data analysis and hypothesis testing. The last aspect is dealt with in later chapters but other components are documented below.

The sample

The sample frame is the CD-ROM database FAME (Financial Analysis Made Easy) as in May 1993 (FAME User Manual, 1993). The information contained in the database is compiled from records filed at Companies House in Cardiff, London and Edinburgh Gazettes by Jordan & Sons Ltd, one of the largest providers of company information in the UK. FAME holds financial information on some 130,000 major UK companies including 5,320 public ones. Financial institutions are not included in the database because they do not file accounts in a form compatible with general accounting practice. In this study, only public companies were surveyed. It was anticipated that private companies would be less likely to participate because they are generally smaller and thus have limited resources or time. This proved to be justified by the fact (outlined in the next section) that the resource and time constraints were one of the major reasons for returns which were not completed. Also, by implication, private companies are privately owned and thus are less concerned about public reporting. Further, by law, small and medium sized companies gain exemptions in disclosing information (HMSO, 1985). Since a major concern of the current study is related to information asymmetry between internal users and external users that may have been caused by IT use, public companies were thought to be more appropriate.

In deciding the sample size, emphasis was placed upon the number of usable questionnaires. Accordingly, three issues were taken into account: number of sub-samples (k) determined by contingent factors, the size of these sub-samples (n) and the survey response rate (r). The sample size (N) was determined using the following formula:

$$N = (n \times k) / r$$

Hoinville *et al.* (1989, p. 61) offered some practical advice on the determination of a sample size and sub-sample sizes:

> In practice, the main determinant of sample size is almost always the need to look separately at the results of different subgroups of the total sample (separate age groups, socio-economic groups, and so on). The total sample size is usually governed by the sample size required for the smallest subgroup: as a rough guide, the smallest subgroup will need to have between fifty and a hundred members.

Because of the nature of the contingency perspective, the sample has to be divided into sub-samples for data analysis. The sample frame already has two strata (listed companies and unlisted ones) according to the contingent factor listing status. A further division of each stratum into three sub-samples was considered. Following the advice of Hoinville *et al.* (1989), the size of each sub-sample was set at 50 (i.e. n = 50). Another consideration was the possible response rate. A pilot study yielded a response rate of 22%. Based on this, a conservative estimate of 20% was applied to the estimate of the sample size (i.e. r = 20%). Using these figures, the sample size for either listed or unlisted companies was determined as $750 = 3 \times 50 / 0.2$, giving 1,500 as the overall sample size. Having determined the sample size, a random sampling procedure was performed to select companies from the CD-ROM FAME.

Note that the standard error of a sample estimate of proportion p obtained from a sub-sample with a size n is given approximately (ignoring the finite population correction) by $\sqrt{\{p(1\text{-}p)/n\}}$ (Cochran, 1977). Thus for n = 50, a maximum standard error of 7% is expected. Of course for large sub-samples, and in particular for estimates based on aggregated sub-samples, the standard error will be smaller.

The questionnaire

The design of the questionnaire (Appendix 4-1) was generally guided by the proposed contingency framework and the hypotheses. As described in the last chapter, the framework involves three aspects (IT use, CFR and contingent factors), the relationships among which are embodied by the formulated hypotheses. The questionnaire consisted of four sections. Three sections were devoted to IT use in accounting, CFR change, and financial environment respectively, corresponding to the three components of the proposed framework. A further section aimed to collect data concerning the role of IT in accounting change and choice, with a view to evaluating some common expectations in the accounting literature as described in Chapter 2.

IT use in accounting. This was dealt with in the first section of the questionnaire. Nine questions were designed, drawn upon previous studies on IT use in accounting (for example, Collier, 1984; Clark and Cooper, 1985; Carr, 1985 & 1987; King *et al.*, 1991), IT forecasts (for instance, Straub and Wetherbe, 1989; Price Waterhouse, 1991) and IT implementation (such as Bailey and Pearson, 1983; Ives and Olson, 1984). In designing these questions, Lazarsfeld's (1958) dimensionalisation approach was pursued. The approach assumes that a concept consists of underlying dimensions which reflect its different aspects. Instead of directly measuring the concept, it encourages the researcher to look first for underlying dimensions of the concept, and then for indicators to measure each dimension. The main advantage is that the nature of the concept to be measured is systematically reflected on. Arbitrary selection of indicators can thus be avoided.

Table 4-2: Variables in the IT Use Index

Dimension	Variable	Abbr.
Extent of IT use	extent of computerisation (Q1)	BEXT
	years of IT use (Q2)	BYRS
	types of IT-based systems in use (Q3)	BTYP
	workstation to staff ratio (Q5)	BRAT
	types of IT applied (Q9)	BTEC
How IT is used	innovative features of IT use (Q4)	BFEAT
	level of IT integration (Q8)	BSTAT
Quality of IT use	user satisfaction (Q6)	BSAT
	objective achievement (Q7)	BOBJ

Note: This table corresponds to Section 1 of the questionnaire.

Five of the nine questions were concerned with the extent of IT use in accounting, namely the *extent of computerisation* (Q1), *years of IT use* (Q2), *types of IT based systems in use* (Q3), *types of IT applied* (Q9) and the *ratio of workstation to staff* (Q5). Two of them, the *level of IT integration* (Q4) and the *innovative features of IT use* (Q4) were designed to collect data about how IT is used. Two other questions, *user satisfaction* (Q6) and *objective achievement* (Q7), were developed to capture the quality of IT use. These nine questions were subsequently used to form an IT use index for hypothesis testing in Chapter 7, apart from being used as individual variables. The variables are summarised in Table 4-2, in which the last column lists the abbreviations. Although it can also be seen as a measure of IT use in accounting, the last question included in this section, *extent of on-line access to accounting information by users* (Q10), was actually designed to supplement two items in questions 21 and 22 concerning information accessibility and availability.

Corporate financial reporting change. The two questions in Section 3 of the questionnaire were designed to obtain this information. These questions reflected three points described in the last chapter: (1) since this study examines the output of the financial reporting system, the two questions were used to cover information provided to users; (2) this study concerns the correlation between IT use and CFR, thus the two questions were designed to collect information concerning change in information provided to users; and (3) the two questions dealt with internal reporting and external reporting separately since such a distinction is made in the hypotheses.

Fifteen items of CFR output were selected, following a review of the literature on financial reporting (such as FASB, 1978-1985; ICAS 1988; ASB, 1991) and the studies of information systems evaluation (for instance, Zmud, 1978; Ahituvi, 1980). Lazarsfeld's (1958) dimensionalisation approach was used again in selecting these indicators. Five indicators were related to relevance, namely *forecast information*, *external information, comparative information, non-financial information, business strategy specific information, segmental information* and *user-tailored information.* Relevance refers to the ability of a piece of information to affect a decision, and it is regarded as having predicting value, confirmative value or evaluative value (ASB, 1991). To achieve relevance, there is a need to report more of the above mentioned information (ICAS, 1988). The time dimension of information provision was measured by two items: *timeliness* and *frequency.* Since computerisation may have changed many traditional features of data processing such as the use of on-line data entry and the loss of audit clues (Chambers and Court, 1987), the reliability or accuracy of information was thought to be a matter of auditability. Hence *auditability* was used as an operational definition of reliability. Two items were chosen to represent the possibility of users to access information: *accessible to formal reports* and information *availability via self-retrieval or request.* The inclusion of this second item was based on the consideration that users might access information in a less formal manner as opposed to the traditional annual and half-year reporting. Two items, *understandability* and *presentation appealing,* were selected to reflect whether information reported is communicable and comprehensible. Finally, *cost* was used to collect data concerning change of information cost.

In order that a reliable comparison could be made between internal reporting change [IRC] and external reporting change [ERC], both IRC and ERC were measured by the same indicators. As can be seen from Section 3 of the questionnaire, all items were measured on a five-point scale: much less, less, no change, more and much more. The respondents were required to specify any change along the scale, and to state the importance of IT in any change.

The 15 selected items, summarised in Table 4-3, form two indices for the purpose of hypothesis testing: IRC index and ERC index. The last two columns of Table 4-3 contain the abbreviations for all the items.

Table 4-3. Variables in the Internal Reporting Change Index and External Reporting Change Index

Dimension	Variable	IRC	ERC
Relevance	forecast information	XFOR11	XFOR21
	external information	XEXT11	XEXT21
	comparative information	XCOM11	XCOM21
	non-financial information	XNON11	XNON21
	strategic information	XSTR11	XSTR21
	segmental information	XSEG11	XSEG21
	user tailored information	XTAI11	XTAI21
Time	frequency	XFRE11	XFRE21
	timeliness	XTIM11	XTIM21
Reliability	auditability	XAUD11	XAUD21
Access	accessibility	XACS11	XACS21
	availability	XAVA11	XAVA21
Comprehension	understandability	XUND11	XUND21
	presentation	XPRE11	XPRE21
Information cost	cost	XCOS11	XCOS21

Note: This table corresponds to Section 3 of the questionnaire.

It is clear that the choice of the items is information characteristics oriented. Information characteristics are well documented (ASSC, 1975; FASB, 1978-1985; ASB, 1991) and are widely used in research. For example, Gorry and Scott Morton (1971) hypothesised that information attributes could be treated as dependent variables in studying information systems. As another example, Stamp (1982) investigated the relative importance of 20 qualitative characteristics of financial information. Moreover, the approach allowed the survey respondents to state the degree of a change in each item selected. As a matter of fact, an alternative approach (information item oriented approach) to designing the two indices was also considered but it was thought to be inadequate for the purpose of this study. Following that approach the participants would be required to evaluate if there has been any change to a list of specific information items (such as cash flows). There were several reasons for not pursuing such an approach. The major one was that a reporting system possesses more than just the information contents dimension. Besides, the information list required would certainly be too long to include in the questionnaire. Finally, it would be impracticable to assess the degree of change in a specific piece of information reported.

Another issue which needed to be addressed during the development of the above two indices was the appropriate time span for comparison. Ideally, it should be from the time when a company started using computers in accounting, but this would be impracticable. Some companies started computerisation some thirty years ago and it would be impossible for the survey respondents to recall what happened then. In addition, a survey subject might have joined the company only recently and thus would not be able to know what happened in the distant past. Consequently, it was decided that changes since the early 1980s were to be investigated, on the grounds that personal computers, database technology and local area networks have become increasingly popular in business since then.

The role of IT use in accounting choice. As shown in Chapter 2, there have been two common expectations regarding the effect of IT on the use of accounting method: (1) the use of more than one method simultaneously to account for a type of transaction such as depreciation, and (2) greater use of mathematical and statistical methods in accounting. Section 2 of the questionnaire was designed to collect relevant information to evaluate these expectations. A careful analysis of the choice of accounting methods spelled out a number of aspects where IT might have a role to play, including the prediction of possible results from an accounting change (Q11), the cost and simplicity of changing a method (Q12 & Q13), the significance of data volume and mathematical complications entailed by a method in accounting choice

(Q14 & Q15), the use of multiple methods (Q16 & Q17), and information requirement analysis (Q18).

Contingent factors. The formulated hypotheses involve four contingent factors: *company size*, *listing status*, *financial reporting strategy* and *management compensation plan*. Information about *company size* and *listing status* was obtained from the sampling frame FAME. *Company size* was measured in terms of a company's average turnover, i.e. the average annual turnover over the last five years. Five-year average total assets could also be used, and the data obtained from FAME. However, it is argued that turnover may be a better measure than assets (Chan *et al.*, 1993). Assets values vary along with accounting policy in relation to fixed assets revaluation and depreciation, treatment of intangible assests, and "off balace sheet" financing. In contrast, the turnover measure does not have this problem, although it also suffers from the problem that companies in different industries may have different definitions. Moreover, the two measures are highly correlated in the current sample; the Pearson correlation coeeficient is 0.94 significant at 0.001. Further, since the variable *company size* has to be converted into an ordinal variable (large, medium and small) so that stratified data analysis can be undertaken to test the hypotheses, the difference between the two measures is more a matter of the criteria of categorisation, given the two measures are highly correlated[3]. Based on these reasons, the turnover measure has been used in this study.

Data about *financial reporting strategy* (Q 27), *management compensation plans* (Q28), and the details of listing markets were collected via the questionnaire. In addition to these contingent factors, questions were designed to collect information regarding the *organisational structure* of the respondent's company (Q23), the

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[3] In fact, when using the same criterion to categorise these two measures (to be described in Chapter 5), the statistical results for the hypothesis testing are very close.

respondent's position (Q32), the IT environment in terms of the *closeness between business and IT* (Q30), *certainty of business environment* (Q31), *market competitiveness* (Q31), *information demand from internal users* (Q32), and *information demand from external users* (Q32). This information can be used in the analysis CFR changes. Finally, there was a question asking if the respondents are prepared to be interviewed (Q34).

Among the variables mentioned in the preceding paragraph, *certainty of business environment* and *market competitiveness* deserve a few more words. These two variables measure the environment of a company. Environment is a major contingency in the contingency theory of organisation. A distinction is made between task environment and general environment. The former refers to the more specific forces which are relevant to the decision-making and transformation processes of the individual organisations, whereas the latter refers to forces at the societal level which affect all organisations. Researchers mainly focus on the task environment. Many measures have been developed for the task environment, but as shown in Chapter 3, contingency theory based studies have been criticised for their lack of consistent definitions and operationalisations of key variables including the environment. For example, some measure the task environment by *degree of homogeneity-heterogeneity*, others by *degree of stability-variability* or by *degree of threat-security*, still others use *degree of munificence-scarcity* to measure the availability of resources in the organisation's environment (Scott, 1987). While some researchers use several of these variables together, they tend to ignore the fact that these variables may highly be correlated. This study has chosen the above two varaibles to describe a company's environment, assuming that the more uncertain the business environment and the more competitive the market, the more information is required, and hence CFR is more likely to change.

Survey respondents

Corporate financial directors were chosen as the respondents on the grounds that they are the persons making major decisions in financial reporting. Moreover, many financial directors are responsible for their companies' IT implementation (King *et al.*, 1991). However, such a choice does not mean that the financial directors are the only suitable respondents. Chief accountants, group accountants or other accountants at this level are also qualified in this respect. In fact, chief (group) accountants were also considered, but were not thought to be the best choice. A chief accountant who was interviewed during a pilot study suggested that financial directors should be approached, because if a financial director cannot respond, he/she may probably hand over the questionnaire to his/her chief accountant or another appropriate person, and thus the probability of a reply increases. However, if chief accountants or people at or below that level are to be approached, it is almost impossible for them to ask their financial directors to complete the questionnaire. This advice was followed.

Section 3: Survey Implementation

Pilot studies

Two pilot studies were undertaken. The first was to evaluate the draft questionnaire. It was accomplished by discussing the draft with financial directors, chief accountants or management development accountants in three public companies. In addition, departmental colleagues were consulted. The collected opinions varied and were sometimes conflicting. From the pilot study, it was estimated that it would take about 15 minutes to complete the questionnaire. Most discussants considered that the length was adequate though two discussants from a company suggested that the questionnaire was still a little too lengthy. Also, most questions were understandable to the discussants.

One discussant proposed asking for specific examples to support the respondent's answers. While this is desirable, the length of the questionnaire would increase and this would endanger the response rate. This issue was anticipated in the choice of data collection method, and face-to-face interviews was thus proposed as a remedy. When this remedy was explained to the interviewee who raised this concern, he was satisfied. In response to the concern about the length issue, the original 19 items related to internal reporting change and external reporting change were reduced to 15. Moreover, originally, a question was designed for each of the 19 items, whereas the retained 15 items were subsequently framed in two tables (Q21 and Q22 in the finalised questionnaire, see Appendix 4-1).

The few questions which were considered to be difficult to understand or answer were either deleted or reworded. For example, two multiple-item tables in relation to the role of IT in accounting choice and change were deleted. In response to a suggestion, several questions were added concerning the respondent and his or her organisation (Q23, Q24, Q25, and Q32). Moreover, more flexible options were designed for some questions, for example, "not applicable" is added where appropriate. The net result of these revisions was that the length of the questionnaire was reduced from a little over eight pages to six.

After this study, a hundred companies were randomly sampled from FAME. Questionnaires were sent to their financial directors aiming to estimate the response rate and to test further the questionnaire. A response rate of 22% was achieved. There were two other blank returns. One was because it was the company's policy not to participate in any survey unless there was an obvious benefit to the company and its shareholders, another because the company had ceased trading. Overall, it was confirmed that most of the questions were comprehensible and that confidentiality would not pose a problem. However, a few questions had to be amended or reworded, and four questions which were either rarely answered or were regarded as less significant were deleted to reduce further the length of the questionnaire.

Formal survey

Having finished the pilot studies, the formal survey started in early June 1993. The questionnaire, accompanied by a covering letter (Appendix 4-2) and a postage-paid business reply envelope, was sent to the financial directors of the selected companies. Dillman's Total Design Method (TDM) (Dillman, 1978) was consulted, and some of the techniques suggested were used, including the *dos* and *don'ts* in the covering letter and an offer of the summary report of the survey. Two weeks afterwards, a follow-up letter (Appendix 4-2) was sent to respondents whose questionnaire had not been returned. Another wave of the questionnaire was dispatched after 10 weeks to the non-respondents with a second covering letter (Appendix 4-2).

The response

Table 4-4 summarises the survey response. Of the 1515 copies of the questionnaire dispatched, 23 were not delivered. The total replies amounted to 376, a response rate of 25%. The usable questionnaires returned were 311, yielding a rate of 20.8%. This rate is not untypically low. Research on survey response shows that the typical response rate of mail survey was 37% in 1966, 24% in 1987, and rather below 24% with current surveys (Richards, 1993).

Table 4-4: An Analysis of Survey Response

	Count	Percentage (%)
(1) issued	1515	
(2) not delivered	23	
(3) completed returns	311	20.8 = (3)/[(1)-(2)]
(4) non-completion returns	65	4.3 = (4)/[(1)-(2)]
(5) total returns	376	25.2 = (5)/[(1)-(2)]

Among the non-usable replies, 10 were only marginally completed and another 55 were returned with a blank questionnaire (Table 4-5). The non-usable replies accounted for 17.3% of the total replies. From Table 4-5, it can be seen that company policy was the main reason for non-completion response. Resource constraints and irrelevance were also important factors.

Table 4-5: An Analysis of Non-Usable Replies

	Count	Percentage(%)
(1) marginal completion	10	15.38
(2) company policy	20	30.77
(3) resource constraints	14	21.54
(4) not applicable or irrelevant	12	18.46
(5) no obvious benefits	1	1.54
(6) problematic questions	2	3.08
(7) confidentiality	1	1.54
(8) other reason	1	1.54
(9) no reason given	4	6.15
(10) total	65	100.00

It is desirable to know if there is any non-response bias. For this purpose, the Ferber test (Ferber, 1948/1949) is performed. The procedures and the results are presented in Appendix 4-3. The test shows that there is little non-response bias in the data. However, the Ferber test cannot detect the hazard hidden in the completed questionnaires as discussed in Section 1: the hidden delegation.

From Table Q33 in Appendix 5-1, the distribution of the response in terms of the respondents' positions in their companies can be seen. Of the 308 respondents who disclosed their positions, 53.5% were financial directors, 18.6% accountants, 8.6% IT managers, 10.6% other executives or non-IT managers and 6.2% company secretaries. Though the targeted survey respondents were financial directors, accountants were also well qualified to complete the questionnaire. Note that the percentage of financial directors and accountants accounted for 72.1% of the respondents. While other groups of respondents might be less involved in financial reporting, it is not reasonable to suggest that they were irrelevant. Company secretaries are in a position to respond to all external information requirements. One company secretary interviewed (a chartered accountant) claimed that he spent about 30% of his time in accounting and was also a member of the company's IT committee. As some of the questions were about IT use in accounting, IT managers were certainly aware of the answers. Moreover, by definition, they are involved in either direct data processing, end-user supporting or reporting system development, and thus they are more or less associated with financial reporting. Therefore, the adequacy of the survey respondents should not be a problem.

Section 4 Personal Interviews

This section describes the design and implementation of the interviews with 14 mail questionnaire survey respondents. The purpose of the interviews was to obtain contextual or in-depth information which could not be acquired via the postal questionnaire survey. It was expected that the collected data could contribute to discussion of findings from the mail questionnaire survey, add evidence or give alternative explanations to the hypotheses, or suggest further research directions. However, it was realised that the interviews were a supplement to the mail questionnaire survey. Moreover, while the mail questionnaire survey was quantitatively oriented, the information acquired from the interviews was primarily qualitative. Because of this, and the limited number of interviews undertaken, it was not expected that the collected data would be capable of statistical analysis.

Prior to the interviews, an interview schedule (Appendix 4-4) had been prepared, consisting of four parts with an introduction and an appendix of definitions of some terms used in the interviews. The contents of the interviews were confined to the topics in the mail questionnaire. Thus the structure of the interview schedule resembled that of the mail questionnaire, consisting of sections dealing with IT use in accounting, CFR changes, the role of IT in accounting change and choice, and the financial reporting environment respectively. The questions contained in the interviews schedule were largely an extension of the questions in the mail questionnaire. Since the interviews were undertaken after the data obtained from the mail questionnaire survey were analysed, the design of the interview questions was informed by the survey data analysis. In effect, the following aspects were emphasised: (1) the process of change of accounting policies and methods, and the role of IT in this process; (2) structural characteristics of external reporting and the role of IT in external reporting; (3) the influence of regulators on IT use in accounting; and (4) the objectives and effects of management incentive plans. The supervisors were consulted about the interview schedule. A pilot study was also undertaken with a finance director.

A semi-structured face-to-face interview was adopted. One can distinguish four types of personal interviews: structured, semi-structured, group interview, and unfocused or unstructured (May, 1993). The structured interview has the same drawback as the postal questionnaire since it has predetermined specific categories of answers, and thus the interviewee is not free to provide additional information. The unstructured interview approach does not seem appropriate either, as it usually takes too much time and this would be impractical from the interviewee's (financial directors) point of view in the case of this study. Another reason for not using the unstructured interview approach is that the interviews were planned as a supplement, and the issues of interest were already determined by the postal questionnaire. Although unstructured interviews may possibly provide more interesting information, such information is unfocused, and as such is not very useful. The group interview method might be desirable but it seemed very difficult to obtain a group of participants in one company. Given the purpose and the resource and time constraints, the semi-structured interview approach was pursued. Such an approach allows the researcher to have certain control over the time, contents, and sequence of the interview, but still gives the interviewee some freedom in responding to the questions.

The interviewees were all volunteers. They had indicated an interest in being interviewed when they filled out the mail questionnaire. Initially, there were 32 offers. Appendix 4-5 shows the characteristics of the volunteers and their companies, in terms of the respondent's position, geographical location, company structure, listing status, IT use variables, financial reporting strategy and management incentive scheme. This information shows that the companies which agreed to take part in the interviews were diverse.

Prior to the interviews, a letter had been sent to the secretaries of these companies, requesting their latest annual report. The annual reports allowed the researcher to be more prepared for the interviews. A summary report of the mail questionnaire survey was sent to the respondents who agreed to take part in an interview, with a covering letter which both thanked them and reminded them of their offer to be interviewed. The summary report was also posted to those who requested it but did not offer an interview. Towards the end of September 1994, all the volunteers were contacted on telephone. It turned out that seven had left their original companies, two were away on holiday, and one was transferred to an overseas branch. However, an appointment was fixed with fourteen volunteers.

Information about interviewees and their companies can be found in Appendix 4-5, the tables of which are comparable to those in Appendix 5-1. From such a comparison, it can be seen that the structure of the interviewees' positions very much resembles that of the respondents in the mail questionnaire survey. In addition, the companies taking part in the interviews are very similar to those previously surveyed in terms of company structure, listing status, size, management compensation plan, extent of computerisation, innovative feature of IT use, workstation to staff ratio, and user satisfaction, although less similar in terms of financial reporting strategy, years of IT use, types of IT-based systems in use, objective achievement, level of IT integration, and types of IT applied. Moreover, the 14 companies are geographically dispersed, and operate various businesses (textile manufacturing, IT services, construction, property management, hotels, leisure, health care, research, business furniture, educational and scientific furniture, extrusion, administrative services, motor trade). These similarities indicate that the interviewees and their companies were generally representative.

The interviews were carried out between 5 October 1994 and 4 November 1994. The last one was changed to a telephone interview, for two reasons: (1) the interviewee was not available at the initially agreed time, and (2) a special and expensive trip had to be made to that single company. The other 13 interviews were audio taped, and subsequently transcribed.

Summary

In this chapter, the rationale for the choice of the survey design, the mail questionnaire method, and the personal interview approach is provided, and the process of implementing the mail questionnaire and the interviews is described. From this description, it can be seen that every measure was taken to avoid arbitrary choice of research design and data collection method. Wherever possible, the available options were examined to ensure that the characteristics of the chosen option matched the conditions or requirements of the study. This chapter also presents the analysis of the survey responses. While the response rate tends to be low (although not untypical), the Ferber test shows that non-response poses little bias. An analysis of the characteristics of the interviewees and their companies indicates that they are representative. The fact of little non-response bias and of the representativeness of the interviewees and their companies implies that further data analysis can comfortably go ahead, although the risk of hidden delegation has to be accepted.

Chapter 5: Changes in Corporate Financial Reporting

The impact of IT on corporate financial reporting [CFR] is defined as IT-related CFR changes, and it is evaluated by correlating the sophistication of IT use and the extent of CFR change. If nothing has changed in CFR, then no impact could be expected, and thus no further investigation is necessary. Accordingly, this chapter examines systematically whether, and to what extent, internal reporting and external reporting have changed. The analysis is based on both the data collected from the sample survey and the interviews. Following a frequency analysis and a test of the difference between IRC and ERC in the first section, Section 2 provides an analysis of the factors that may affect IRC and ERC. IT as one of the factors will be dealt with separately in Section 3.

Section 1: Perceived Changes in CFR

This analysis addresses both the degree and the direction of CFR changes. A change can be a positive one, such as more information and more frequent reporting, or a negative one such as less information and less understandable information. Data on the occurrence, extent and direction of change in 15 aspects of both internal reporting and external reporting have been gathered from the sample survey. The frequencies for the 15 items of internal and external reporting are tabulated in Tables Q21a and Q22a of Appendix 5-1 respectively.

Internal reporting change

From Table Q21a in Appendix 5-1, it is obvious that few companies report negative changes in the aspects of internal reporting except in information *cost*. About half the companies report a change towards more or much more costly information, a little more than a quarter report no change and the remaining companies see a cost reduction. However, some responses indicate a change but do not specify the degree though the number of these responses is small. This information is displayed in the column headed "Change/No Direction".

The column headed "No Change" lists the frequencies of companies where there is no change to the internal reporting items. Four items, *external information*, *non-financial information*, *accessibility* and *segmental information*, are reported to have not changed by the highest percentage of companies (about 40%). Also, about 30% of companies have not experienced any change in *strategic information*, *auditability*, *availability* and *understandability*. The least frequently mentioned items in this column are *forecast information*, *timeliness*, *frequency* and *presentation*, implying that these are the items which have changed in the widest range of companies.

It can be seen from columns "Much More" and "More" that all items except *cost* have changed in the positive direction in over half of the companies. Four items have had a positive change in over 80% of companies, namely *forecast information*, *timeliness*, *frequency* and *presentation*. Among them, *forecast information* and *timeliness* are also reported by about 55% of companies to have changed greatly. The next most frequently mentioned items which have experienced much change include *frequency*, *presentation* and *user-tailored information*.

The above analysis is based on the survey data. As a test, however, data were also collected from the interviews about what aspects of internal reporting have undergone the greatest change in the last ten years or since the interviewees joined their companies. Interestingly, the interviews revealed a similar pattern of internal reporting change. More timely and more frequent reporting are major changes in many companies. Some companies have changed from annual reporting to monthly reporting, or from monthly reporting to weekly reporting, while others even provide certain daily management information such as cashflows.

Another major change is that the scope of internally reported information has been expanded. This is evidenced by the provision of more forecast information rather than just historical information. Cashflow forecasts are seen to be extremely important by many companies, especially during a period of economic recession. Hence, these companies provide annual, monthly or even weekly cashflow forecasts. A second aspect of expansion is the increased amount of non-financial information. The case of one large company illustrates this point. While the traditional financial reporting system has undergone only very limited change, major developments and changes have taken place in marketing information reporting. The expansion can also be seen from the fact that internally reported information has become more user-tailored, that is, it is well articulated in relation to specific departments, projects or contracts, and is provided directly to the people involved. While data presentation was not seen as having undergone major change by the companies that participated in the interviews, other aspects of internal reporting change were observed such as change from a decentralised to a centralised financial reporting system, better access by some managers to financial information, and improved accounting control (debts control, project control, credit control and customer accounts management).

External reporting change

The direction of the changes in external reporting (Table Q22a of Appendix 5-1) is similar to that in internal reporting exhibited in Table Q21a. That is, the percentages of companies which report negative changes are very small. Again *cost* is an exception. The number of companies where externally reported information is more or much more costly is four times more than those whose externally disclosed information is less or much less costly. The table also shows the responses (though very few) which indicate a change but do not specify the degree or direction.

The table shows that nine items are said to have had 'No Change' by over half of companies. *Availability*, *accessibility*, *strategic information* and *non-financial information* have not changed in 60% to 76% of companies. The other items are *external information*, *comparative information*, *segmental information*, *user-tailored information* and *understandability*. Note that the smallest percentage in this column is with *timeliness*, indicating that this item is more likely to change.

Columns headed "Much More" and "More" display frequencies concerning positive changes. Taking the two columns together, the most frequently mentioned items (by about half or more companies) are again *forecast information*, *timeliness*, *frequency* and *presentation* as in internal reporting. Noticeably, the first three of these items are reported to have changed greatly by between 20% and 27% of companies. In addition, just under 20% of companies consider that they now report much more *external information*.

A comparison between Table Q21a and Table Q22a shows that the change in any internal reporting aspect is generally greater than the change in the corresponding external reporting item. However, the two tables also exhibit a consistency in terms of the direction of change. Moreover, items most frequently said to have changed significantly are the same in both internal and external reporting. These items are *forecast information*, *timelines*, *frequency* and *presentation*. Similarly, *availability*, *accessibility*, *strategic information*, *external information*, *segmental information*, *understandability* and *non-financial information* are considered by the largest percentage of companies to have had no change in both internal reporting and external reporting.

To understand better external reporting change, it is necessary to examine the structural features of external reporting, because there are many different user groups and various means of reporting (formal or informal). For this purpose, a number of questions were addressed to the interviewees, including: (1) who are the most important external user groups of financial information? (2) what information apart from the formal reports (interim and annual reports) is provided to them? and (3) what changes have occurred in external reporting in the last 10 years or since you joined the company?

Table 5-1: Major Group of External Users of Financial Information

Comp-any	Major User Group			Company Characteristics		
	Banks	Clients	Share-holders	Loan	Main Business	Ownership
1	yes			no	health care	family
2	yes			yes	furnishing & car trade	family
3	yes	yes		yes	construction	directors
4			yes	yes	research	unlisted
5		yes	yes	no	mgt services & unit trusts	unlisted
6	yes		yes	yes	hotel & leisure	listed
7	yes		yes	yes	textile	listed
8		yes		no	business furniture	directors
9			yes		educational furniture	parent listed
10	yes			yes	leisure	family
11	yes	yes	yes	yes	mgt services & unit trusts	listed
12	yes			yes	property	listed
13			yes	no	extrusion, window & door	listed
14			yes	yes	IT services	listed

Note: In the last column, "family" or "directors" owned companies are all unlisted.

The answers to the first question are tabulated in Table 5-1. Eight out of 14 companies see banks or other creditors as the most important external user group. In most cases, this is so because the companies obtain loans or credit from their banks. It is part of the borrowing conditions that companies provide additional information other than their interim and annual reports. However, one company sees its bank as the most important user because the company is an expanding business and may need financial support from its bank even though it has not borrowed so far. Eight companies see shareholders as the most important external user group. Six of them are listed companies. Although the other two are unlisted, they have little or very low gearing. Four companies regard potential customers as the most important user group since their survival or growth depends on their ability to gain business contracts from new customers. These companies are either manufacturers or providers of management services.

The responses to the second question are rather unconventional. On the one hand, none of the companies disclose to shareholders additional information apart from formal reports (interim and annual reports). On the other, many companies report to the banks or other creditors much management information: quarterly or monthly management accounts, and even creditors and debtors lists, or the order book at anytime. Several companies adopt an "all open" policy toward banks' or other creditors' information requirements. As one finance director puts it, "As far as the banks are concerned, they have all the information they want. No information cannot be disclosed to them." Two companies do not see banks as the most important user group because their loans are very small, but the banks still have access to quarterly management accounts. As to those companies which regard the potential customers as the most important user group, they need to provide, in addition to interim and annual reports, detailed information (financial or non-financial) so that the customer can assess whether a contract can be awarded to these companies. This is just the same as companies providing detailed information to potential investors when issuing shares to the public.

The data concerning the third question (change in external reporting) show three patterns. In some companies, the major change is in external information requirements which have increased dramatically, in terms of extent, involvement, timeliness and frequency. In other companies, the major change is in the reporting system itself. For example, one company used to have financial accounts prepared by auditors, but it now does this by itself. Another company has introduced desk-top publishing technology and graphical packages for the preparation of financial reports. In still others, the major change is seen in the output of the reporting systems: information is now produced more quickly and presented better. Moreover, given the fact that many companies provide management information to banks or other creditors, and potential customers, some of the afore-mentioned internal reporting changes can be extended to some external reporting.

Testing the differences between IRC and ERC

The above frequency analysis suggests that the change in internal reporting is greater than that in external reporting. To confirm this, the Wilcoxon matched-pairs signed-ranks test is performed. A brief description of this procedure is provided in Appendix 5-2.

The method is used, firstly, to test if the aggregated internal reporting change (IRCAGG)[1] is greater than the aggregated external reporting change (ERCAGG), and secondly to see if individual internal reporting aspects have undergone greater change than corresponding external reporting aspects. All tests are one-tailed. Results from the first are displayed in Table 5-2 while those from the remaining tests are presented in Appendix 5-2. Both Table 5-2 and Appendix 5-2 show the mean rank for the negative and positive ranks, the number of cases on which these are based, the number of tied ranks, the test statistic *Z*, and its significance level.

It is clear from Table 5-2 that there is a significant difference between IRCAGG and ERCAGG, and that IRCAGG is greater than ERCAGG as the one-tailed P value is far

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[1]The procedure for aggregating IRC items and ERC items will be discussed in the next chapter.

below the acceptable significance level, say 0.01. It can be seen from Appendix 5-2 that in 14 of the 15 aspects, the *Z* statistics are significant (one-tailed P is far less than 0.01), and internal reporting change is greater than external reporting change. The only exception is that the change in the *cost* of internal reporting does not differ from that in the *cost* of external reporting.

Table 5-2: Wilcoxon Matched-Pairs Signed-Ranks Test Comparing IRC with ERC

Mean Rank	Cases	
116.43	188	- Ranks (ERCAGG Lower Than IRCAGG)
28.71	24	+ Ranks (ERCAGG Greater Than IRCAGG)
	24	Ties (ERCAGG Equal IRCAGG)

	236	Total

Z = -11.8538 1-Tailed P = .0000

Section 2: Factors Affecting CFR Changes

The factors considered include *certainty of business environment* (CERT), *market competitiveness* (COMPT), *information demand from external users* (EDEM), *information demand from internal users* (IDEM), *financial reporting strategy* (FRSTR), *company size* (SIZE), *management compensation plan* (PLAN) and *listing status* (LIST). The correlations between the first six ordinal factors and the items of internal reporting and external reporting have been obtained by performing a Spearman correlation analysis. The results are summarised in Table 5-3. Note that the last row of the table shows the correlations between these factors and IRCAGG as well as ERCAGG, both of which are the sums of the scores of their 15 individual items. The other two nominal variables will be dealt with later.

Table 5-3a: Spearman Correlation Coefficients between Internal Reporting Variables and Factors That May Affect IRC

Internal Reporting	CERT	COMPT	EDEM	IDEM	FRSTR	SIZE
forecast info	-.018	-.079	.243**	.307**	.007	.113
external info	.083	.038	.424**	.221**	.140*	.222**
comparative info	.101	-.032	.204**	.200**	.072	.107
non-financial info	.004	-.081	.177**	.059	.029	.044
strategic info	.097	-.094	.165**	.281**	.106*	.194**
segmental info	-.015	-.033	.259**	.137*	.151*	.236**
user-tailored info	.107	-.128*	.122	.210**	.035	.141*
frequency	.068	-.037	.077	.341**	-.070	-.042
timeliness	-.072	-.026	.118	.348**	.005	.052
auditability	-.024	-.082	.041	.226**	-.025	-.073
accessibility	.106	-.078	.117	.217**	.121	.093
availability	-.040	-.079	.090	.179**	.108	.069
understandability	-.015	-.071	.093	.137*	.038	-.057
presentation	.112	-.027	.215**	.141*	.025	.126*
cost	.067	-.132*	.154*	.129*	.074	.078
IRCAGG	.046	-.115	.315**	.380**	.131*	.142*

Table 5-3b: Spearman Correlation Coefficients between External Reporting Variables and Factors That May Affect ERC

External Reporting	CERT	COMPT	EDEM	IDEM	FRSTR	SIZE
forecast info	-.028	-.112	.387**	.159*	-.043	-.048
external info	.076	-.015	.421**	.185**	.072	.166*
comparative info	.148*	-.059	.324**	.175**	.108	.155*
non-financial info	.124	-.016	.330**	.195**	.133	.198**
strategic info	.066	-.169*	.334**	.279**	.150*	.242**
segmental info	.025	-.080	.348**	.229**	.267**	.297**
user-tailored info	-.038	-.020	.288**	.085	.182**	.151*
frequency	.040	-.078	.473**	.182**	.002	.044
timeliness	-.011	-.032	.465**	.237**	.056	.131
auditability	.022	-.106	.278**	.240**	.064	.035
accessibility	.128	-.069	.341**	.148*	.113	.179*
availability	.066	-.074	.167*	.137*	.057	.019
understandability	.015	-.131	.325**	.150*	.099	.182**
presentation	.024	-.104	.376**	.195**	.080	.209**
cost	.006	-.160*	.272**	.103	.071	.156*
ERCAGG	.052	-.092	.531**	.278**	.142*	.203**

Note: * denotes significant at 0.05 and ** significant at 0.01 (two-sided tests).

Certainty of business environment and *market competitiveness* measure a firm's environment. Companies facing a more uncertain business environment and a more competitive market need more and better information to manage the business, and need to disclose more and better information to external users in order to attract capital and human resources and maintain good relations with existing stakeholders. Thus, the two variables may be expected to have a positive association with IRC and ERC. However, Tables 5-3 shows that they are not associated with IRCAGG, nor with ERCAGG. Although they have associations with one or two individual items of internal reporting or external reporting, these associations tend to be very weak. The reason for this may be that although greater uncertainty and more competitiveness require more information, the information that really matters may be non-accounting information rather than accounting information which is largely historical, financial and internal. In addition, the data obtained may be problematic due to the use of simple questions in the questionnaire. Both certainty and competitiveness are complex dimensions of the environment, and the data obtained may not have captured that complexity.

To the extent that financial reporting is demand-pushed, it can be expected that users' demand is positively associated with CFR changes. However, financial reporting may also be supply-constrained because of commercial secrets, information costs and self-interest, and thus it may not be associated with CFR changes. Tables 5-3 shows that the associations between *information demand from internal users* and IRCAGG and between *information demand from external users* and ERCAGG are positive and relatively strong. Moreover, *information demand from internal users* is positively associated with almost all internal reporting items, and *information demand from external users* with all external reporting items. From an agency theory perspective, whether there is an association depends upon the net effect of the demand and supply on the agency benefits and costs. The results seem to suggest that the net effect of demand and supply is positive. Since it is unlikely that greater change in internal reporting or external reporting results in greater information demand, *information demand from internal users* can be seen to be an influential factor for IRC, and *information demand from external user* for ERC. It is interesting that *information demand from internal users* is positively related to ERCAGG and similarly, *information demand from external use* is positively associated with IRCAGG, suggesting that there is an association between internal reporting change and external reporting change.

Companies with a more information-oriented external reporting strategy are more likely to improve external reporting which in turn has an effect on internal reporting. Tables 5-3 shows that there is indeed a positive though quite weak association between *financial reporting strategy* and both IRCAGG and ERCAGG. Since large companies, compared with small ones, are under more pressure to make changes in financial reporting and in a better position to cope with information demand from both internal and external users, *company size* may positively correlate with IRCAGG and ERCAGG. This positive association obtains in the table, although very small. Note that both factors are weakly correlated with only a few items of IRC or ERC, indicating that they have limited effects. This also explains why the correlations between the two factors and IRCAGG or ERCAGG are rather small.

Since *listing status* (LIST) and *management compensation plan* (PLAN) are nominal variables, their association with IRC or ERC, as well as with their component items, is better examined through the contingency table analysis using Cramer's V statistic[2]. The results are summarised in Table 5-4. Being more externally financed, listed companies have to compete with each other for lower financing cost and higher security liquidity. Thus the extent of their external reporting may be more extensive than unlisted companies, and these companies are more likely to improve external

[2]Since IRCAGG and ERCAGG are ordinal variables, their values ranging from 0 to 30, they are recoded into nominal variables IRCNOM and ERCNOM respectively, in order that a contingency table analysis can be performed. The recoding system is as follows (old value to new value): 0 = 0, 1 to 10 = 1, 11 to 20 = 2, and 21 to 30 = 3.

reporting for these purposes. Also, listed companies have to comply with additional reporting requirements, and their financial reporting practice should change along with the change in these requirements. Given these reasons, it may be expected that there is a positive association between *listing status* and ERC. As the information disclosed to external users is of course available for managers, a positive association can also be expected between *listing status* and IRC. However, Table 5-4 shows no evidence to support these predictions; *listing status* is only very weakly associated with one indicator of internal reporting, namely *forecast information*. One reason for this absence of association may be that the reporting requirements issued by the financial market have not changed over time, and hence there is no corresponding IRC and ERC. Indeed, little change has been made since 1985 to the additional financial reporting requirements imposed by the London Stock Exchange relating to the directors' report, interim report, and preliminary announcement of the profit or loss for the financial year before annual reports are published (London Stock Exchange, 1985 & 1993).

Management compensation plan is related to managers' horizons. Short-term schemes such as a bonus may give rise to a short-time horizon whereas long-term schemes such as share options encourage long-time horizons. The information needs of these two types of horizon should be different. The latter requires more and better information than the former in order to cope with the greater uncertainty and complexity involved in decision making. Thus, companies with a long term incentive scheme are likely to experience more changes in internal reporting. As to external reporting, there are two different theories as discussed in the development of Hypothesis 6 in Chapter 3. Agency theory predicts that share ownership oriented plans tend to reduce monitoring and hence external reporting, whereas the alternative theory anticipates that such plans will increase external reporting. Table 5-4 shows that *management compensation plan* has a positive though weak association with both IRCNOM and ERCNOM.

Specifically, it is positively correlated with *forecast information*, *external information*, *strategic information* and *segmental information* in internal reporting, and with *segmental information* in external reporting. An analysis of the contingency tables indicates that companies with a long-term management compensation plan combined with a short-term one tend to experience more changes in the above mentioned aspects of IRC and ERC. Note that the agency theory argument concerning the relationship between *management compensation plan* and ERC is not supported whereas the alternative theory seems to obtain limited support.

Table 5-4: Cramer's *V* Measure of the Association between Nominal Factors and Internal/External Reporting Items

Internal Reporting	Cramer's *V*		External Reporting	Cramer's *V*	
	PLAN	LIST		PLAN	LIST
forecast info	.204**	.133*	forecast info	.160	.097
external info	.228**	.148	external info	.107	.088
comparative info	.100	.113	comparative info	.170	.064
non-financial info	.148	.078	non-financial info	.154	.116
strategic info	.161*	.139	strategic info	.132	.136
segmental info	.234**	.095	segmental info	.269**	.108
user-tailored info	.129	.068	user-tailored info	.127	.114
frequency	.098	.060	frequency	.100	.045
timeliness	.124	.118	timeliness	.111	.038
auditability	.086	.127	auditability	.151	.136
accessibility	.140	.117	accessibility	.141	.133
availability	.153	.116	availability	.141	.122
understandability	.106	.119	understandability	.113	.071
presentation	.107	.085	presentation	.155	.141
cost	.161	.107	cost	.138	.137
IRCNOM	.163*	.133	**ERCNOM**	.180*	.077

The above tested factors were pre-determined in designing the questionnaire and the data were collected from the sample survey. In order to obtain views which are more liberal, the interviewees were further asked about the major factors that led to the internal/external reporting changes which they had described. This resulted in four categories of factors for internal reporting change, namely (1) the introduction of a new finance director, (2) the use of IT, (3) management information requirements, and (4) external requirements. The last factor indicates that internal reporting is also influenced by external forces. This is consistent with a point made in the above Spearman correlation analysis: internal reporting change and external reporting change are associated with each other. An interesting example illustrates this relationship. A small company introduced its monthly management accounts because its banks requested this information as a borrowing condition. The company's managers found monthly information very useful to themselves and hence took a positive attitude toward the bank's requirement.

For the external reporting change, two factors were readily identifiable. The first is the increased demands from external users and the second the use of IT. While the first factor provides incentives for external reporting change, the second has played an enabling role. Compared with the factors considered in the sample survey, only one is new, that is, the introduction of a new finance director. The other factor, the use of IT, will be examined in the next section.

Section 3: The Importance of IT in CFR Changes

IT use may be added to the list of factors that affect internal reporting and external reporting as discussed in the last section. IT is the main concern of this study. Its role in IRC and ERC is investigated in two different ways. One is by correlating IT use with internal/external reporting variables, the other by analysing the respondents' opinions of IT importance in IRC and ERC. The former is left to Chapter 7 while the latter is dealt with in the current section. Before examining the impact of IT on CFR, however, it is necessary to establish that IT is used in accounting *in the sample*, for if no IT use is made in accounting there is no impact of IT on CFR and thus no further investigation is necessary. It is also necessary to establish that the sophistication of IT application in accounting differs across companies. If no difference exists, the correlation analysis undertaken in the next chapter would be unnecessary. This section, therefore, first analyses the application of IT in accounting and then the perceived importance of IT in CFR changes.

Sophistication of IT use in accounting

In the mail questionnaire survey, nine variables were developed to measure the sophistication of IT use in accounting as described in Chapter 3. The nine variables are analysed one by one below. The frequencies for them are presented in Tables Q1 to Q9 of Appendix 5-1. These tables also show frequencies of each group of companies by size. A Kruskal-Wallis analysis is undertaken to test if the differences among the groups are significant. An explanation of the statistical procedure and the results are presented in Appendix 5-3. For the purpose of comparison, a classification of company size is needed. Because the legal classification scheme defined by the Companies Act 1985 (HMSO, 1985) does not apply to public companies and no other classification is readily available, the ratio variable SALE is reduced to an ordinal variable SIZE (see Table Q35 of Appendix 5-1). SIZE consists of three categories: small companies (SALE ≤ £10m), medium sized companies (£10m < SALE ≤ £100m), and large companies (SALE > £100m).

Extent of accounting computerisation (Table Q1). The computerisation of the basic accounting function has reached a high level, consistent with Clark and Cooper (1985), Carr (1987) and Wilson and Sangster (1992). Over 94% of all companies have either fully or largely computerised accounting, while only a very small percentage of companies have computerised half or less of their accounting. The extent of computerisation tends to be greater in large companies. The Kruskal-Wallis analysis shows that this difference is statistically significant at 0.05. However, there is little difference between medium sized and small companies.

This large extent of computerisation necessities a further examination of its effects as revealed in the interviews. The most frequently mentioned effects are more timely and frequent management reporting, savings in labour and time, and the change of the accountants' role from book-keeper to data analyst, problem detective and solver. However, a more fundamental is that some companies can no longer run their businesses without computerised accounting information systems. Moreover, there are also negative effects. For example, some companies produce large volumes of information with little attention given to user issues, such as the relevance of that information or whether such volumes can be absorbed.

Years of IT use in accounting (Table Q2). Companies vary sharply in their years of IT use in accounting. While nearly one fifth have a history of five or fewer years, about 16% have experienced IT in accounting for 16 or more years. The Kruskal-Wallis analysis shows that differences due to company size are significant at 0.01. Thus it appears that the larger the company, the longer it has used IT in accounting.

Types of IT-based accounting systems in use (Tables Q3a & Q3b). Table Q3a shows that almost every company runs IT-based transaction systems, indicating that IT is commonly used for data processing. Moreover, IT has also become an important decision support tool: nearly 90% of companies use spreadsheets or other financial modelling systems, and about one third have applied executive information systems [EIS] and 15% have used expert systems [ES]. Although both Collier (1984) and Carr (1987) found that spreadsheets and financial modelling systems were playing an increasing role in accounting, ES and EIS represent new forms of decision support. However, the extent of the use of ES tends to be low and this is consistent with Sangster's (1994) observations. The three company groups do not differ very much in terms of transaction systems, but more large companies have used expert systems.

The difference in the use of EIS is even greater. However, there is little difference between medium sized companies and small ones in this respect.

It can be seen from Table Q3b that a little more than half of the companies have used two types of IT-based accounting systems and that nearly one third have used three types. The contrast between the two extremes is interesting: while about 10% of companies implement four or more types, nearly the same percentage only use one type. Generally, the large companies tend to use more types of IT-based systems than both medium sized and small companies. The difference between companies of differing size is significant at 0.01.

Innovative feature of IT use in accounting (Table Q4). Very few companies see IT use as a mere substitute for manual systems. The majority regard IT as improving manual operations. Moreover, the remaining companies report that their IT applications do things differently or innovatively. This suggests that the situation has been improved compared to King *et al.* (1991) who found that there was a strong tendency to use IT to "computerise" existing (manual) systems. The Kruskal-Wallis analysis shows no significant difference among the three types of companies.

Interviewees were asked to support their claims made in the questionnaires about the innovative feature of IT use in their companies. In those companies where IT is regarded as a substitution for, but an improvement on, manual operations, improvement can be found in three aspects. One is in the output in terms of better and quicker information, reduction of labour costs, and accurate and efficient management of massive client accounts. Another aspect is in data processing, for instance remote data input, the use of spreadsheets for accounts consolidation, and data processing integration. The third aspect is concerned with accountants. For example, the use of the computer has enabled a company to prepare financial accounts by itself rather than rely on auditors and has caused accountants in others to change their role from book-keeper to data analyst and problem solver. Two companies which participated in the interviews had claimed that IT was used to do what could not be done before. In one, computerised accounting systems effectively provide contract- or project-specific information to anyone involved, while in the other computers automatically invoice the customers and undertake various debt analysis. Only one company participating in the interviews had stated that they used IT in an innovative way, and this is supported by users manipulating and interrogating data with a database management system.

Workstation to accounting staff ratio (Table Q5). In nearly 80% of companies, each member of accounting staff has at least one workstation (including PC and other terminals). The mean ratio of all companies is 0.96 with a standard deviation of 0.40. These figures suggest a great change compared to Carr (1987) who found few organisations which reached a device to staff ratio of one. The Kruskal-Wallis analysis does not indicate a significant difference among the three groups of companies.

User satisfaction (Table Q6). In nearly 80% of companies, users of IT-based accounting systems are either almost satisfied or fully satisfied. In others, users are a little dissatisfied or very dissatisfied. The table suggests that users in small companies are slightly more likely to be content than in medium sized and large ones. However, the Kruskal-Wallis analysis does not show a significant difference.

Objective achievement (Table Q7). Nearly 90% of respondents think that the objectives of IT applications have been met fully or almost so. Seven companies report that it is too early to make comments on this, and another five respondents state that the objectives are unknown (note that neither of these is included in the table). The Kruskal-Wallis analysis does not show a significant difference among the three groups of companies in this respect. The interviews uncover a variety of reasons why users are not satisfied and why the objectives are not achieved. Poor systems integration is a major cause. For example, in some companies data have to be transferred in hard copy or re-entered manually from one application or location to another. A further problem is unfriendly user interfaces. A third cause is the inability of accounting systems to produce information relevant to main management concerns. Other reasons include systems being too slow to get reports ready on time, poor reporting facilities which result in undesired formats, and lack of technical support.

Level of IT integration (Table Q8). Generally, the level of IT integration is encouraging. IT applications in accounting are integrated or partly integrated in a little more than half of companies, linked with other management information systems [MIS] in about 30%, and are connected to electronic data interchange systems [EDI] in some 13%. This picture contrasts sharply with that drawn by King *et al.* (1991) who observed very limited progress towards systems integration. The overall level of IT integration is greater in large companies. The Kruskal-Wallis analysis indicates that there is indeed a significant difference. Table Q8 also suggests a tendency that integration of accounting applications with non-accounting ones is greater in large companies; however, there is little difference between medium sized and small ones.

The interviews provide further data concerning how systems are separated or integrated. A number of companies report that major IT-based accounting systems are separate, the main modes being (1) disintegrated system modules, (2) separate systems in newly-merged companies, (3) geographically separated systems, and (4) the separation between record-keeping systems from reporting facilities. All these cause data re-entry, thus affecting data processing efficiency and preventing information from being used effectively. In companies which report that major IT-based accounting systems are integrated, their integration is achieved by acquiring a fully integrated accounting package, by developing additional applications to integrate otherwise separate systems, or by using a networked system so that the output of one application can be easily used as input to another. In addition, one company's accounting systems are integrated with material and production planning systems.

Types of IT applied in accounting (Tables Q9a and Q9b). PCs are the dominant hardware, though minicomputers or mainframes are also widely used (Table Q9a). Accounting packages, and spreadsheets or other financial modelling packages are the most widely-used software. While local area networks (LAN) are popular, wide area networks (WAN) are also used by some 18% of companies. Interestingly, a quarter of companies use external databases and 10% use CD-ROM technology, although few have experienced hypertext or hypermedia, image processing systems or voice messaging systems. Clearly in nearly every IT type the percentage is highest for large companies and lowest for small ones, suggesting that larger companies tend to use more types of IT.

The interviews reveal how some technologies are used. Spreadsheets prove to be very useful in preparing management reports as well as financial statements. In addition they are used for cashflow forecasts, annual budgets, accounts' consolidation and data analysis such as debt age analysis. However, most companies do not use the sophisticated mathematical or statistical functions. Some companies have their accounting systems on a LAN. Although this may be shared by non-accounting departments such as warehouse, purchases or sales, it is not used to disseminate accounting information. Most companies with subsidiaries or branches located on different sites have call-up communication facilities via public telephone lines.

As shown in Table Q9b, a little over half of all the companies have applied four to six types of technologies, and about one third have experienced seven to nine types. Only a small proportion of companies have used either fewer than four types or more than nine. Large companies again have applied more types of IT than the others. The percentage of large companies which have used more than ten types of IT is much higher. While none of the large companies and only a very small number of medium sized ones fall into the category of fewer than four types, the percentage for small companies in this category is about 13%. The majority of large companies have used seven or more types of IT, while the majority of medium sized and small ones have used six or fewer types of IT. These suggest that the larger a company is, the more types of IT it uses. The Kruskal-Wallis analysis supports this conclusion.

The above describes the current state of IT use using nine indicators. The interviewees were also asked to recount briefly the history of IT use in their companies. Most interviewees, however, could only recall recent developments or those since they joined their companies. Despite this, their stories shed light on three lines of IT diffusion. A major theme in most companies is IT integration. Many techniques have been used to integrate systems, for instance, establishing remote direct data input to achieve geographical integration, using spreadsheets to consolidate outputs from separate systems, developing macros to connect separate systems, creating integrated databases, and using a network. Another important theme is system update or extension. Some companies experience systems overhaul several times while others have adopted a gradual change strategy. A further line is the exploitation of existing facilities. In some companies, attention is paid to changing the output or data formats according to managerial requirements, while continuing to use the existing facilities.

Summary. Accounting has attracted extensive use of IT and is fully or largely computerised in most companies. Not only has IT led to the automation of transaction processing in almost all companies, it has also become an important decision support tool as indicated by the widespread use of spreadsheets and by the availability of EIS and ES in some companies. However, accounting does not prove to be an area where advanced technologies are widely used.

Only in a small proportion of companies is IT a mere substitute for manual operations. In most companies, IT is seen as having brought about improvement, change or innovation. The use of IT has become irreversible in some companies. In addition, it has positively affected timeliness and frequency of managerial reporting, given rise to greater efficiency, and even changed the role of accountants. Also, the level of integration between IT-based accounting applications is high, and some companies have even integrated these with MIS and EDI. Furthermore, the quality of IT use is high in most companies, indicated by user satisfaction and objective achievement.

In general, large companies seem to use IT more extensively. They out-perform medium sized companies which in turn out-perform small ones in terms of years of IT use, types of IT-based systems in use, types of IT applied, and the use of more recent technologies. The extent of accounting computerisation and the level of IT integration are greater in large companies. However, no real difference is found between small and medium sized ones in these respects. Nor do the three groups of companies exhibit significant difference in terms of the workstation to accounting staff ratio, the innovative feature of IT use, user satisfaction or objective achievement..

Some of the above results are consistent with previous research, such as the extent of computerisation and the decision supporting role of IT. Others suggest that great change has taken place. The workstation to staff ratio has risen dramatically since Carr (1987), the level of IT integration is greater than that described by King *et al.* (1991), and accountants are using additional decision support tools such as ES and EIS and not just spreadsheets as found by Collier (1984) and Carr (1987).

Perceived IT importance in CFR changes

The preceding subsection indicates that great use of IT has been made in accounting although the sophistication varies among companies. The question now remaining to be answered is whether IT use plays a part in CFR changes, and if so, to what extent. Although the last subsection already touched on the effect of IT use, the role of IT in CFR changes deserves a more systematical examination, and this is now turned to. Recall that in the questionnaire survey the respondents were asked how important IT was in IRC/ERC if any such change had taken place. The analysis hence focuses on cases where a change was observed.

IT importance in internal reporting change. Table Q21b in Appendix 5-1 tabulates levels of IT importance in 15 internal reporting aspects, and the number and percentage of companies at each level. There is no percentage in the column labelled "Not Important" greater than 10%, indicating that IT is considered by over 90% of companies to have at least some effect on the changes in all 15 internal reporting aspects (this has taken account of the percentages in the column labelled "Important/No Degree" which means that respondents indicated that IT was important but did not specify how much). In the column "Very Important", the largest percentages (about 60%) are with changes in *forecast information*, *frequency* and *timeliness*. In addition, over 40% of companies think that IT plays a very significant role in changes in *user-tailored information*, *availability* and *presentation*. Interestingly, it can be seen from Section 1 of this chapter that all these aspects of internal reporting except availability are considered by the highest percentage of companies to have undergone a great change, indicating a positive association between the extent of change and the degree of IT importance.

IT importance in external reporting change. Table Q22b in Appendix 5-1 tabulates levels of IT importance in 15 external reporting aspects and the number and percentage of companies at each level. Only two percentages in the column termed "Not Important" exceed 10% and the related items are *non-financial information* and *strategic information*. Most of the percentages in this column are slightly higher than those in the corresponding column in Table Q21b, suggesting that IT is less important in ERC than in IRC. In contrast, the percentages in column "Very Important" are smaller than those in the same column in Table Q21b. The highest percentage in this column of Table Q22b is about 47% for *forecast information* while the highest percentage is over 60% for *timeliness* in the corresponding column of Table Q21b. However, the aspects on which most companies consider IT to have a very important influence are quite similar in both tables, including *forecast information*, *timeliness*, *frequency* and *presentation*.

To test further these results from the sample survey, the interviewees were asked to evaluate which aspects of internal/external reporting had been affected most by IT use. Table 5-5 summarises the results. From the table it can be seen that for internal reporting, a large majority of companies marked information *contents*, *timeliness*, *presentation* and data processing *efficiency* while much fewer companies chose *frequency* and *access*. Note that this evaluation largely resembles the survey results. In the survey, *forecast information* and *user-tailored information* are among the items considered by a large number of companies to have been affected by IT use; they are underlying dimensions of information *contents*. *Timeliness* and *presentation* are similarly rated in both the sample survey and the interviews. However, while the percentages of companies which marked *frequency* is the highest in the survey, it is the smallest in the interviews. Noted that the items in the sample survey are not the same as those in the interviews. This may have resulted in some incomparability.

As to external reporting, the most frequently marked item is *timeliness* which is followed by *freedom from error* and *presentation*. This evaluation is consistent with the survey results with respect to timeliness and presentation, but is less so in terms of *freedom from error*.

Table 5-5: Aspects of Internal/External Reporting on Which IT Has the Greatest Effect

Internal Reporting	Count	%	External Reporting	Count	%
efficiency	9	75.0	efficiency	5	41.7
contents	10	83.3	contents	1	8.3
cost	7	58.3	cost	3	25.0
timeliness	10	83.3	timeliness	10	83.3
frequency	5	41.7	frequency	2	16.7
access	5	41.7	access	1	8.3
presentation	11	91.7	presentation	6	50.0
freedom from error	7	58.3	freedom from error	7	58.3

Note: the percentages are based on the number of valid cases which is 12.

Correlation analysis. The above frequency analysis indicates that when an item of internal reporting is seen as having changed very much by a high percentage of companies, IT is also seen as being very important in the change by a large number of companies. The same applies to external reporting. This sheds light on the possibility that the degree of IT importance is associated with the extent of IRC and ERC. To investigate this, a Spearman correlation analysis is performed. The results are displayed in Table 5-6. The second column in the table contains the coefficients between the extent of change in all internal reporting items and the corresponding degrees of importance of IT in that change, whereas the fourth column presents the correlations between the extent of change in all external reporting items and the corresponding degrees of importance of IT in that change.

It can be seen from Table 5-6 that IT importance is indeed positively associated with almost all aspects of internal reporting and external reporting, and more importantly, the associations are strong. The only aspect with which IT importance is not associated is the *cost* of external reporting.

Taking account of the above frequency analysis and this correlation analysis, it is clear that IT is important in IRC and ERC in most companies and that, in the respondents' view, the greater the change in IRC and ERC, the more important IT is in that change.

Table 5-6: Spearman Correlation Coefficients between IT Importance and CFR Changes

Internal Reporting	Coefficient	External Reporting	Coefficient
forecast info	.447**	forecast info	.574**
external info	.518**	external info	.548**
comparative info	.482**	comparative info	.531**
non-financial info	.606**	non-financial info	.496**
strategic info	.484**	strategic info	.523**
segmental info	.548**	segmental info	.555**
user-tailored info	.587**	user-tailored info	.526**
frequency	.562**	frequency	.585**
timeliness	.638**	timeliness	.580**
auditability	.546**	auditability	.613**
accessibility	.566**	accessibility	.667**
availability	.539**	availability	.549**
understandability	.487**	understandability	.361**
presentation	.584**	presentation	.539**
cost	.179*	cost	.090

Testing the difference between IT importance in IRC and IT importance in ERC. The above frequency analysis also suggests that IT is more important in IRC than in ERC. This warrants a statistical test. Again, a one-tailed Wilcoxon matched-pairs signed-ranks test is applied. The test is performed at both aggregated level and disaggregated level. For the aggregated level, two variables, IMPIRC and IMPERC, are derived from adding the scores of 15 IT importance items corresponding to the 15 items of internal reporting and external reporting. Table 5-7 shows the results of the test at the aggregated level and suggests that IT is more important in IRC than in ERC with the difference being significant at one-tailed P value far below 0.001. Appendix 5-4 exhibits the results from more detailed tests. Except in *external information*, *comparative information*, *auditability*, and *accessibility*, IT importance in IRC is greater than IT importance in ERC in all the other 11 aspects.

The difference between IT importance in internal reporting and that in external reporting can also be assessed from Table 5-5. Except for *timeliness* and *freedom from error*, the percentages of companies for external reporting items are all lower than the corresponding ones for internal reporting items, further suggesting that IT is more important in internal reporting than in external reporting.

Table 5-7: Wilcoxon Matched-Pairs Signed-Ranks Test of the Difference between IT Importance in IRC with That in ERC

IMPIRC IMPIRC = SUM of items regarding IT importance in IRC
with IMPERC IMPERC = SUM of items regarding IT importance in ERC

Mean Rank	Cases	
96.83	160	- Ranks (IMPERC Lower Than IMPIRC)
32.47	19	+ Ranks (IMPERC Greater Than IMPIRC)
	18	Ties (IMPERC Equal IMPIRC)

	197	Total

Z = -10.7140 1-Tailed P = .0000

Summary

This chapter has analysed internal reporting change (IRC) and external reporting change (ERC), tested the difference between IRC and ERC and examined the factors (including IT use) that may affect IRC and ERC.

The survey shows that the change in all aspects of internal reporting and external reporting is positive in most companies with the exception of the *cost* of financial information. It is clear that there is parallelism between IRC and ERC. On the one hand, *forecast information*, *frequency*, *timeliness* and *presentation* are most frequently marked as having greatly changed in both internal reporting and external reporting. On the other hand, *availability*, *accessibility*, *strategic information*, *external information*, *segmental information*, *understandability* and *non-financial* *information* are most frequently marked as exhibiting no change in either internal reporting or external reporting. However, this consistency does not mean that the degree of IRC is the same as that of ERC. In fact, the Wilcoxon tests show that IRC is greater than ERC except in one aspect, *cost,* where no difference is found, suggesting that the information asymmetry between managers and external users has worsened.

Consistent with the sample survey, the interview data show that *timeliness*, *frequency*, *forecast information* and *user-tailored information* are internal reporting aspects that have greatly been improved. However, the interviews add more internal reporting aspects which have undergone major changes such as non-financial information and accounting control, while down playing *presentation* improvement. With regard to external reporting, the interviews reinforce the survey findings that *timeliness* and *presentation* have both been improved greatly. However, the most fascinating finding is that many companies see banks and other creditors or potential customers as their major external group of users of financial information, and hence provide them with much management information in addition to interim and annual reports. This implies that many changes in internal reporting have been extended to external reporting. As an aside, it should be pointed out that this finding casts doubts about the adequacy of the traditional approach to the examination of external reporting which is based on interim and/or annual reports only (see, for example, Cooke, 1992 & 1993).

The data suggest that *information demand from internal users*, *information demand from external users*, *financial reporting strategy*, *management compensation plan* and *company size* have some influence on both IRC and ERC. In contrast, *certainty of business environment* and *market competitiveness* have little effect on either IRC or ERC. Nor is there any association between listing status and either IRC or ERC. The interview data confirm that *information demand from internal users* and *information demand from external users* are the major factors that affect IRC and ERC. It is interesting that internal reporting may be affected by external users while external reporting may be influenced by internal ones.

IT is seen as another important factor. IT has been extensively used in accounting. A major effect of this use is that many companies can no longer run their businesses without computerised accounting systems. IT use has also resulted in more timely and frequent management reporting, savings in labour and time, and a change in the role of accountants from book-keepers to data analysts or problem detectives and sovlers. However, it does not seem that accounting is an area where the latest technologies such as expert systems and hypertext are commonly used. Moreover, in some companies IT-based accounting systems are still separate, IT may not be used creatively, users may be dissatisfied or the systems may not have lived up to their expectations. A comparison with findings of previous studies shows that IT use has become more sophisticated in a number of ways. This progress is achieved mainly through IT integration and update, although some companies tend to adapt the existing facilities to new information requirements. Large companies tend to use IT more extensively, and to have achieved greater integration than smaller ones, especially in integrating accounting systems with non-accounting ones. However, no significant difference is found among the three groups of companies in terms of *innovative feature of IT use*, *user satisfaction* and *objective achievement*.

The importance of IT use in IRC and ERC is evidenced by the correlation analysis between perceived IT importance and the IRC and ERC items. Except for the *cost* of external reporting, there is a positive and relatively strong association between perceived IT importance and the change in all other IRC and ERC items. Moreover, when there is a change in an aspect of either internal or external reporting, IT is also considered by a large majority to have exerted some influence. The most frequently marked items for which IT is considered to be very important in both IRC and ERC are very similar, and they include *forecast information*, *frequency*, *timeliness*, *availability* and *presentation*. Also, IT is considered by many companies to be very important to both *user-tailored information* in internal reporting and *external information* in external reporting. Although these parallels exist, the Wilcoxon tests indicate that IT use is generally more important in IRC than in ERC, indicating that IT may have played a role in the increase of the information asymmetry between managers and external users. However, the importance of IT is not different in internal reporting and external reporting as far as *external information*, *comparative information*, *auditability* and *accessibility* are concerned.

Some of these survey results are supported by the interview data: IT is commonly regarded as having greatly improved *presentation, timeliness* and *contents* in internal reporting, and *timeliness* and *presentation* in external reporting. However, the interview data also add data processing *efficiency* and *freedom from error* as the internal reporting aspects, and *freedom from error* as an external aspect, which have benefited a great deal from IT use.

This chapter has established that there have been changes in both IRC and ERC, although the extent of change varies across companies and in different aspects. Great use of IT has been made in accounting although the sophistication of IT application varies in different companies. Moreover, data suggest that IT use plays a role in both IRC and ERC, and is seen to be more important in IRC than in ERC. However, how strong is the association between the level of IT sophistication and the extent of IRC and ERC? And upon what factors is this association conditional? These two questions are addressed in the next chapter.

Chapter 6: The Relationship Between IT Use and CFR Changes

The last chapter analysed changes in CFR. Based on respondents' ratings of the importance of IT in CFR changes, the analyses in that chapter also suggest that IT is important in CFR changes in most companies, and that IT is more important in internal reporting change (IRC) than in external reporting change (ERC). This chapter investigates further to what extent IT use is associated with CFR changes and under what circumstances an association exists. The focus here is to test statistically the hypotheses developed in Chapter 4 and this is dealt with in Section 2. However, exploratory analyses are also undertaken in Section 3. The analyses in these two sections are performed at different levels of data aggregation which are discussed in the first section.

Section 1: Data Analysis Strategy

Because both IT use and CFR changes are measured by multiple items, it is possible to analyse their relationships following several different strategies.

Aggregated analysis

One strategy is to construct an overall scale for each index. Two different approaches are available for such a purpose. One is the simple summation of the item scores and the other is the weighted aggregation of the item scores. Conceptually, it is desirable to construct a weighted scale. Such a scale possesses greater discriminatory power than a scale derived from a simple addition. Sometimes objective weightings can be obtained such as volumes of consumption in the construction of a weighted price index. However, in many other cases, especially in social and behavioural sciences, researchers have to use subjective weightings. In this latter situation, caution must be exercised to avoid the danger of using weightings that are too arbitrary. In the absence of information about weightings, one has to use simple aggregates. This may invite criticism towards the equal weight put on the items in an index, but the approach has been adopted on many occasions in the social sciences. For example, Brayfield and Rothe (1951) developed an eighteen-item index and constructed an overall scale to measure job satisfaction. Similarly, Schacht (1990) developed a seven-item index using a simple aggregate to evaluate statistics textbooks used in the social sciences according to students' instructional needs. Examples can also be found in the accounting literature. Nobes (1992) developed a multiple-item scale using simple addition to classify international financial reporting practices. Moreover, a well-accepted scaling method, Likert scaling, actually derives a total score for an index by summing the values of each item (Frankfort-Nachmias and Nachmias, 1992). This approach will be taken to construct an overall scale for each index.

Before using the indices, it is necessary to test their internal consistency. Details of the tests are presented in Appendix 6-1, and summarised in Table 6-1. The method applied is Cronbach's Alpha (Cronbach, 1970). It measures the internal consistency of the items in an index by correlating the score of an item with the total score of the remaining items. Generally, if the items in the index are consistent (that is, they are measuring the same thing), they should be highly correlated with the total score of the other items in the index, and the alpha measure tends to be high. While Bryman and Cramer (1994) contended that the alpha value should be at least 0.80, Nunnally (1978) argued that the alpha value at around 0.50 to 0.60 would be acceptable. It should be recognised, however, that the size of alpha is associated with the number of items in an index. That is, the alpha value tends to be large when there are more items in the index. Yet there are no criteria regarding the ideal number of the items. Therefore these rules of thumb cannot be used as an absolute criterion.

Table 6-1: Reliability Analysis of the IT Use, IRC and ERC Indices

Index	Alpha	Standardised Alpha
IT use index (all items)	.627	.640
IT use index (excluding BRAT)	.653	.669
IRC index (all items)	.830	.838
ERC index (all items)	.911	.912

Table 6-1 indicates that items in the IRC index and ERC index are quite consistent implying that the indices are quite reliable, as both alpha and standardised alpha are over 0.80 in both cases. Here the standardised alpha is the alpha value obtained when all items are standardised to have a variance of 1. The overall scales for the IRC and ERC indices, termed IRCAGG and ERCAGG are the sums of individual indicators respectively. The alpha and the standardised alpha for the IT use index are 0.627 and 0.640 respectively. The item *Workstation to staff ratio* (BRAT) has the lowest correlation with the total score of the other items. When this item is excluded from the index, alpha increases to 0.653 and the standardised alpha to 0.669. These are acceptable by Nunnally's standard. Although they are not quite up to Bryman and Cramer's standard, they are still acceptable if the number of items in the IT use index is considered which is much smaller than that in the IRC and ERC indices. Hence, an overall scale, termed ITUSE, for the IT use index is constructed excluding BRAT.

Dimensionalised analysis

Alternatively, the relationships between dimensions of the IT use index and those of the IRC and ERC indices may be examined. If this approach is to be pursued, the question of how to determine the dimensions and how to construct scales or scores for the dimensions requires careful consideration.

As mentioned earlier, IT use index, IRC index and ERC index all consist of multiple items. Some items measure one aspect while some other items measure others. Each index can thus be seen as comprising several aspects which are often referred to as dimensions. The dimensions can be used in two different ways. First, the search for dimensions is often used as an important aid to understanding the nature of complex concepts and a means of finding indicators for them. In addition, the dimensions can be used as separate variables for which separate scales need to be constructed. Often these two uses are combined and this is the case here.

Two approaches may be used to formulate dimensions of a concept. One is by qualitative analysis which requires much subjective judgement, and the other uses statistical procedures. In formulating the questionnaire, three dimensions were identified for IT use (*extent of IT use*, *way IT is used* and *quality of IT use)* and six dimensions for IRC and ERC indices (*relevance*, *access*, *comprehension*, *time*, *auditability* and *cost*), as shown in Tables 4-1 and 4-2 in Chapter 4.

A statistical approach to formulating the dimensions of an index is provided by principal components analysis (PCA) and factor analysis, both of which are briefly described in Appendix 6-3. Table 6-2 summaries the results from a factor analysis using PCA as the factor extraction method for the three indices. The missing values are replaced with the mean of the non-missing values, however, other methods (excluding cases listwise and excluding cases pairwise) give substantially the same results. The equamax method is chosen to rotate the components extracted from the PCA so that the extracted components become more interpretable (Johnson and Wichern, 1992). There are two other main rotation methods (varimax and quartimax, see Appendix 6-3 for an explanation), the primary selection criterion being whether one method generates more interpretable results. Kaiser (1974) provides a Kaiser-Meyer-Olkin (KMO) measure of the adequacy of the factor analysis: KMO in the 0.90s is marvellous, in the 0.80s is meritorious, in the 0.70s is mediocre, in the 0.50s is miserable, and below 0.5 is unacceptable. However, these criteria must be used with caution as the KMO measure is dependent on the number of items or variables.

When the number is small, the KMO measure tends to be low. The KMO measure is also given in Table 6-2.

Table 6-2: Summary of Principal Components and Factor Analysis

Index	Factors and variables attached to the factors	Variance explained	KMO
IT use index (all items)	F1: BTYP, BTEC, BSTAT, BYRS F2: BSAT, BOBJ, BEXT F3: BRAT, BFEAT	F1=27.3% F2=16.2% F3=12.0%	.68
IT use index (excl. BRAT)	F1: BTYP, BTEC, BYRS F2: BSAT, BOBJ, BEXT, BSTAT, BFEAT	F1=30.7% F2=18.0%	.70
IRC index	F1: XACS11, XAVA11, XUND11, XPRE11 F2: XSEG11, XEXT11, XNON11, XSTR11, XCOM11, XTAI11, XFOR11 F3: XFRE11, XTIM11, XAUD11 F4: XCOS11	F1=30.2% F2=8.9% F3=8.8% F4=7.1%	.84
ERC index	F1: XCOM21, XNON21, XFOR21, XPRE21, XUND21, XEXT21, XSTR21, XSEG21, XCOS21 F2: XACS21, XAVA21, XAUD21, XTIM21, XFRE21, XTAI21	F1=44% F2=8.2%	.90

Notes to the table: (1) Factor extracting method: principal component analysis; (2) Factor rotating method: equamax; (3) Missing values treatment: replacing with mean

It can be seen from Table 6-2 that the results are different from those derived in developing the questionnaire shown in Tables 4-1 and 4-2 in Chapter 4. In particular, the statistical procedures produce different dimensions for the IRC and ERC indices. This difference obstructs the use of these results for comparing the relationship between IT use and IRC, and that between IT use and ERC. Moreover, the factors in the ERC index are not easy to interpret. Nor are the factors in the IRC index though to a lesser degree. Yet the above are the best results from a number of attempts using different combinations of missing value treatments and rotation methods. The major difficulty in interpreting the factors lies in the fact that some original variables have superficially been clustered to a factor. This highlights a problem with a statistical approach to dimensionalisation: statistical procedures only recognise the numbers, not the meaning behind the numbers. Thus the dimensions so produced may only be seen as dimensions in a statistical sense. Apart from the problem of interpretation, the extracted and rotated factors can only explain about half of the total variance in the original items. This implies that the results should be used with great caution and an alternative approach is preferred if further analyses are to be based on dimensional scales. The result from a search for such an approach is a combination of subjective dimensionalisation and the use of PCA or factor analysis on each dimension. Table 6-3 presents a summary of this attempt.

Table 6-3: Principal Components Analysis on Subjectively Formulated Dimensions

Index	Dimensions	Factors and variables attached to the factors	Variance explained	KMO
IT use index	IT use extent (ITENT)	F1: BEXT, BTYP, BTEC, BYRS	52.1%	.69
	Way IT is used (ITWAY)	F1: BSTAT, BFEAT	59.9%	.50
	Quality of IT use (ITQUL)	F1: BSAT, BOBJ	73.8%	.50
IRC index	Relevance (INREL)	F1: XFOR11, XEXT11, XSTR11, XSEG11, XTAI11, XNON11, XCOM11	38.6%	.81
	Access (INACC)	F1: XACS11, XAVA11	73.2%	.50
	Time (INTIM)	F1: XFRE11, XTIM11	85.1%	.50
	Comprehension (INCOM)	F1: XPRE11, XUND11	74.1%	.50
ERC index	Relevance (EXREL)	F1: XFOR21, XEXT21, XSTR21, XSEG21, XTAI21, XNON21, XCOM21	51.1%	.87
	Access (EXACC)	F1: XACS21, XAVA21	79.8%	.50
	Time (EXTIM)	F1: XFRE21, XTIM21	89.9%	.50
	Comprehension (EXCOM)	F1: XPRE21, XUND21	83.4%	.50

Notes to the table: (1) Factor extracting method: principal component analysis; (2) Factor rotating method: varimax; (3) Missing values treatment: pairwise deletion

In Table 6-3, each row represents a dimension formulated on the basis of qualitative analysis. Items in the three indices are grouped along dimensions to which they attach. The factor analysis using PCA as the factor extraction procedure has been performed for each dimension. Note that in every case, only one factor has been extracted and further rotation is not required or necessary. This may be seen as a justification for the dimensions so developed. Also the sizes of the variance explained by the factors are much larger compared with those in Table 6-2. The factor scores resulting from this analysis will be used in Section 3 in the analysis of the relationships between the dimensions of IT use and those of IRC and ERC.

Disaggregated analysis

A third data analysis strategy is to analyse separately each item or dimension. A major problem with this strategy is that there is a danger of producing overwhelming output because there are so many items in the three indices. It will also be difficult to synthesise and understand the results. Moreover, it is very likely that inconsistent results will be produced, and hence it may be impossible to draw any overall conclusion or to test the hypotheses. In addition, as pointed out by Bryman and Cramer (1994), the more statistical tests are carried out, the more likely it is that some of them will be significant by chance, and it is not possible to determine the likelihood of this if the data come from the same sample.

Of course, some combination of the above strategies is also possible. For example, one can examine the relationships between the overall score of the IT use index and the dimensions or individual items of the other two indices, or vice versa.

It is possible that these strategies will produce some inconsistent results. However, it is also possible that they are complementary to each other. For example, an analysis at the aggregated level may establish an overall relationship between IT use and the CFR changes while the disaggregated analysis may specify which aspect of IT use is associated with the CFR changes. With this in mind, the hypotheses will be tested following the aggregated data analysis approach while other possible relationships not covered by the hypotheses will be explored under alternative strategies.

Section 2: Hypothesis Testing

Selecting testing methods

To test the hypotheses, the correlation coefficients between IT use and CFR variables must be calculated and then compared using appropriate statistical procedures. The choice of a statistical procedure is primarily determined by the purpose of the research and the type of data. Consider first the role of the research purpose. Some research aims to evaluate the differences between variables while in other cases the intention is to investigate the relationships between them. Some statistical procedures are designed for the first purpose while others for the second (Bryman and Cramer, 1994). As the purpose of testing the hypotheses in this study is to investigate the strength of the relationships between IT use and CFR changes, methods of the latter kind are required. Procedures for such a purpose include contingency table analysis, Pearson correlation analysis, Spearman rank correlation analysis (often referred to as Spearman's *rho*) and regression. In choosing from them, however, consideration must be given to data type to which the discussion now turns.

It is often held that contingency table analysis is most suitable for analysing the relationships between nominal variables while Spearman's rho is appropriate for the relationships between ordinal variables[1], and regression and Pearson correlation analysis for those between interval and/or ratio variables (Elifson *et al.*, 1982). Following the aggregated data analysis strategy as discussed in the first section, the overall scales of the three indices are used to test the hypotheses. Since these aggregated scales are essentially ordinal variables, Spearman's rho is selected for measuring the strength of the association between IT use and CFR variables. Unlike the Pearson correlation analysis, this method does not assume that the variables are continuous (interval or ratio variables) (Elifson *et al.*, 1982). Thus its scope for application is broader.

However, it may be appropriate to point out that although multiple-item scales are of an ordinal nature, there has been a trend towards treating them as interval data

[1]Kendall rank correlation analysis (often referred to as Kendall's tau) is designed for the same purpose involving ordinal variables, but it is less commonly used.

(Bryman and Cramer, 1994). One reason for such an approach is that multiple item scales have a relatively large range of categories. This treatment may also be justified by the central limit theorem which implies that aggregating ordinal variables that have been coded on any "sensible" scale will tend to produce an approximate normal variable. Further to this trend, Labovitz (1970) argued that statistical methods which are normally used for interval or ratio data can and should be applied to almost all ordinal variables. A more moderate approach would be to treat multiple-item scales as if they are interval data, but in the meantime not to use a single-item ordinal variable in that way.

Since the testing of the formulated hypotheses also involves a comparison of the strength of the contingent relationships or the sizes of correlation coefficients, it is necessary to investigate whether the differences between these coefficients are statistically significant. However, as methods for testing such differences between correlation coefficients determined from ordinal data are not well developed, methods for continuous data are used as an approximation. A well-known Z test (Wetherill, 1981) is used to test the significance of the difference between two correlation coefficients r_1 and r_2. For testing differences among three or more correlation coefficients, a chi-square test (X^2) is applied (Wetherill, 1981). A T test (Williams, 1959) is used to compare two dependent coefficients r_{13} and r_{23}, where r_{13} is the coefficient between variable 1 and variable 3, and r_{23} is that between variable 2 and variable 3. Details of these statistical procedures and their application are given in Appendix 6-4. It should be pointed out that the rank correlation coefficients produced from the Spearman correlation analysis are compared, although strictly speaking the tests are designed to compare Pearson correlation coefficients. Because of this, the results can only be used as a guide.

As the purpose of examining the relationship between IT use and CFR changes is to ascertain whether IT use has an impact on CFR, it is also necessary to recognise that association does not necessarily mean causation. In order to draw causal inferences from an association between two variables, temporality or the time order of the two variables must be considered, and it should be established that the cause precedes the effect (Huff, 1973; Elifson *et al.* 1982). However, the relationships between IT use and IRC and between IT use and ERC may be reciprocal or symmetrical. It may be true that more IT use leads to more CFR changes, but it may also be the case that CFR changes result in greater IT use. In the former, IT acts as a cause of the changes whereas in the latter IT is a facilitator of the changes. This study is not intended to distinguish these two roles since such distinction is difficult to make, if not totally impossible. Instead, the impact of IT is defined to include both, as both are important. This treatment echoes the view of Rosenberg (1968); he casts doubt about the necessity or possibility of specifying which of the two reciprocal variables is the original cause, while acknowledging that the discovery of symmetrical relationships is valuable for understanding social phenomena. Moreover, taking a dynamic view, an association between IT use and CFR changes may be better seen as the result of some successive and cumulative interactions between IT use and CFR changes. On this basis, it could be argued that IT use is both the cause and the facilitator of the CFR changes.

Having discussed the approaches to data analysis, chosen the statistical procedures, and clarified the difference between association and causation, the hypotheses are now tested. Note that the overall scales for the IRC index and the ERC index, termed IRCAGG and ERCAGG, are the sums of all individual item scores, and the overall scale for the IT use index, called ITUSE, is the sum of all individual item scores with the exception of BRAT which has been excluded following the reliability analysis.

Hypothesis 1: IT use is associated more with IRC than with ERC. The Spearman correlation coefficients in Table 6-4 suggest that IT use is positively associated with both IRC and ERC, indicating that IT has played a role in both IRC and ERC, a result consistent with the finding in the previous chapter: IT use is important in both IRC and ERC. However, neither of the two correlations is particularly strong, suggesting that the role of IT is limited, especially in external reporting.

Table 6-4: Spearman Correlation Coefficients between IT Use and IRC and between IT Use and ERC[2]

	IRCAGG	ERCAGG
ITUSE	.305** (281)	.149** (236)

More relevant to the hypothesis, Table 6-4 shows that IT use is more associated with IRC than with ERC. This difference is significant at less than 0.004 in the one-sided *T* test (Appendix 6-4). These results support the hypothesis. Because of information costs, commercial secrets, managers' self-interests, or technological asymmetry, improved information for internal users resulting from or facilitated by the increased use of IT has not been equally enjoyed by external users. The result is consistent with a finding in the previous chapter: IT use is more important in IRC than in ERC. This consistency gives additional support for the hypothesis. These results together suggest that IT use has played a part in the exacerbation of the information asymmetry between managers and external users as demonstrated in the last chapter. The implication is that to the extent that information asymmetry gives rise to moral hazard and adverse selection problems, the negative effect of IT on information asymmetry has offset the social value of external reporting.

A paradox appears in the above results. On one hand, there is a positive (though weak) association between IT use and ERC implying that the use of IT is partly responsible for ERC. On the other, IT may have had a negative effect on the information asymmetry. The paradox disappears when it is realised that although IT

[2]In presenting individual correlations, * denotes significant at 0.05 and ** significant at 0.01 (two-sided tests); sample sizes are in brackets.

use may have changed external reporting or facilitated ERC, this change is on a much smaller scale compared with IRC.

Hypothesis 2: The relationship between IT use and IRC is stronger in small companies than in large ones. Table 6-5 shows that the association between IT use and IRC is stronger in small companies than in medium-sized ones, and much stronger than in large ones. Moreover, the relationship is not significant at all in large companies. The one-sided *Z* test shows that the difference between the coefficient of small companies and that of medium-sized ones is significant at 0.10, and the difference between the coefficient of small companies and that of large ones is significant at 0.05 (Appendix 6-4). These are consistent with the hypothesis.

Table 6-5: Spearman Correlation Coefficients between IT Use and IRC by Size

Company Size	ITUSE and IRCAGG
Small	.381** (83)
Medium sized	.184* (118)
Large	.098 (56)

Several reasons can be offered. One is that small companies, compared with their larger counterparts, have less complicated organisational structures and thus require less complex information systems. This makes it easier to implement changes. Another reason is that the disadvantage of small companies in terms of information processing resources over larger companies may have been overcome by the use of increasingly powerful IT. Moreover, small companies may have started from a lower base of IT use. The use of IT would, therefore, accentuate the degree of change in internal reporting. This disposition at least makes them feel that internal reporting is much improved.

Since *company size* (SIZE) is categorised upon an analysis of average sales as described in Chapter 4, an alternative categorisation may provide useful comparable information. *Listing status* seems appropriate for this purpose. Usually, listed companies are larger than unlisted ones. In the current surveyed sample, the average sales are £650 million for listed companies and £30 million for unlisted companies. In fact, the Cramer's *V* measure of the association between *company size* and *listing status* is 0.379**. If the hypothesis can hold, the relationship between IT use and IRC should be stronger in unlisted companies than in listed ones. This is exactly the case as can be seen from Table 6-7.

Hypothesis 3: **The relationship between IT use and ERC is stronger in large companies than in small ones.** Table 6-6 shows that a positive and significant association obtains only in large companies. This is consistent with the hypothesis and is further supported by the chi-square test which shows that the difference among the coefficients of the three groups is significant at 0.10 (Appendix 6-4). It is expected that the relationship in medium-sized companies would be stronger than that in small ones, but neither of them are significant. While this does not refute the hypothesis, it suggests that an association between IT use and ERC could only appear in *very* large companies.

Considering that the major problem in external reporting is whether or not to disclose some information as discussed in Chapter 3, an implication of this result is that *very* large companies are more likely than smaller ones to use IT for external reporting. An important function of external reporting is the reduction of information asymmetry and hence the reduction of agency costs. As has been suggested in the development of the hypothesis, agency costs resulting from moral hazard and adverse selection problems increase with firm size since large companies are more externally financed and are more sensitive to political costs than smaller ones. Therefore, large companies are more willing to improve external reporting and this gives IT a role to play.

Table 6-6: Spearman Correlation Coefficients between IT Use and ERC by Size

Company Size	ITUSE and ERCAGG
Small	.196 (69)
Medium sized	-.065 (100)
Large	.297* (48)

Parallel to Hypothesis 2, this hypothesis may also be tested using listing status as a proxy for *company size*. However, Table 6-7 shows that neither of the two contingent correlations between IT use and ERC is significant, although the one in listed companies is marginally stronger than that in unlisted ones. This may be because the classification of companies is too rough. As shown above, a positive and significant association between IT use and ERC only exits in *very* large companies, whereas the proxy variable clearly confounds medium-sized and large companies.

Hypothesis 4: **The relationship between IT use and ERC is stronger in listed companies than in unlisted ones.** It can be seen from Table 6-7 that IT use is marginally more associated with ERC in listed companies than in unlisted companies. However, neither coefficient is significant, and the difference between them is small and clearly not significant.

Table 6-7: Spearman Correlation Coefficients between IT Use and IRC and between IT Use and ERC by Listing Status

Listing Status	ITUSE and IRCAGG	ITUSE and ERCAGG
Listed	.250** (132)	.156 (111)
Unlisted	.340** (148)	.122 (124)

Since *listing status* is an indictor of an externally institutionalised agency monitoring and/or bonding device (financial market regulation), the fact that the relationship between IT use and ERC is hardly conditional upon *listing status* may suggest that market regulators have not contributed anything to the use of IT for external reporting. However, the effect of financial market regulation may have been confounded by the size effect, for *listing status* may also be seen as an indicator of company size. This issue can be addressed by performing a partial correlation analysis (Elifson *et al.*, 1982), which measures the linear relationship between two variables (ITUSE and ERCAGG) controlling for a third variable (*company size* [SALE[3]]). To facilitate a comparison between listed companies and unlisted ones, the partial correlation analysis is performed on listed companies and unlisted ones separately.

The results are displayed in Table 6-5-3 of Appendix 6-5 which shows that the sizes of both coefficients are reduced and the difference between the two correlations becomes even smaller. The reduced sizes of the coefficients indicate that *company size* is indeed a factor that affects the relationships between IT use and ERC, whereas the non-existence of a difference further suggests that the market regulators have had no bearing upon the relationship between IT use and change in external reporting in the UK. One reason for this may be that although listed companies have to comply with additional reporting requirements, these requirements do not amount to the extent where companies must produce additional information, or to the extent where companies have to use more IT or improve existing IT based systems. Alternatively stated, companies which have sufficient information to meet internal information needs must be able to meet information requirements posed by the financial market regulators. Moreover, although listed companies may benefit from additional disclosure, this additional information is already available internally. Thus it is not necessary to use more IT or update existing IT facilities. These arguments suggest that the role of IT in external reporting is very much limited by the existing information asymmetry between internal users and external ones in favour of the former. Further, although listed companies have to comply with more stringent

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[3]Since partial correlation analysis assumes that the involved variables are interval or ratio variables, the indicator of *company size* (SALE), which is the average turnover and a ratio variable, is used to replace SIZE which is an ordinal variable.

financial reporting requirements imposed by the financial market regulators, these requirements may have not undergone much change as discussed in the previous chapter.

The interview data provide further evidence against this hypothesis. Interviewees in listed companies were asked whether they felt any influence from the stock exchange regulators on the use of IT for external reporting. The answers were unanimously negative. This contrasts to the situation in the USA where the Securities and Exchange Commission (SEC) has developed a system called EDGAR. Although not empirically tested yet, EDGAR, by implication, can be expected to produce some improvements on financial reporting. In the UK, no such development has been initiated by financial market regulators, by the Companies Houses, or by anyone else. However, interviewees took a positive attitude towards any development of this kind. On the one hand, they would be happy to submit financial reports in an electronic format, on the other, they expect to benefit from sharing financial information held in a massive database.

Hypothesis 5: **The association between IT use and ERC is conditional upon financial reporting strategy**. Three types of financial reporting strategy are listed in Table 6-8: suppressing financial information (*suppressing*), strictly adhering to minimum reporting requirements (*ritualism*) and disclosing additional information where confidentiality allows (*informational*). Testing the hypothesis requires the examination of the contingent relationships between IT use and ERC, however, those contingent relationships between IT use and IRC are also displayed in the table in order that a contrast can be made between internal reporting and external reporting.

The table shows that IT use and ERC are positively and significantly associated with each other in companies adopting the *ritualism* strategy. No association in companies with a *suppressing* strategy could be expected but the sample size is too small to validate the result. Nor could an association between IT use and ERC be found in companies adopting an *informational* strategy.

Intuitively, the reason for the existence of a positive and significant association in companies adopting a *ritualism* strategy may be that financial reporting regulation has pushed companies to improve external reporting and this has given IT a role to play. This could be achieved either directly or indirectly. In the former case, regulators require companies to use a certain IT for external reporting, as SEC does. However, the empirical evidence presented in the examination of Hypothesis 4 gives no support for this interpretation. Alternatively, changes in Companies Acts, accounting standards and other financial reporting regulations may require a change of accounting method or disclosure format, which may in turn require software amendments or hardware updating, or affect the companies in purchasing IT systems. This explanation has acquired very limited empirical support. For example, interview data show that companies have to amend their software or purchase new software when VAT rates change. However, financial market requirements related to financial reporting have not had this effect as shown in the discussion of Hypothesis 4.

The lack of a significant association between IT use and ERC in companies adopting an *informational* strategy suggests that the existence of an appropriate IT infrastructure to meet the mandatory external reporting requirements may also provide a sufficient IT infrastructure to meet the needs of an *informational* strategy. Hence IT use may not be affected significantly by an *informational* strategy. More importantly, information may be already available, though it is for internal users. It is not necessary, therefore, for companies adopting an *informational* strategy to use additional IT or enhance existing IT in order to produce more and better information specifically for external users.

The statistics do not show a clear pattern of the contingent correlations between IT use and ERC among companies adopting different financial reporting strategies. A possible reason may be that the data about financial reporting strategy is problematic. The respondent might have taken financial reporting strategy as too serious a matter to disclose. Alternatively, there might be no clear strategy in the company, or even if there is one, it may be too complicated to communicate.

Table 6-8: Spearman Correlation Coefficients between IT Use and IRC and between IT Use and ERC by Financial Reporting Strategy[4]

Financial Reporting Strategy	ITUSE and IRCAGG	ITUSE and ERCAGG
Suppressing	.467 (14)	.097 (11)
Ritualism	.417** (137)	.255** (115)
Informational	.168 (118)	.008 (105)

To clarify this, interviewees were asked to discuss their companies' financial reporting strategies. The obtained data suggest that these companies disclose different information to different user groups. For example, companies could disclose to creditors detailed management accounting information as well as annual and interim reports, while they only disclose the latter to their shareholders. Clearly, the reason for creditors to have access to additional information is because companies rely on their financial support. However, the extent of disclosure to creditors seems to depend on the amount of borrowings. Two interviewed companies which have a small loan provide only quarterly management accounts to their creditors, whereas another six companies which have substantial borrowings provide monthly management accounts, and in some cases the list of creditors and debtors and even the order book.

In interpreting the above difference, however, two factors should be recognised.

[4] The Spearman correlation coefficient between *company size* (sale) and *financial reporting strategy* is 0.287**. To control the size effect, a stratified partial correlation analysis is undertaken. The results, shown in Table 6-5-4 of Appendix 6-5, are very similar to those shown in Table 6-8 although the correlation coefficients are a little smaller.

Firstly, in some companies all or the main shareholders happen to be directors, and they as directors thus already have full access to all financial and non-financial information. Therefore, in these companies the seemingly information asymmetry between shareholders and creditors may not exist. This applies to five of the ten interviewed companies which provide management accounting information to their creditors. Secondly, as one interviewee argued, annual reports may already contain more information than required by law and accounting standards.

In summary, the interview data suggest two points. First, while it is possible to identify a company's financial reporting strategy, the strategy may have a structural feature, that is, it varies depending on different user groups. This should be taken into account in any future investigation of the influence of financial reporting strategy on the relationship between IT and ERC. Moreover, companies may have to take an externally imposed position in financial reporting. The influence of the resource power of creditors (banks) on the extent and frequency of disclosure is illustrative of this point.

Second, it is possible that the relationship between IT use and ERC is conditional upon the existence and level of borrowings, since companies with a loan, and especially a large loan, tend to disclose to creditors much more information in addition to formal reports, and this gives IT a role to play. It is argued in agency theory that as the gearing ratio increases, managers have a greater incentive to transfer wealth from creditors to themselves and existing shareholders, given the existence of information asymmetry (Fama and Miller, 1972; Jensen and Meckling, 1976). This can be achieved by, among other means, paying liquidating dividends and diluting coverage on existing debt by issuing new debt with the same or higher priority. However, the potential wealth transfer is positively related to residual loss since creditors would anticipate these opportunistic activities and thus seek compensation by discounting the firm's security. Therefore, if managers and shareholders agree not to exercise opportunistic behaviour, they would benefit from a higher security price and an increase in firm value because such agreements (debt covenants) reduce the probability of suboptimal investments. Although managers and shareholders have to bear the costs of establishing and executing these contracts, these costs are relatively small compared with the residual loss. Financial reporting plays a central role in many debt covenants because accounting data are used in them and because extensive disclosure is often required by the creditors. When the gearing ratio is very high, the extent and frequency of financial disclosure reaches a point where IT use becomes essential.

This last point is tested by a Spearman correlation analysis of the relationship between IT use and ERC by stratifying the sample by the variable gearing (GEAR). Usually gearing measures the extent that a company is financed by long term sources of funds carrying a fixed interest charge or dividend such as unsecured loans, debentures and preference shares. In the sample frame FAME, however, gearing measures the relationship between shareholders' funds (including preference shares) and creditors' funds, using the following formula which is suitable for testing the above observation:

$$Gearing\ (\%) = \frac{bank\ overdrafts + long\ term\ liabilities}{shareholders'\ funds} \times 100$$

The five-year average gearing ratio was extracted from FAME, and was categorised into four levels: (1) Gearing = 0% to 10%, (2) Gearing = 11% to 50%, (3) Gearing = 51% to 100%, and (4) Gearing > 100% (Table Q36 in Appendix 5-1). The results of the contingent analysis (Table 6-9) show that there is indeed a positive significant association between IT use and ERC when the gearing ratio is over 100%. This supports the above agency theory argument.

Table 6-9: Spearman Correlation Coefficients between IT Use and IRC and between IT Use and ERC by Gearing

Gearing	ITUSE and IRCAGG	ITUSE and ERCAGG
0% to 10%	.187 (35)	.078 (28)
11% to 50%	.358** (71)	.221 (63)
51% to 100%	.254* (66)	-.024 (56)
over 100%	.470** (68)	.300* (56)

Hypothesis 6: **The association between IT use and ERC is conditional upon management compensation plans.** Table 6-10 displays the Spearman correlation coefficients between IT use and ERC in relation to four options of *management compensation plan*: no plan, bonus, share options, and bonus plus share options. The chi-square test shows that there is no significant difference among the four contingent correlations between IT use and ERC. The contingent relationships between IT use and IRC are also presented in the table in order that a comparison between internal reporting and external reporting can be made.

Table 6-10: Spearman Correlation Coefficients between IT USE and IRC and between IT Use and ERC by Management Compensation Plan[5]

Management Compensation Plan	ITUSE and IRCAGG	ITUSE and ERCAGG
No plan	.533** (57)	.337* (48)
Bonus	.145 (58)	.011 (54)
Share option	-.023 (41)	-.133 (31)
Bonus plus share option	.210 (87)	.060 (75)

It can be seen from Table 6-10 that the strongest associations between IT use and ERC are in companies without any compensation plan and that the associations are only statistically significant in that sub-sample. It is hypothesised that the strength of the contingent associations between IT use and ERC might vary from one mode of *management compensation plan* to another. However, this is not supported by the analysis here. It seems that the type of compensation plan has no effect on the

[5] The Cramer's V measure of association between *company size* and *management compensation plan* 0.246**. To control the size effect, a stratified partial correlation analysis is undertaken. The results, shown in Table 6-5-5 of Appendix 6-5, are very similar to those shown in Table 6-10 although the correlation coefficients are a little smaller.

relationship between IT use and ERC. Therefore, no support is obtained for either the agency theory argument and the alternative argument used in the development of this hypothesis.

In the light of this result, management compensation plans were discussed with the interviewees. It turns out that all companies which do not have any management incentive plan are small family businesses. This is understandable as the directors are the owners and they do not need any additional incentive. According to Hypothesis 2, the fact that the companies are small may explain the strong positive and significant relationship *between IT use and IRC* in companies without any management incentive plan. However, this does not provide any reason for the positive and significant association *between IT use and ERC* in companies without management incentive plans. A close look at these companies reveals that this positive and significant association may be attributable to the fact that the companies either have some substantial borrowings, or are very likely to gain financial support from their creditors in the near future.

Why then is there no association between IT use and ERC in companies with a compensation plan? The interview data show that a number of factors make the bonus plans and sometimes the share option schemes ineffective in many companies which participated in the interviews. The most important factor is poor operating performances during the economic recession. This occurred in several companies where the operating results were so poor that no or only very small bonuses could be provided, or share prices were so low that share options did not mean much to directors. Another factor is cash shortage. For example, a large company with both a bonus plan and a share option scheme formulated a major IT strategy, but the strategy could not be implemented because of financial difficulties. The same company also had to reduce the graphics and exclude colour graphics altogether in its annual reports in order to reduce expenditure. Other factors include difficulties in measuring management performance, the effect of salary-tied pension schemes on directors, and nominal bonus schemes. These factors in effect break the two links upon which the hypothesis was developed: between compensation plans and IT investment decisions, and between compensation plans and financial reporting decisions. This may be why there is no association between IT use and ERC in companies operating short and/or long term management incentive schemes. However, caution must be exercised in accepting this explanation because the number of interviews is limited.

Discussion

It is interesting that the first hypothesis is further supported by the contingent analysis (Hypotheses 2 to 6). From Tables 6-5 to 6-10, it can be seen that most contingent correlations between IT use and IRC are larger than the corresponding ones between IT use and ERC, with one obvious exception. From these tables, it can also be found that some contingent correlations are larger or smaller than the two overall correlations shown in Table 6-4. This reveals an advantage of contingent analysis based on subsamples over the overall analysis based on the whole sample. The sizes of the contingent correlations may be quite different from the corresponding overall associations. Consequently, on the one hand, an association between two original variables in the overall analysis does not mean that this association exists in all the subsamples. Even if there are associations in all subsamples, their sizes may vary. On the other, even if there is no association between two variables in the overall analysis, one may still find one in the contingent analysis in one or two sub-samples. Therefore, a contingent analysis can specify the location of an association found in the overall analysis and may reveal an association that is not apparent in the overall analysis.

It has been demonstrated that the introduction of the contingent factors in the analysis enables the specification of the conditions under which the relationship between IT use and CFR changes becomes particularly pronounced. Moreover, as also noticed by Hyman (1963), such specification naturally leads to further interpretation or explanation of the relationship. For example, the introduction of company size as a factor provides several potential explanations. Finally, by stratifying by the contingent factors, the effect of the relationships[6] between them and the original variables (ITUSE, IRCAGG and ERCAGG) are controlled. *Company size* is positively associated with IT use (coefficients being 0.335**) and it, together with *financial reporting strategy,* is also associated with both IRC and ERC as shown in the pervious chapter. By stratifying the sample into sub-samples by these factors, the contingent analysis excludes the effects of these marginal relationships, and thus contributes to the establishment of non-spurious associations between IT use and CFR changes.

Recall that *company size*, *information demand from internal users*, and *information demand from external users* are associated with both IT use (0.335**, 0.138*, and 0.167** respectively), and with CFR changes (Chapters 5). It is desirable that these factors are simultaneously controlled when the hypotheses are tested. For this, the partial correlation analysis appears helpful. However, this method requires the use of interval or ratio variables, since it is based on Pearson correlations. While *company size* (SALE) is a ratio variable, the other three are ordinal. Treating ordinal variables as interval by following Labovitz's (1970) arguments, the partial correlation analysis is used as a trial. Because of the compromise involved, the results (Appendix 6-5) can only be seen as an approximate guide. The effect of controlling these variables is that the sizes of most correlation coefficients are slightly smaller than the earlier Spearman correlation coefficients. However, the patterns of the contingent associations have not been altered.

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[6] Such relationships are called marginal relationships (Hyman, 1963)

This section has tested the hypotheses. However, as the data used concerning IT use, IRC and ERC are aggregated, some information may have been lost in the aggregation process. It is therefore desirable to analyse the data at a less aggregated level, and this is addressed in the following section.

Section Three: Exploratory Analysis

Because the IT use variables and the CFR variables are aggregated, the tests in the previous section cannot give information regarding which CFR aspect is more associated with IT use, nor can they tell if any IT use item is more associated with IRC and ERC than other IT use indicators. However, the contingency perspective suggests that IT may have a different impact on different aspects of CFR. Therefore, the current section addresses this issue by analysing disaggregated or dimensionalised data. The analyses here are exploratory in nature, mainly aiming to provide further elaboration on the relationship between IT use and CFR changes. Evidence supporting or refuting any hypothesis will be pointed out.

Relationships among aggregated IT use variable and individual CFR variables

According to the contingency perspective, it is likely that some CFR aspects are more, some less and others not at all associated with IT use. To investigate this, a Spearman correlation analysis of the relationships between the aggregated IT use variable ITUSE and individual IRC and ERC items is performed (Table 6-11).

It can be seen from Table 6-11 that 11 IRC items are positively and significantly associated with IT use. The largest coefficient (.289**) is with *user-tailored information*. This implies that IT is used as a powerful tool to sort and tailor information to meet users' specific needs. The next largest coefficients are with *availability*, *strategic information* and *comparative information*. IT use is also positively associated with *forecast information, external information, segmental information, timeliness, frequency, understandability* and *presentation.* However, IT use hardly has any association with *non-financial information, auditability, accessibility* and *cost.*

While as many as 11 IRC items are positively associated with IT use, only three ERC variables are positively and significantly associated with IT use, namely *non-financial information, segmental information* and *presentation.* It seems that some speculated benefits to external users from IT use such as more frequent reporting, more timely reporting and on-line reporting (ITG, 1989) have not yet emerged. Note that this result is inconsistent with a finding obtained in Chapter 5: IT use is considered very important for positive changes in timeliness and frequency of external reporting by both survey respondents and interviewees.

Table 6-11: Spearman Correlation Coefficients between Aggregated IT Use Variable and Items in IRC and ERC Indices

IRC and ERC Item	Correlation between ITUSE and IRC Item	Correlation between ITUSE and ERC Item
Forecast information	.188**	.010
External information	.158**	.035
Comparative information	.224**	.129
Non-financial information	.051	.148*
Strategic information	.249**	.124
Segmental information	.184**	.197**
User-tailored information	.289**	.022
Frequency	.184**	.047
Timeliness	.166**	.086
Auditability	.020	.056
Accessibility	.111	.051
Availability	.257**	-.001
Understandability	.121*	.103
Presentation	.176*	.163*
Cost	.112	.125

Note: The smallest sample consists of 217 cases

It is also noticeable from Table 6-11 that the coefficient between IT use and *non-financial information* of external reporting is larger than that between IT use and *non-financial information* of internal reporting, and in this case the first hypothesis (IT use is more associated with IRC than with ERC) is not supported. However, the number of significant correlations in the table shows that IT use is generally more associated with IRC variables than with ERC variables. This suggests a positive correlation between the size of coefficient in the aggregated analysis and the number of significant coefficients in the disaggregated analysis. Noticeably, the sizes of the correlation coefficients in the table are all quite small, in fact, none exceeding 0.3.

Relationships among individual IT use variables and aggregated CFR variables

Because items in the IT use index represent different aspects of IT use, it is unlikely that these aspects have the same association with changes in CFR. This warrants an investigation into the relationships between individual IT use indicators and the aggregated CFR change variables.

The Spearman correlation analysis is again applied and the results are presented in Table 6-12. The table indicates that *extent of computerisation*, *types of IT based systems in use*, *types of IT applied*, *level of IT integration* and *innovative feature of IT use* are positively associated with IRC while *years of IT use*, *workstation to staff ratio*, *user satisfaction* and *objective achievement* do not have any significant association with IRC at all.

In contrast, the last column shows that only *years of IT use*, *types of IT-based systems in use* and *types of IT applied* are significantly associated with ERC, and that the correlations are quite small. Both coefficient sizes (except in one aspect of IT use, *years of IT use*) and the number of significant correlations support the hypothesis that IT use is more associated with IRC than with ERC.

Note that only *types of IT-based systems in use* and *types of IT applied* are positively associated with both IRC and ERC. *Level of IT integration* and *innovative feature of IT use* are associated with IRC but not with ERC. This seems to suggest the irrelevance of the *way IT is used* to external reporting. A further point to make is that neither indicators of the *quality of IT use* are correlated with either IRC or ERC. This lack of association is unexpected since improvement in financial reporting should be reflected by the level of user satisfaction and the extent of objective achievement. A possible reason is that the two measures (although widely used in the literature of information systems evaluation) are not sophisticated enough to capture fully the quality of IT based accounting applications.

Table 6-12: Spearman Correlation Coefficients between IT Use Variables and Aggregated IRC and ERC Variables

IT Use Variable	IRCAGG	ERCAGG
Extent of computerisation	.173**	.039
Years of IT use	.088	.148*
Types of IT-based systems in use	.196*	.132*
Types of IT applied	.282**	.181**
Workstation to staff ratio	.064	.062
Level of IT integration	.205**	.102
Innovative feature of IT use	.149*	-.028
User satisfaction	.086	-.054
Objective achievement	.085	.025

Note: The smallest sample consists of 226 cases.

Relationships between individual IT use and CFR variables

Apart from the above semi-disaggregated analyses, a fully disaggregated analysis is performed to examine the relationships between individual IT use variables and individual CFR change variables. The results are displayed in Appendix 6-2. It is clear from the appendix that the significant coefficients between IT use items and ERC items are much fewer than those between IT use items and IRC items. It is also noticeable that the coefficients in both tables are quite small.

For internal reporting, the strongest correlations exist between *types of IT-based* *systems in use* and *strategic information*, between *types of IT-based systems in use* and *user-tailored information*, between *types of IT applied* and *forecast information*, between *types of IT applied* and *user-tailored information*, between *types of IT applied* and *availability*, and between *level of IT integration* and *availability*. For external reporting, the strongest correlations exist between *years of IT use* and *segmental information*, between *types of IT applied* and *non-financial information*, and between *types of IT applied* and *presentation*. However, none of these coefficients exceeds 0.3. This again implies that IT use has played only a limited role in IRC and ERC.

An examination of the number of significant correlations provides further information about the relationships among the items. Some IT use items are significantly associated with more IRC/ERC items while others with fewer or no IRC/ERC items. *Types of IT-based systems in use, types of IT applied* and *level of IT integration* are typical examples of the former, while *workstation to staff ratio, user satisfaction* and *objective achievement* are examples of the latter.

A similar comparison can be made among IRC and ERC items in terms of the number of significant correlations that they have with IT use items. Again, some items are significantly associated with more IT use items while others with fewer. Examples of the former include *forecast information, strategic information, user-tailored information, frequency* and *timeliness* in internal reporting, *comparative information, non-financial information* and *cost* in external reporting. For the latter, there are *auditability, accessibility, understandability* and *cost* in internal reporting and most ERC items.

Dimensionalised data analysis

Using the factor scores for the dimensions in Table 6-3 obtained in the first section of this chapter, a number of correlation analyses can be performed. Examine first the relationships between the aggregated IT use variable (ITUSE) and dimensions of IRC and ERC. As shown in Table 6-13, the aggregated IT use variable (ITUSE) is positively associated with all the IRC dimensions. However, it is only positively associated with two ERC dimensions, namely *relevance* and *comprehension*. This not only provides support for Hypothesis 1, but may also explain why IT use is less associated with ERC than with IRC, the reason being that IT use has little bearing upon the other two ERC dimensions: *access* and *time*. The absence of an association between IT use and these two ERC dimensions is consistent with the results shown in Table 6-11, and is again contradictory to common speculations.

Table 6-13: Spearman Correlation Coefficients between Aggregated IT Use Variable and Dimensions of IRC and ERC

CFR Dimensions	Coefficients
IRC: Relevance	.303**
Access	.192**
Time	.184**
Comprehension	.194**
ERC: Relevance	.313**
Access	.029
Time	.080
Comprehension	.146*

Note: The smallest sample consists of 213 cases.

Note that the difference between the association between IT use and the *access* dimension of internal reporting and that between IT use and the *access* dimension of external reporting is further supported by additional data. In the questionnaire survey, the respondents were asked about the on-line access that various user groups have to accounting information (Table Q10 of Appendix 5-1). As expected, corporate managers have more on-line access than external users. Managers in about 70% of companies have some on-line access whereas the percentages for institutional shareholders, individual shareholders, creditors, and suppliers or customers are about 2%, 6%, 10% and 14% respectively.

Table 6-14: Spearman Correlation Coefficients between Dimensions of IT Use and Aggregated IRC and ERC Variables

IT Use Dimensions	IRCAGG	ERCAGG
Extent of IT use	.297**	.211**
Way IT is used	.229**	.059
Quality of IT use	.075	-.049

Note: The smallest sample consists of 226 cases.

Next, the relationships between IT use dimensions and aggregated IRC and ERC variables are investigated. Table 6-14 shows that only the *extent of IT use* is significantly and positively associated with both IRC and ERC, though the association with IRC is stronger. In contrast, the *way IT is used* is associated with IRC but not with ERC, and the *quality of IT use* has no association with either IRC or ERC. These results are consistent with those shown in Table 6-12.

Finally, the relationships between dimensions of IT use and those of IRC and ERC are investigated. Table 6-15 shows that the *extent of IT use* is significantly and positively associated with all dimensions of IRC and ERC except for the *access* dimension of external reporting. The *way IT is used* is significantly and positively associated with all dimensions of IRC, but only with one dimension of ERC (*relevance*), suggesting that the *way IT is used* is more important to IRC than to ERC. This echoes the results exhibited in Tables 6-12 and 6-14, although a modification is provided by the existence of a positive association between the way IT is used and the *relevance* dimension of external reporting. In contrast, the *quality of IT use* has little to do with any IRC or ERC dimension except the *time* dimension in internal reporting. This largely resembles the results shown in Table 6-12 and 6-14, although a modification is provided by the presence of a positive association between the *quality of IT use* and the *time* dimension of internal reporting.

In summary, ITUSE, as an aggregate, is positively associated with all IRC dimensions but with only two ERC dimensions (*relevance* and *comprehension*). The *extent of IT* *use* is positively associated with both IRC and ERC as well as their dimensions except for the *access* dimension in external reporting. The *way IT is used* is positively associated with IRC and all its four dimensions but with only one ERC dimension (*relevance*). The *quality of IT use* has no association with IRC and ERC, nor with any of their dimensions except for the *time* dimension of IRC.

Table 6-15: Spearman Correlation Coefficients between IT Use Dimensions and Dimensions of IRC and ERC

Dimension	Extent of IT use	Way IT Is Used	Quality of IT use
IRC: Relevance	.3236**	.1623*	.0495
Access	.1563*	.2066**	.0495
Time	.1385*	.2183**	.1352*
Comprehension	.1825**	.1242*	.0953
ERC: Relevance	.3661**	.1361*	.0571
Access	.0673	.0010	-.0101
Time	.1617*	-.0321	-.0465
Comprehension	.2055**	.0182	-.0580

Note: The smallest sample consists of 204 cases.

Summary

The relationships between IT use and changes in CFR have been examined in this chapter by way of testing the hypotheses using aggregated data and by some exploratory analyses based on disaggregated or dimensionalised data.

The first hypothesis is confirmed: IT use is more associated with IRC than with ERC. One implication is that IT is now extensively used in accounting, and that more and better information is available, but external users have not benefited as much as corporate managers. This result is consistent with a finding obtained in the last chapter: IT is perceived to be more important in IRC than in ERC. Given that IRC is greater than ERC (a finding obtained in the last chapter), these results together suggest that IT use has played a role in increasing the gap between internal reporting and external reporting. The analysis also supports the hypothesis that the relationship between IT use and IRC is stronger in small companies than in large ones, suggesting that IT use is more effective when the organisation is less complex and hence the information system is less complicated. It may also be because IT use, especially the use of PCs, LANs and economical software, has removed or made less significant some previous resource constraints in smaller companies. The confirmation of the hypothesis that the relationship between IT use and ERC is stronger in large companies than in smaller ones is consistent with agency theory, suggesting that large companies (more exactly *very* large companies) are more likely to share the benefits from IT use with external users because of the reduction of agency costs (less political costs and more financing benefits) arising from improved external reporting.

IT use is also found to be positively associated with ERC in companies which strictly adhere to reporting requirements. However, only very limited evidence suggests that this might be because changes in accounting standards and regulations (excluding financial reporting requirements imposed by the financial market as these have experienced little change) result in changes of accounting method or disclosure format, and thus make it necessary to change or update IT systems. It is surprising that there is no association between IT use and ERC in companies adopting an informational reporting strategy. The existing information asymmetry may be one reason for this, since where an information asymmetry exists between internal users and external users, an informational strategy does not necessarily require the production of additional information. Moreover, the informational strategy may not necessarily require an update of the IT infrastructure. Further, the interview data suggest that a company may have different strategies towards different user groups, implying that *financial reporting strategy* is far more complicated than Gibbins *et al.* (1990) described.

Discussions with interviewees about the financial reporting strategy suggest that the relationship between IT use and ERC may be conditional upon the existence and level of gearing, because companies relying upon financial support from creditors tend to disclose management information to creditors. Consistent with the agency theory arguments, a statistical test shows that when the gearing ratio exceeds 100%, there is indeed a positive association between IT use and ERC.

It has been found that IT use is positively and significantly correlated with external reporting change when companies operate no management compensation plan. The interview data suggest that the positive correlation between IT use and ERC may have resulted from the fact that these companies rely on creditors and hence they have to adopt an open policy to creditors. It is unexpected that IT use has no association with ERC in companies operating any type of management compensation scheme. The interview data suggest that factors such as poor operating results, low market prices and cash shortage may have made management incentive plans ineffective in many companies, thus breaking the two hypothesised links with financial reporting decision making, and with IT investment decision making. However, since only 14 interviews were conducted, these reasons should be treated as indicative rather than conclusive.

No evidence has been found which supports the hypothesis that the relationship between IT use and ERC is conditional on listing status. This indicates that financial market regulators have played no role in promoting IT use for the purpose of external reporting in the UK, and/or that financial reporting requirements imposed by the financial market regulators have undergone little change.

The exploratory analyses using disaggregated data and dimensionalised data are a complement to the aggregated analysis. A number of observations have been obtained. First, IT use is more associated with IRC than with ERC, an additional support for

Hypothesis 1. Second, IT use has little bearing upon the *access* and *time* dimensions of external reporting, a finding conflicting with speculations in the literature. Third, how IT is used has little to do with external reporting although it is relevant to internal reporting. Finally, the *quality of IT use* has little association with either IRC or ERC. As discussed earlier, this is unexpected. A possible reason for the absence of an association is that the variables used may be problematic.

It should be remembered that these findings should not be over interpreted because the data have been obtained from the providers rather than users of information. It is possible that users have a different perception regarding the changes in information that they receive, and hence the influence of IT on these changes.

An advantage of the stratified data analysis is that the criticism levelled on the contingency theory of organisation (CTO) concerning linear relationship assumptions as discussed in Chapter 3 can be avoided. However, the approach adopted in this chapter could not avoid another criticism on CTO: the contingent factors have not been analysed in a collective manner and thus the collective influence of these factors on the relationship between IT use and CFR could not be discerned. The reason for this failure lies in the nature of the sample data which are largely ordinal and nominal and thus are incapable of being used collectively in more sophisticated statistical models.

Chapter 7: IT in Accounting Method Choice and Change

The previous two chapters have investigated the impact of IT on the extent and quality of information provided to users. However, financial disclosure is only one part of CFR, although it is perhaps the most substantial part. Another important aspect is accounting method choice and change. According to the proposed contingency perspective, the impact of IT on CFR varies depending on different aspects of CFR. Thus the findings obtained in the last two chapters may not be applied to accounting method choice and change, and it is necessary to undertake a separate investigation of the impact of IT on this aspect.

Accounting method choice and change has attracted persistent research effort, exemplified by "positive accounting theory" (Watts and Zimmerman, 1990). Research, however, has exclusively been undertaken to explore the factors that affect accounting method choice, while leaving the process of accounting method choice and change unattended. The result of this searching effort is that a number of factors have been identified as causes of accounting method choice and change by positive accounting theory and other accounting studies. IT, however, has not been considered as a factor. On the other hand, it is suggested that the use of IT is responsible for greater use of the more sophisticated techniques and multiple methods in financial management such as investment appraisal (Sangster, 1993). Similarly, as described in Chapter 2, there have been expectations in the literature concerning the impact of IT on accounting that IT would lead to more use of sophisticated methods (McRae, 1964; AAA, 1966) and the use of multiple methods (AAA, 1966; Bedford, 1973; Tweedie and Whittington, 1990).

This chapter evaluates whether IT is a factor influencing accounting method choice and change, and in particular whether the above two predictions have been realised.

The first section introduces theories of accounting choice and factors affecting accounting choice identified using these theories. A descriptive model of the process of accounting method choice and change is provided in Section 2, and the role of IT in that process is assessed in Section 3.

Section 1: Accounting Choice Studies

There are three competing yet confounding theories of accounting choice, namely opportunism, efficient contracting, and information perspective (Holthausen, 1990). The opportunism view holds that accounting choice is driven by opportunistic behaviour of management for maximising their own utility. Because of their holdings of shares, share options, and their bonus compensation plans, managers could take actions that transfer wealth from debt-holders and shareholders to themselves. This is essentially a self-interest theory of accounting choice. In the agency or contracting setting, since shareholders and debt-holders realise that the future actions of management can transfer wealth among contracting parties, they seek price protection against the loss from this expected managerial opportunism when writing contracts. Aware of this price-protection mechanism, management would in turn attempt to maximise the amount of expected opportunism. However, since information asymmetry and costs make perfect monitoring of management behaviour difficult or impossible, management could take additional actions unexpected by other contracting parties for their own interests (Christie and Zimmerman, 1994).

Similar to the opportunism theory, the efficiency perspective is based on the notion that contracts are implicitly or explicitly based on accounting numbers. Unlike the opportunism perspective, however, the efficiency view maintains that accounting methods are selected to minimise agency costs (such as contacting costs, monitoring costs, bonding costs, and the residual loss from dysfunctional costs) among the various parties, resulting in maximising the value of the firm.

In contrast, the information perspective suggests that accounting methods are chosen to reveal management expectations about the future cash flows of the firm. While the other two views emphasise the causal relationship between accounting choice and cashflows, this perspective stresses that the chosen methods provide information about cashflows, but do not directly affect them (Holthausen and Leftwich, 1983).

Most accounting choice studies adopt the opportunism view and some the efficiency perspective, whereas the information perspective has not been tested (Watts and Zimmerman, 1990). However, it is argued that many empirical findings of the factors that affect accounting choice can be interpreted for both opportunism and efficiency reasons (Christie and Zimmerman, 1994). Similarly, some evidence which supports the efficiency theory is also consistent with the information view (Holthausen, 1990). This implies that the three theories may be at least partly interwoven with each other.

With difficulty in structuring theoretical arguments, most accounting choice studies test three particular hypotheses: (1) bonus plan hypothesis - managers of firms with bonus plans are more likely to use accounting methods that increase current period reported income, (2) debt to equity hypothesis - the higher the company's leverage, the more likely managers use accounting methods that increase income, and (3) political cost hypothesis - large firms rather than small firms are more likely to use accounting choices that reduce reported profits where size is used as a proxy variable for political attention. Empirical evidence is generally consistent with these hypotheses though the explanatory power of the models used in these studies tend to be low (Watts and Zimmerman, 1990).

Although the empirical results are not always consistent, other factors found to affect accounting choice include business risk, interest coverage, dividend constraints (Christie, 1990), ownership structure, industrial classification, capital intensity, and a net operating loss carried forward (Kuo, 1993).

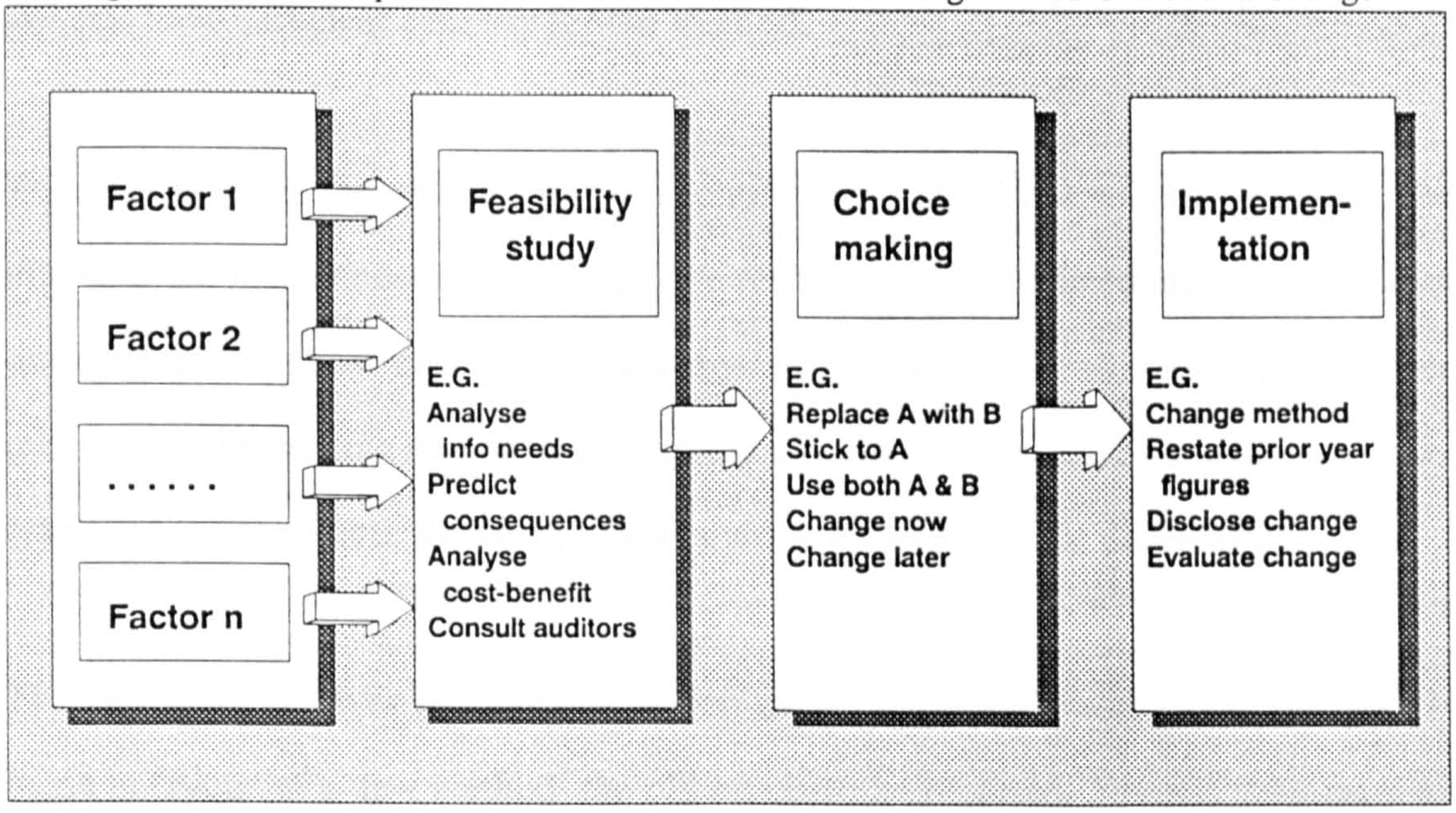
Two observations can be made about this literature of accounting choice. First, it consists essentially of factor-seeking studies. That is, attention has been paid to stimuli that lead managers to use a particular accounting method or a set of accounting methods, while the process of adopting the method chosen, or how the accounting method is chosen and implemented, has rarely been touched. Second, since the process of accounting method change is largely neglected, some more obvious factors which may influence accounting choice have been set aside, for instance, the cost of changing one method to another, the firm's capability of applying the alternative methods, data volume induced consideration in applying the alternatives, and the use of IT. For these reasons, this literature cannot provide any assistance in investigating the role of IT in accounting method choice and change.

Section 2: The Process of Accounting Method Choice and Change

Earlier, the impact of IT on financial reporting was defined as IT-related changes in financial reporting, which encompasses two different roles of IT: as a cause and as a facilitator. This definition is also applied here in examining the importance of IT in accounting method choice and change.

To assess properly these two roles of IT, especially the facilitating role, it is desirable to see accounting method choice and change as a process. Figure 7-1 provides a descriptive model of this process which consists of three phases: feasibility studies, choice-making, and implementation.

Figure 7-1: A Descriptive Model of the Process of Accounting Method Choice and Change



There are two types of accounting method change. One is mandatory, required by law or generally accepted accounting principles [GAAP]. The other is voluntary, at the discretion of management, but confined to law, GAAP, and an agreement between management and other claim-holders. Management may actively consider whether to change an existing method, driven by factors such as those described in the previous section.

In either case, a feasibility study may be required before a method is chosen. One aspect of this feasibility study might be the prediction of the economic and political consequences of alternative methods. Another could be a cost-benefit analysis, comparing the relative costs and benefits of alternative methods. Users' information requirements may also be considered. This is most likely if the management takes an information perspective. Further, it may be necessary to consider whether the intended change will violate law or GAAP, and thus auditors might be consulted. In addition, the management may have to consider the technical or technological constraints, for example, whether the method is understandable and whether the systems have sufficient capacity for the method.

The next stage is the choice of an accounting method. In a mandatory change, the management may choose to implement the required method immediately, or at a later time. In a voluntary change, the management may decide to substitute another method for the existing one or to stick to the old one. In some cases, the decision may result in the use of both the new method and the existing one for different purposes.

The last stage involves the implementation of the chosen method. If the decision is made in favour of a new method, the old one is to be replaced. For this, training may have to be provided for the accountants, and the related accounting system to be changed. Moreover, to maintain consistency and comparability, prior year figures may have to be restated using the new method. In addition to these, the system capacity may need to be enhanced if the decision is such that multiple methods are to be used. If the change is material, the change and its effects may have to be disclosed in the annual reports or elsewhere. Also, the management may assess the change and see if it has or can meet their expectations. If not, a further change may be conceived.

What can IT do in this process? First, IT could be one factor which makes managers consider an accounting method change. Second, IT might be helpful in the feasibility study. One way would be by providing assistance in the user requirement analysis, simulation or prediction of consequences, and cost-benefit analysis. Another would be that the presence of IT makes some traditional considerations less significant, such as the cost of the method change, the difficulty in changing a method, the large data volume introduced by the new method, and the sophistication of the new method. At the second stage of the accounting choice and change process, IT such as expert systems or decision support systems may replace managers in making the choice if the change is relatively minor. In more significant changes (those having considerable economic or political consequences), the choices have to be made by managers themselves. Finally, the use of IT might make the implementation of the change more efficient and effective. For example, with all inventory evaluation methods programmed, it is much easier and perhaps less costly to switch between them. The use of IT also makes the restatement of prior year figures a less formidable task.

Section 3: The Role of IT in Accounting Method Choice and Change

Data concerning the role of IT in some aspects of accounting method choice and change were collected via the questionnaire survey, and are tabulated in Tables Q11 to Q18 of Appendix 5-1. This section analyses and summaries the collected data.

Predicting consequences of accounting method change by using IT (Table Q11). An accounting method choice and change may result in many economic consequences to managers and other stake-holders. A possible role of IT is that it may be used to simulate the consequences of alternative methods and predict probable results of an accounting change. The data show that a large majority of companies use IT this way although the frequency of this use varies across these companies.

Cost and smoothness of an accounting method change (Tables Q12 and Q13). A change of accounting method is often costly and cumbersome. Does IT use reduce or increase the cost? Does IT make such a change easier or more difficult? One third of companies report that IT use reduces the switching cost. However, a negative effect occurs in ten percent of companies, while no difference is observed in about 21% of companies. As to the other question, a little over half of the companies receive a positive effect, compared to only a little more than 6% of companies where a negative effect is witnessed. Also, no difference can be observed in about 16% of companies.

Significance of method complexity in accounting choice (Tables Q14 and Q15). An accounting method may be complex because it requires the processing of a large amount of data or because it is mathematically or statistically sophisticated. Both may present a barrier to the adoption of the method. A little more than one third of companies report that IT enables them to use more frequently those accounting methods which are mathematically or statistically sophisticated, while only 1% claim that IT reduces the use of methods of this kind and some 29% report that there is no change. When asked to assess whether IT use has made the consideration of data volume more significant or less in accounting choice, 38% of companies claim that IT makes this consideration less significant, about 23% give the opposite answer, and nearly 25% do not witness any change.

The use of multiple methods (Tables Q16 and Q17). A company may use different accounting methods simultaneously to serve various reporting purposes. For example, under the circumstances of inflation, both historical cost and a method of current cost may be used. However, the adoption of multiple methods requires greater information capacity. Has IT use enabled the use of multiple methods? The responses contrast sharply: about 45% of companies say "Yes", and about the same percentage of companies answer "No". The most frequently cited example by those whose reply is "Yes" is the use of depreciation methods (by 62%), although income measurement, stock valuation, costing and foreign currency translation are also used as examples by 42% to 49% of companies.

User information needs analysis (Table Q18). To make a wise accounting choice, it may be necessary to analyse and define user information requirements. Several reasons suggest that IT can improve information analysis. First, accountants freed from clerical work through automation can work more on information analysis.

Second, each time a new information technology is introduced or when an old IT-based system is upgraded, user information needs must be analysed, specified and programmed. Indeed, information analysis has become an important part of systems development (Avison and Fitzgerald, 1988). Finally, the greater capacity for information processing provided by IT allows systems builders to proceed with fewer inhibitions and consider a higher degree of quantification (Murray, 1967). This is partly supported by the survey data: IT has improved the definition of information needs of internal users in an overwhelming percentage of companies (about 85%). However, the percentage of companies where IT use also makes information needs of external users better defined is only 23%, an indication of information asymmetry.

The role of IT in accounting method choice and change was also investigated in the interviews (Appendix 4-4). One question posed to the interviewees is whether IT is a cause of any accounting method change. Of the eight interviewees who answered this question, only one gave a positive reply. The example given is the change from last-in-first-out method to average cost in securities valuation. The company had long realised the advantage of average cost, but could not use it until the computer was introduced. The other interviewees could not find a method change caused by the use of IT. One reason given by an interviewee is, "Accounting policy is driven by regulatory environment, not really IT-driven. Accounting policy has little freedom". Another interviewee provided a different view: "You do not need to change your accounting policies to suit IT. Rather, IT is there to suit your changes and your requirements".

The interviewees were also asked to describe the process of accounting method choice and change, and the role of IT in this process. The results show that different activities are carried out in choosing and changing an accounting method, but in all companies the process generally consists of the three phases shown in the descriptive model (Figure 7-1). However, the way the choice is made at the second stage may differ from one company to another. In some companies the decision is made by the board of directors, while in others the decision makers are the finance director and the managing director. Moreover, the way a decision is made depends on the significance of the change under consideration. As for the role of IT, interviewees reported a number of aspects where IT is particularly important: (1) IT use makes the method change much easier since current packages accommodate many alternative methods; (2) IT-based systems provide the data for the comparison of alternative methods; (3) IT such as a spreadsheet package is very useful in simulating and predicting the possible results of the proposed change; and (4) IT helps determine the optimal extent of change, such as an appropriate level of bad debt provision and a sensible estimate of asset lives.

A further question raised with the interviewees is whether their companies actually use multiple accounting methods, and mathematically or statistically sophisticated methods with the assistance of IT. The answer to both questions was negative. In the case of multiple methods, IT provides the capacity to use different methods in theory, but companies do not actually use multiple methods for the same transaction or the same type of transaction. One reason given by the interviewees is that it is not necessary to use multiple methods. However, two companies report that they use multiple methods in forecasting cashflows, for example, both historical cost and inflation may be considered.

Summary

This chapter has provided a descriptive model of the process of accounting method choice and change, and assessed the role of IT in accounting method choice and change. Only very limited evidence is found which supports the assumption that IT is a cause of accounting method change. However, IT is found to play a significant facilitating role in several aspects of accounting method choice and change.

It is largely agreed that IT is an important supporting tool in simulating accounting changes, defining information requirements of internal users (but not external ones), and easing the change of accounting method. However, there is no agreement as to whether IT use has increased or reduced the cost of switching an accounting method, whether IT use has made less significant a consideration of the data volume to be handled, whether IT use has given rise to greater use of mathematically sophisticated methods in accounting, and whether IT has increased the use of multiple methods.

Chapter 8: Conclusions

This study has two principal objectives: (1) to propose a contingency framework, and (2) to evaluate empirically the impact of IT on CFR under the proposed framework. The contingency framework is presented in Chapter 3, while the empirical evaluation of the impact of IT on CFR is undertaken in Chapters 5 to 7. The primary purpose of the current chapter is to assess these two objectives. In addition, the limitations of this study are pointed out, and the implications for financial reporting policy-making and for further research are discussed.

Section 1: The Contingency Perspective

The main aspect of the proposed perspective is that it offers a view of the relationship between IT and CFR: the impact of IT on CFR is conditional. It assumes that the actual impact of IT varies depending on some key environmental, organisational and managerial factors, and varies depending on different aspects of CFR. This also means that IT may have no impact at all under certain circumstances.

Clearly, this view is different from both the universalist views, and the particularist perspectives represented by emergent theories (Markus and Robey, 1988). The universalist perspectives either assume that IT has unlimited power (IT imperative), or postulate that organisational forces have unlimited control over the consequences of IT use (organisational imperative). The contingency perspective admits the power of IT which attracts people to use it, but its use is to some extent subject to human judgement and control. It also admits that people and organisations have some control over IT use, but on the other hand, it holds that the consequences of IT use may not always be as expected .

In contrast, the particularist views maintain that the consequences of IT use are unpredictable, because of the influence of either the social factors (social-technical systems theory) or political factors (organisational politics). The contingency perspective also considers the influence from various factors. However, it holds that the consequences of IT use are predictable, though this requires a knowledge of some key contingent factors. Moreover, while the two emergent theories focus either on social factors or political ones, the contingency perspective allows an examination of different types of factors in a single study. In the current study, the factors considered include political (listing status), economic (company size, leverage, management incentive plan), and cultural (financial reporting strategy). Therefore, compared with those emergent theories, the proposed framework is more general, and offers flexibility in selecting factors.

Since the impact of IT on CFR is conditional, the discovery of contingent factors that specify the degree or pattern of IT impact becomes the focus. This provides an interface to some existing knowledge such as studies of CFR using information economics, agency theory and positive accounting theory, as these studies are concerned with the factors that affect financial reporting. These studies are used in two ways. First, they suggest the contingent factors to be considered in this study. Second, they provide theories or explanations. It has been demonstrated in Chapter 6 that some factors considered in these studies (company size, leverage) also moderate the relationship between IT use and CFR.

The contingency perspective is analytical, as it allows a breakdown of the relationship between two original variables into component associations. This is achieved in two ways. One is by examining the role of IT in different aspects of CFR assuming that it varies from one aspect to another. It encourages a disaggregated data analysis and leads to the specification of the relative importance of IT in different aspects of CFR.

The first hypothesis provides an illustration of this approach. Without a separate investigation into the relationship between IT use and IRC, and that between IT use and ERC, the research would not be able to bring IT use into the context of information asymmetry.

The second way is by identifying contingent factors which specify the pattern and degree of the impact of IT on CFR. This encourages a contingent analysis based on sub-samples, as opposed to an overall analysis based on the whole sample. It leads to the specification of the conditions under which IT has or has not played a role in CFR. The hypotheses other than the first illustrate this approach. The results from the tests of these hypotheses persuasively show that such an analysis results in rather fruitful findings, demonstrating that IT use is more important in some sub-samples than in others, and has no association at all with IRC or ERC in still others. Compared with the results from the overall analysis (the test of the first hypothesis), the contingent correlations are not always consistent with the overall correlation in terms of size and direction. For instance, the overall relationship between IT use and ERC is smaller than the contingent associations in large companies. This is the case because the overall relationship is a kind of complex "sum" of the contingent associations and marginal relationships (Hyman, 1963).

Such an analytical approach allows the researcher to gain insights into the issues under investigation and enhances his/her understanding and ability to predict. For example, with the knowledge that IT has greater impact on IRC than on ERC and that IT is more associated with ERC in large companies than in smaller ones, one would not generally predict that IT has or has not an impact on CFR without distinguishing internal reporting from external reporting and without differentiating company size.

This study has also demonstrated that the contingency perspective is operational. First, it can be formulated into a specific and testable hypothesis, once a contingent factor is determined. This can be seen from Chapter 3. Second, Chapter 6 shows that the contingency framework is statistically viable. Statistical procedures for contingent analysis are well developed. Depending upon the type of variable which is involved, well accepted methods such as contingency table analysis, Pearson correlation analysis, Spearman correlation analysis, and Kendall correlation analysis can be used. Moreover, this perspective offers a three dimensional research design by considering contingent factors as well as IT use and CFR changes. Such a design has a potential advantage for the researcher. If the researcher only considers two dimensions (say IT use and a CFR change) and hopes to find a relationship between them, he/she may be disappointed at the result that no relationship exists. However, by taking a contingent factor into account, a relationship between IT use and a CFR change at one or more levels of that factor may be found.

The contingency perspective is proposed for the evaluation of the impact of IT on CFR in this study. There is no reason, however, why it cannot be applied in the study of the impact of IT on other aspects of accounting such as accountants, accounting organisation, and accounting data processing. The assumption that the impact of IT is conditional has been supported by empirical data in the current study, and seems widely applicable. For example, it could be hypothesised that the impact of IT on accounting organisation (centralised or decentralised, independent or absorbed into a larger data processing function) is conditional upon factors such as company size, corporate culture, management style, and corporate organisation. Similarly, it could be hypothesised that the impact of IT upon individual accountants (substituted, endangered, de-skilled, bewildered, helped, or enriched) is conditional upon age, education (with or without IT training), and position (book-keeper through to strategic decision-maker). It could also be hypothesised that the impact of IT on accounting data processing is conditional upon the nature of the data related to transactions, expertise or decision making.

The proposed contingency framework should be evaluated further with reference to the criticisms toward the contingency theory of organisation (CTO) as detailed in Chapter 3, since it is developed analogously from CTO. A major strength of the proposed framework is that it segments the sample into subsamples according to the specified contingent factors and examines the contingent relationships in subsamples. For example, it does not assume that the association between IT use and ERC increases in a linear manner as the size of the company increases. Rather, it hypothesises that IT use is more associated with ERC in large companies than in small ones. This approach has avoided the much criticised linear assumptions often made in CTO between the contingent factors and the original variables (structure and performance). Further, being aware of the fact that some contingent factors are correlated with each other, partial correlation analysis has been performed to control the effect of company size while testing Hypothesis 4, 5 and 6. Finally, the symmetrical property of the contingency theory has been recognised in Hypotheses 2, 3, 4, 5 and 6.

However, the proposed framework suffers from two common problems of CTO. First, while the segmental analysis has helped avoid the problem of linear assumptions, it has not enabled the examination of the contingent factors in a collective manner. Theoretically, one could stratify the sample according to all the contingent factors simultaneously, but this would require an exceptionally large sample or the subsamples would be too small for any sensitive data analysis. Alternatively, one could use liner regression models or partial correlation analysis to incorporate all other factors, but this treatment would again fall victim of the linear assumption problem. Moreover, because the nature of the data obtained (most of the variables are ordinal or nominal), neither of these two possible approaches could be implemented in a strict sense.

Moreover, this study is largely a cross-sectional investigation, and thus is only a static test of the proposed perspective, although interviews have provided some information about the dynamic nature of the impact of IT on CFR. Consequently, questions such as how IT and CFR interact with each other remain to be answered. To fully test the framework, some kind of longitudinal or anthropologically anchored approaches may be needed, although a robust theory should withstand empirical investigation from either approach (Gordon and Narayanan, 1984).

Section 2: The Impact of IT on CFR

This section synthesises the main empirical results concerning the impact of IT on CFR. These findings, however, should be treated with caution as they are constrained by the limitations of this study. Some of these limitations have already been discussed in the previous section, and a full summary will be presented in Section 4. However, it may be necessary to draw attention to two particular limitations here. First, the data in this study have been acquired from the providers rather than users of financial information for various reasons outlined in Chapter 1. Because of this, the findings below do not necessarily represent users' perceptions. Second, the impact of IT is defined as IT-related CFR changes and this definition is intended to encompass two possible roles of IT (as a cause and as a facilitator of a CFR change). As the relationship between IT and CFR is likely to be symmetrical or reciprocal, it is difficult and may not be necessary to distinguish these two roles (Rosenberg, 1968), and thus no such attempt has been made in this study. Consequently, "impact" or "the role of IT" does not necessarily mean "IT causes a CFR change".

Both internal reporting and external reporting have been improved but the information asymmetry between managers and external users has increased. Chapter 5 shows that there is a positive change in all investigated aspects of internal reporting and external reporting in most companies with the exception of the *cost* of financial information. Interestingly, clear parallelism exists between IRC and ERC. *Forecast information*, *frequency*, *timeliness* and *presentation* are most frequently marked as having greatly changed in both internal reporting and external reporting. In contrast, *availability*, *accessibility*, *strategic information*, *external information*, *segmental information*, *understandability* and *non-financial information* are most frequently marked as exhibiting no change in either internal reporting or external reporting.

In spite of this consistency between IRC and ERC, the Wilcoxon tests indicate that overall IRC is greater than ERC, and the change in all investigated aspects of internal reporting except information *cost* is greater than the corresponding aspects of external reporting.

IT plays a role in both IRC and ERC but is also attributable to the exacerbation of the information asymmetry between managers and external users. A number of factors have played a role in IRC and ERC, including *information demand from internal users*, *information demand from external users*, *financial reporting strategy*, *management compensation plan* and *company size*.

IT is another factor. The extensive use of IT is seen by many companies as having had an irrevocable effect: they can no longer run their businesses without computerised accounting systems. The interview data also show that IT use has resulted in more timely and frequent management reporting, savings in labour and time, and a change of the role of accountants from a book-keeper to a data analyst, problem detective or solver.

The survey data analysed in Chapter 5 indicate that IT is considered to be important in both IRC and ERC, especially in the change in *forecast information*, *frequency*, *timeliness*, *availability* and *presentation*. Except for the *cost* of external reporting, there are positive and relatively strong associations between the degree of IT importance and the extent of change in all aspects of internal reporting and external reporting, further suggesting that IT plays a role in both IRC and ERC.

However, the Wilcoxon tests show that, overall, IT is seen to be more important in IRC than in ERC. Individually, IT is considered to be more important in all aspects of internal reporting than in the comparable aspects of external reporting, except in the change in *external information*, *comparative information*, *auditability*, *accessibility* and *availability*. Moreover, consistent with Hypothesis 1, various correlation analyses using aggregated, dimensionalised and disaggregated data in Chapter 6 demonstrate that IT use is more associated with IRC than with ERC. These results suggest that IT has played a role in the aggravation of the information asymmetry between managers and external users.

The impact of IT on external reporting is conditional. First, while IT use may play a part in the change in one aspect of external reporting, the same may not be true for another aspect. The exploratory correlation analyses in Chapter 6 show that IT use has contributed to the provision of more *segmental information*, *non-financial information* to external users, and has improved the *presentation* of financial reports. Moreover, the frequency analysis in Chapter 5 suggests that IT use has also enabled more timely and, to a lesser extent, more frequent external reporting. However, the analyses in both chapters find little effect of IT on the other investigated aspects of external reporting. Especially, some speculations in the literature (for example IT use enables more on-line reporting) have not been realised.

Second, the hypothesis testing in Chapter 6 shows that the relationship between IT use and ERC varies depending on contingent factors such as *company size* and *gearing*. The relationship between IT use and ERC is stronger in *very* large companies than in smaller ones, suggesting that *very* large companies are more likely to use IT for external reporting because of the reduced agency cost and reduced political confrontation arising from improved external reporting. The relationship between IT use and ERC is also conditional upon the existence and level of gearing. In order to reduce agency cost arising from high financing cost and suboptimal investment, companies with a very high gearing ratio (exceeding 100%) tend to disclose to banks and creditors much management accounting information in addition to the mandatory interim and annual reports, and this gives IT a role to play.

In addition, *financial reporting strategy*, *management compensation plan*, and *listing status* are also hypothesised contingent factors, but the results are mixed and somewhat unexpected. IT use is found to be positively and significantly associated with ERC in companies adopting a *ritualism* reporting strategy. However, only very limited evidence suggests that this might be because changes in regulations result in changes of accounting method or disclosure format which in turn require IT systems updating. Unexpectedly, contradictory to the existence of a positive association in companies with a *ritualism* strategy, no association between IT use and ERC is found in companies adopting an *informational* strategy. This might be due to the existence of information asymmetry between internal users and external users in favour of the former, as the asymmetry allows companies to use internally available information to meet the requirements of an *informational* strategy. Moreover, although the *informational* strategy requires improved external reporting, existing IT systems may be able to achieve this and therefore an update of the IT infrastructure may not be necessary. However, given the above mentioned conflict, a further reason may be that the variable derived from Gibbins *et al.* (1990) is problematic. As discussed in Chapter 6, a company may have different reporting strategies for different user groups, and thus the variable adopted could not capture that complexity. Therefore the use of this variable needs further elaboration.

IT use is positively and significantly correlated with ERC when companies operate no management incentive plan. The interviews suggest that this may be because these companies rely on creditors and hence they have to adopt an open policy to them. Unexpectedly, IT use does not seem to be associated with ERC in companies operating any management incentive scheme. The interview data indicate that factors such as poor operating results, low market prices and cash shortage may have made management incentive plans ineffective in many companies, and thus may have broken the hypothesised links between management compensation plans and decision makings in both financial reporting and IT investment. However, since these explanations have been acquired from only 14 interviews, they should not be seen as conclusive, and further corroborative evidence is required.

Moreover, there is no significant association between IT use and ERC in listed companies, and no evidence supports the hypothesis that the relationship between IT use and ERC is stronger in listed companies than in unlisted ones. One reason for this may be that little change has taken place to the financial reporting requirements imposed by the financial market. Indeed, this has been so since 1995. Another reason may be that financial market regulators have not contributed to promoting IT use for external reporting in the UK. The interviews indicate that neither the financial market regulator nor any other financial reporting regulator has made a direct contribution.

The impact of IT on internal reporting is conditional. First, the effect of IT depends on different aspects of internal reporting. For example, the survey data analysed in Chapter 5 indicate that IT is considered to be very important in the provision of, for instance, more forecast and user-tailored information, and more timely and better presented information. However, it is seen to be less important in the change in non-financial information and understandability.

In addition, it is found that the relationship between IT use and IRC is stronger in small companies than in larger ones. It may be because IT use is more effective when the organisation is less complex and hence the information system is less complicated. It may also be because IT use has removed or made less significant some previous resource constraints in smaller companies. Further, since small companies started from a lower reporting base, it is more likely that the use of IT or a update of IT may accentuate the improvement in internal reporting. Surprisingly, there is no association between IT use and IRC in large companies although this reinforces Carr's finding (1987) that large companies are rather sceptical about the benefits from IT use.

IT may not be a cause but is an important facilitator of accounting method change. There is only very limited evidence which indicates that IT use causes accounting method change. Nor do the data support the prediction that the use of IT results in (1) greater use of mathematically or statistically complicated methods in accounting, and (2) the use of multiple methods. One reason for this is that accounting method choice and change is largely regulation-driven and the scope of accounting choice is small in the UK. Further, an accounting policy change is not for the use of IT. Rather, it is the converse. Nevertheless, IT plays a significant facilitating role in the feasibility study stage and implementation stage of the process of accounting method choice and change. For example, it makes the method change-over much easier and is very useful in predicting the possible consequences of a policy change.

The disclosure of management accounting information to external users points the need of a broader approach to the investigation of external reporting. In discussing financial reporting strategy with interviewees, it was observed that many companies now provide their creditors or potential customers with much management accounting information in addition to interim and annual reports, while they may only provide interim and annual reports to shareholders. The disclosure of management accounting information indicates that at least some external users can benefit from some internal reporting improvements (whether or not IT-induced). It however also suggests a possible deterioration of the information asymmetry among external users. Perhaps more importantly, this finding casts doubt on the adequacy of the traditional approach to the investigation of financial disclosure based on formal interim and/or annual reports only. Given that companies may have different sets of external reports to different users, a new approach is needed which includes all these different sets. Such an approach may be more appropriate for determining the extent of disclosure and discretionary disclosure, for the study of the information asymmetry between internal users and external users and among external users, and for the examination of how information affects different users on the financial market.

Section 3: Implications

The previous two sections have already discussed some implications of the proposed perspective and the findings. This section is an extension of those discussions, especially on two aspects: information asymmetry and the nature of financial reporting.

IT and information asymmetry. Many of the above findings indicate that the issue of information asymmetry may have been complicated by the use of IT. It is, therefore, necessary to elicit the implications of this effect. Recall that there are two forms of information asymmetry in an agency setting. The first is between more informed managers and less informed investors, and the second is among external users groups. This study mainly involves the first by contrasting internal reporting and external reporting. As discussed in Chapter 3, information asymmetry combined with unconstrained opportunism results in two major problems: moral hazard and adverse selection. Largely because of these problems, the amelioration of information asymmetry by increasing public financial reporting provides a number of social benefits as identified in information economics (Walker, 1987).

Information technology is instrumental to financial reporting. However, it is a double-edged sword. Its use may either alleviate or aggravate information asymmetry. Based on the data collected from the providers of information, this study has demonstrated that IT use has contributed to some financial reporting improvements, but it has also played a role in worsening the information asymmetry between corporate managers and external users. IT has now been used extensively in accounting and, as a result, more and better information becomes available. While managers have full access to this information, outsiders do not. To a lesser extent, this study has also found that IT use plays a role in increasing the information asymmetry among external user groups. On the one hand, IT use enables companies to provide creditors with monthly or even more frequent management accounting information; on the other, public shareholders and other stakeholders may receive only mandatory interim and annual reports. A comparison of the benefits to different user groups suggests that IT is harmful to the extent that the enlarged information asymmetry counteracts the social value of financial reporting.

The desire to alleviate information asymmetry provides a strong rationale for financial reporting regulation (Beaver, 1986). Since IT use has played a role in the increase of the information asymmetry under investigation, it should be realised that IT use in accounting is not merely a matter of technological innovation, but it also involves the interests of many users of accounting information. It may also be argued that the effect of IT use in accounting is not confined to individual organisations, and thus it needs some monitoring and control at a societal level. Thus the question of regulators' role and responsibility in the use of IT in accounting is raised.

Many studies have provided recommendations to various regulators in this respect. However, all the recommendations made have been concerned with accountants (as individuals or as a whole). Nothing has been proposed about regulators' role in IT use for external reporting purposes except Hopwood *et al.* (1990) who adopt a do-nothing position. Their advice to the Institute of Chartered Accountants in England and Wales is that the institute should make no attempt to exert much influence on the development of IT applications or their commercial exploitation.

To the extent that IT use has a negative effect on the information asymmetry between internal users and external ones, it could be argued that financial reporting regulators have a responsibility for monitoring and controlling IT use in accounting. Three approaches by which regulators may play a role are conceivable: (1) directly regulating IT use for external reporting, (2) producing more stringent regulations on financial reporting which in turn influence IT use, and (3) directly using IT by regulators for external reporting. A combination of these options is of course a possibility. Further research is required to establish the feasibility of these approaches and this is beyond the scope of this thesis. However, intuitively the first approach seems least acceptable if at all. The second appears more promising as it poses little resource requirements for regulators, although resistance from financial information providers may be provoked. The third one is possible and is currently adopted by SEC although the effect of its system (EDGAR) on external users remains uncertain at this stage. In short, it seems that any attempt to reduce IT use for internal reporting is doomed. A more acceptable way is perhaps to encourage and promote greater IT use for external reporting. However, the data in this study indicate that regulators have done little in promoting IT use for external reporting in the UK.

IT and the nature of financial reporting. It may be asked why IT use is attributable to the increase in the information asymmetry between managers and external users. Is it because of the existence of a technology asymmetry? Or is it because the level of IT development is too low at this stage, for example, the unconnectedness of IT between users and providers? These may be relevant, but the main reason appears to lie in the nature of CFR (as discussed in Chapter 3).

Clearly, the evidence from this study does not support the technical view of CFR. If CFR was purely a technical system, the use of IT would have eliminated or at least reduced the asymmetry between internal users and external ones. Undoubtedly, even the technology at today's level has this potential. However, the potential has not been fully explored or realised. This is at least partly because CFR is influenced by many non-technological factors and these factors make CFR a matter of whether some information should be disclosed to some users, and when and how, rather than a simple matter of how to meet users' information needs. This point is supported by the finding that corporate managers benefit more from IT use than external users, and that some external users benefit more than others. Moreover, Chapter 6 repeatedly suggests that the role of IT in external reporting is always limited by the existing information asymmetry (Hypotheses 4, 5 and 6).

It follows that the nature of CFR determines the extent of impact of IT on CFR. From an agency theory point of view, managers and other stakeholders may be self-interested. The conflict of interests leads to confrontations among the interested parties, and the deployment of various agency monitoring, bonding and incentive systems, some of which may be externally institutionalised such as stock exchange listing requirements, accounting standards, auditing, and regulations. Financial reporting plays a significant role in maintaining agency relations and is an important means of achieving goals for the interested parties. This is because it can be used to adjust the level of information asymmetry among these parties and thus is itself a monitoring or bonding device. Moreover, it forms an important basis for the implementation of many other monitoring, bonding and incentive mechanisms. How it is used depends upon the overall trade-offs between benefits and agency costs (not just those arising from financial reporting) to the claimholders. This in turn determines the extent of IT use for CFR especially for external reporting as IT is instrumental to CFR. This argument has gained support from the findings related to the tested contingent factors *company size* and *gearing*.

Section 4: Strength, Weakness and Scope for Further Research

Compared with previous evaluative studies concerning the impact of IT on accounting, the novelty and strength of this study is highlighted by several aspects. First, while all previous studies concentrated on internal accounting and reporting, this study focuses on external reporting, although for the purpose of comparison it also involves internal reporting. Second, most previous studies suffered from a lack of theoretical guidance, whereas this study is grounded on the contingency framework which is analogous to the theory of organisation. Third, this study has used rigorous statistical procedures to analyse the data, which could not be found in previous studies. Next, most earlier studies focus on the impact of IT on accountants, whereas the emphasis of this study is the information provided to the users. In addition, this study has also avoided some common problems found in studies under contingency theory of organisation as discussed in Section 1, such as the linear relationship assumption and neglecting non-monotonic hypotheses.

However, this study has its limitations in addition to those discussed in Section 1. Some are inherent in the research design or methods adopted, and they are difficult to overcome unless alternative research designs or methods are used. Others can be ameliorated by some kind of extension, and thus point the way to future research.

The first limitation lies in the survey design adopted. Studies adopting this design are strong in external validity, because it allows an investigation to be carried out in a natural setting and thus findings can be generalised to real-life situations. Also it permits the use of random sampling techniques, and hence statistical inferences can be made to broader populations. However, this design is weak in drawing causal inferences. Although such a design is consistent with the nature of the relationship between IT and CFR which is reciprocal, the inability to draw causal inferences and hence to distinguish the two roles of IT in CFR changes (cause and facilitator) has hindered the possibility of eliciting more interesting policy implications and making more strong recommendations from the findings. Further, this design is responsible for a limitation already pointed out in Section 1: the study is largely a static test of the proposed contingency framework.

A second limitation is related to the mail questionnaire approach adopted in this study. The main drawbacks of this method include difficulties in detecting non-response bias, obtaining in-depth information, and discovering and avoiding hidden delegation. The first issue has been addressed by the Ferber test. Also some companies provided reasons why they did not complete the questionnaires and these reasons could be applied for non-response. The second limitation may, to some extent, have been remedied by the face-to-face interviews. However, no measure has been taken to tackle the third one, and no effective techniques are available for this purpose. Consequently, the data obtained form the questionnaire may have been contaminated by hidden delegation.

A further problem is related to the nature of the data obtained. Most of the variables in the study are nominal or ordinal, and this has limited the use of more sophisticated statistical procedures. As a result, the contingent factors could not be analysed collectively, and their joint effect on the association between IT use and CFR could not be determined. This makes the current study fall victim of a criticism of the contingency theory of organisation. Moreover, as pointed out earlier, several variables (*certainty of business environment, market competitiveness,* and *financial reporting strategy*) may be problematic and their use needs further corroboration.

Another limitation is that the participants of the mail questionnaire survey and interviews were the providers of financial information. Users of financial information are not included for the reasons presented in Chapter 1. This exclusion makes this study a one-sided story of the impact of IT on CFR, and hence the findings presented above could not be extended to external users. It is possible, however, that users may provide somewhat different data. Therefore, it would be desirable to investigate their perceptions on the impact of IT on CFR in a future study. Moreover, such an extension makes it possible to study the impact of IT on the information asymmetry among external user groups. This can be achieved by collecting data about the use of IT in the company which provides the information to external users, and data about the extent and quality of information received by different user groups. A comparison can thus be made between these groups regarding the relationship between IT use and information received.

Moreover, this study has investigated public companies only. The impact of IT on CFR in private companies might be different. As another extension to the current study, therefore, private companies could be investigated in a future study. In addition, this thesis has considered only limited facets of financial reporting and contingent factors, while the contingency perspective opens the door to the investigation of others aspects and factors. In particular, the influence of IT on information asymmetry among outside user groups of financial information deserves intensive research, and such research may add substantial knowledge to information economics in general, and agency theory in particular.

The findings of this study also shed light on a number of other research possibilities. Apart from that already mentioned above (the role of regulators in the use of IT for external reporting), other examples include: What are the exact consequences of the enlarged information asymmetry between managers and external users? How is IT used to manipulate financial reporting, and how is the enlarged information asymmetry exploited?

Summary

There have been a number of empirical studies evaluating the impact of IT on accounting, mostly since the early 1980s. While their practical recommendations may have influenced the actions of accountants and professional bodies, most of them neither made any attempt at theoretical development nor were guided by theory. In the light of this, the current study has attempted to propose a contingency framework analogous to the contingency theory of organisation. The proposed framework seems general, flexible, analytical, and operational, although it should be subject to further empirical test especially longitudinal investigation. The framework is appropriate for the investigation of the impact of IT on CFR, and its principles may also be applied into the study of the impact of IT on other aspects of accounting.

While previous evaluative studies showed an interest in social and human issues, their focus was largely on accountants and internal accounting, which is undoubtedly too narrow. This study has, for the first time, put an emphasis on external reporting and the users of financial information (although indirectly by investigating the information provided to them). In so doing, it has found that IT use has played a role in the exacerbation of information asymmetry between managers and external users. Since the enlarged asymmetry may intensify some socially harmful problems such as moral hazard and adverse selection, this finding raises a serious challenge to financial reporting regulators: what should they do about the use of IT for external financial reporting? Following the proposed perspective, this study has also found that company size and leverage are factors which moderate the impact of IT on external reporting, while listing status, financial reporting strategy and management compensation plan do not. These findings will enhance the understanding of why the impact of IT varies, and will increase the ability to determine the degree and pattern of the impact of IT on CFR, thus being useful to financial reporting regulators. Another interesting finding is that the impact of IT on internal reporting seems greater than in small companies than in large companies.

In addition, this study has investigated changes in CFR and found that IRC is generally greater than ERC. Moreover, some companies not only provide external users with formal financial reports, but also with management accounting information. This casts doubt about the traditional approach to the investigation of CFR by covering only interim and annual reports only. Furthermore, this thesis has evaluated the role of IT in the process of accounting method choice and change, and has found little evidence to support the common expectation that IT use leads to greater use of more sophisticated mathematical or statistical methods in CFR, or to support the expectation that IT use affect accounting method choice. However, it is found that IT plays a significant enabling role in the process of accounting method choice and change.

The limitations of this study should be borne in mind in interpreting these findings. Some are inherent in the research design and methods adopted. For example, the survey design fosters the difficulty in drawing causal inferences, and the mail questionnaire approach allows undetectable delegation. The other limitations suggest opportunities for further research by extending the current study. One possibility is the use of external users as research subjects to investigate the impact of IT use on the information asymmetry among external user groups. Moreover, the findings of this study point the way to additional research topics, such as the exact consequences of the enlarged information asymmetry between managers and external users, and the approach by which regulators can play a role in monitoring and controlling the use of IT in accounting.

Appendix 4-1: The Questionnaire

Ref. no.

Information Technology and Corporate Financial Reporting

INSTRUCTIONS: Please (1) tick or fill in appropriate boxes or cells of tables; (2) circle the question number if a question is not applicable.

Section 1: IT Application in Accounting

1. To what extent has your company computerised its accounting function? (*Tick* ONE *only*)

- ☐1 fully
- ☐2 largely
- ☐3 about half
- ☐4 fractionally
- ☐5 not at all ...**If 5, please go to Section 3 (Q.21 onwards)**

2. If you ticked 1, 2, 3 or 4 in question 1, how many years has your company been using computers in accounting? (*Tick* ONE *cell*)

Number of years	0-5	6-10	11-15	16-20	21-25	26-30	>30

3. What types of IT based accounting systems are there in use in your company? (*Tick* ALL *that apply*)

- ☐1 transaction systems
- ☐2 decision support systems(e.g. spreadsheet based systems)
- ☐3 expert systems
- ☐4 executive information systems
- ☐5 other systems(specify)________________________

4. What is the main feature of IT use in accounting in your company? (*Tick* ONE *only*)

- ☐1 a substitute for manual operations
- ☐2 a substitute for manual operations but improving on them
- ☐3 doing what could not be done manually
- ☐4 doing things innovatively

5. What is the ratio of workstations to accounting staff in your company? W/S
(Note: "Workstations" includes workstations, PCs and terminals)

6. To what extent are the users satisfied with the major IT applications in accounting in your company? (*Tick* ONE *only*)

- ☐1 fully satisfied
- ☐2 almost satisfied
- ☐3 a little dissatisfied
- ☐4 very dissatisfied

7. To what extent have the objectives of your company's major IT applications in accounting been achieved? ***(Tick* ONE *only)***

☐1 fully met
☐2 almost met
☐3 not met
☐4 far from being met
☐5 negative results produced (specify) ____________________
☐6 too soon to tell
☐7 objectives unknown

8. What is the state of major IT applications in accounting in your company? ***(Tick* ALL *that apply)***

☐1 separate from each other
☐2 integrated with each other
☐3 integrated with other management information systems(MIS)
☐4 integrated with electronic data interchange(EDI) systems

9. Which of the following has been applied in accounting in your company? ***(Tick* ALL *that apply)***

☐1 word processor
☐2 personal computer
☐3 minicomputer/mainframe
☐4 local area network(LAN)
☐5 wide area network(WAN)
☐6 laser scanner
☐7 optical disk & CD-ROM
☐8 graphic software
☐9 accounting software
☐10 spreadsheet/financial modelling package
☐11 computer-aided software engineering(CASE)
☐12 external databases
☐13 hypertext/hypermedia
☐14 image processing system
☐15 voice messaging system
☐16 other(specify)____________________

10. Please estimate the percentage of each user group who is provided with accounting information on-line in your company. ***(Tick* ONE *cell in each row)***

	0%	1-10%	11-30%	31-50%	51-70%	>70%
corporate managers						
institutional shareholders						
individual shareholders						
suppliers and customers						
creditors(e.g. banks)						
employees						

Section 2: IT Impact on Accounting Method Choice and Change

11. How often does your company use IT to simulate accounting changes? ***(Tick* ONE *only)***

☐1 always ☐2 often ☐3 occasionally ☐4 never

12. Has IT made a switch from one accounting method to another more or less costly in your company? ***(Tick* ONE *only)***

☐1 less costly ☐2 same ☐3 more costly ☐4 don't know

13. Has IT made a switch from one accounting method to another easier or more difficult in your company? ***(Tick*** **ONE** ***only)***

☐1 easier ☐2 same ☐3 more difficult ☐4 don't know

14. Has IT enabled your company to use <u>mathematically complex</u> methods (e.g. regression) in accounting more or less frequently? ***(Tick*** **ONE** ***only)***

☐1 more ☐2 same ☐3 less ☐4 don't know

15. Has IT made data volume to be handled with a method a more or less important consideration in accounting choices in your company? ***(Tick*** **ONE** ***only)***

☐1 more ☐2 same ☐3 less ☐4 don't know

16. Has IT enabled your company to use more than one method (see Q.17 for examples) for a (type of) transaction simultaneously for different purposes? ***(Tick*** **ONE** ***only)***

☐1 yes ☐2 no ☐3 don't know

17. If you ticked yes in question 16 please indicate which of the following applies. ***(Tick*** **ALL** ***that apply)***

☐1 income measurement(HCA/CCA)
☐2 stock valuation(LIFO/FIFO)
☐3 depreciation
☐4 costing(absorption/variable)
☐5 foreign currency translation
☐6 other(specify)______________

18. Has IT use improved the information needs definition of <u>managers</u> and <u>external users</u> in your company? ***(Tick*** **ONE** ***for each column)***

managers' needs	external users' needs
☐1 yes	☐1 yes
☐2 no	☐2 no
☐3 don't know	☐3 don't know

19. How has IT been used in relation to your company's external reporting strategy (ERS)? ***(Tick*** **ALL** ***that apply)***

☐1 nothing to do with ERS
☐2 implementing ERS
☐3 reinforcing ERS
☐4 effecting change(s) in ERS

IF you ticked 4, please describe the change(s)____________________________

20. What effect has IT had on accounting decisions (e.g. in accounting choices, accounting changes and estimates) in your company ? ***(Tick*** **ALL** ***that apply)***

☐1 more efficient
☐2 more effective
☐3 no effect
☐4 less efficient
☐5 less effective
☐6 other(specify) ____________

Section 3: IT Impact on Financial Information Provision

For each aspect of financial information provision in the following two tables, please (1) indicate any change since the early 1980s in your company; (2)if a change, state the importance of IT in the change.*(Fill in cells with appropriate numbers from the following two lines)*

change	1 much more	2 more	3 no change	4 less	5 much less
IT importance	1 very important	2 important	3 some effect	4 not important	

21. Information reported to corporate managers (Note)

	Change	IT Importance
forecasted information		
external information		
comparative information		
non-financial information		
business strategy-specific information		
segmental information		
user tailored information		
frequent reporting		
timely reporting		
auditable		
accessible to formally reported information		
available via self-retrieval & request		
understandable		
presentation appealing		
costly		

22. Information provided to external users (Note)

	Change	IT Importamce
forecasted information		
external information		
comparative information		
non-financial information		
business strategy-specific information		
segmental information		
user tailored information		
frequent reporting		
timely reporting		
auditable		
accessible to formally reported information		
available via self-retrieval & request		
understandable		
presentation appealing		
costly		

(Note: The above two tables are very important. It would be very much appreciated if you could fill in them with particular care and patience)

Section 4: Financial Reporting Environment

23. Is your company a parent company or a subsidiary? *(Tick* ONE *only)*

☐1 parent company
☐2 subsidiary
☐3 both 1 & 2
☐4 neither 1 nor 2

24. Is your company's head office separate from its operating divisions?

☐1 yes ☐2 no

25. If you ticked yes in question 24, which of the following do you work for?

☐1 head office ☐2 divisional office

26. Is your company a listed one on the International Stock Exchange?

☐1 yes ☐2 no

27. Which of the following best describes your company's <u>external</u> financial reporting practices? *(Tick* ONE *only)*

☐1 not disclosing unfavourable information where possible
☐2 adhering strictly to mandatory requirements
☐3 disclosing additional information where confidentiality allows

28. Please indicate the <u>major mode</u> of directors' compensation plans that has been adopted in your company:*(Tick* ALL *that apply)*

☐1 none ☐3 bonus
☐2 share option ☐4 other(specify)______________

29. Please estimate the percentage of accounting staff who are members of professional accounting bodies and who have received IT training. *(Tick* ONE *cell in each row)*

	1-5%	6-10%	11-30%	31-0%	51-70%	>70%
member of accounting bodies						
received IT training						

30. Which of the following best portrays the relationship between IT and the main business of your company? *(Tick* ONE *only)*

☐1 IT-based transaction systems underpin business operations
☐2 IT is used to produce IT products
☐3 IT is mainly the means of controlling and managing the business
☐4 other(specify) ____

31. What is the level of <u>certainty</u> of your company's business environment and <u>competitiveness</u> in your company's main market?*(Tick* **ONE** *only for each column)*

level of certainty	extent of competitiveness
☐1 very uncertain	☐1 very competitive
☐2 quite uncertain	☐2 quite competitive
☐3 relatively certain	☐3 mildly competitive
☐4 rather predictable	☐4 not competitive

32. How would you describe the *<u>internal</u>* and the *<u>external</u>* demand for financial information in your company since the early 1980s?*(Tick* **ONE** *only for each column)*

internal demand	external demand	
☐1	☐1	increased dramatically
☐2	☐2	increased steadily
☐3	☐3	not noticeably different
☐4	☐4	fallen steadily
☐5	☐5	fallen dramatically

33. What is your position in your company? ____________________

34. Would you be prepared to take part in a short follow-up interview?

☐1 yes ☐2 no

If yes, please indicate whom to contact (write separately if you prefer)

Name: ____________________ Tel: ________________________

Address: ____

____

THANK YOU VERY MUCH FOR YOUR HELP

Please return the questionnaire using the addressed envelope enclosed (no stamp is needed). Please provide any comments or suggestions you may have on the questionnaire below. If you would like to have a copy of the summary report from this survey, please tick this box ☐ and indicate below whom to send or write separately if you prefer.

Appendix 4-2: Covering Letters to Survey Respondents

1: The covering letter sent with the first wave of the questionnaire

Direct line: (031) 455 3324
Date: 14 June 1993.

Dear Sir/Madam,

I am investigating the impact of information technology (IT) on corporate financial reporting (CFR), an increasingly disturbing issue for corporate managers, regulators and users of financial information. In this project IT is defined as computer based information processing and communication technologies.

Your company has been selected at random for inclusion in a questionnaire survey relating to this research. I would be very grateful if you could spend about **15 minutes** completing the questionnaire on behalf of your company.

Your completed questionnaire will only be used to produce statistical summaries. Neither you nor your company will be identified and the reference number in the questionnaire is for mailing purposes only.

In the questionnaire you have an opportunity to request a summary report of the findings from this survey if you so wish. In addition, if you have any questions concerning the project, please do not hesitate to contact me.

It would be very much appreciated if you could return the completed questionnaire as soon as possible.

Thank you for your assistance.

Yours faithfully

Jason Ze Zhong Xiao

2. The remind and thank-you letter following the first wave of questionnaire

Direct line:(031) 455 3324

28 June 1993

Dear Sir/Madam,

You will recall that as an important part of a project investigating the impact of information technology on corporate financial reporting, I asked you about two weeks ago if you would mind completing and returning a questionnaire that I sent to you.

If you have already completed and returned it, please accept my sincere thanks. If you have not yet done so I would be grateful if you could do so as a matter of urgency. Some important policy implications are expected from this project for accounting standard setters, corporate managers and accounting researchers, but the implications cannot be fully and precisely elicited without your contribution.

Just in case you have not received the questionnaire, I have enclosed another copy.

Thank you for your kind attention.

Yours faithfully

Jason Ze Zhong Xiao

3. The covering letter sent with the second wave of questionnaire

Direct line:(031)4553325
16 September 1993

Dear Sir/Madam,

IT impact on corporate financial reporting

I am writing to you about our study of the impact of information technology (IT) on corporate financial reporting (CFR). As yet we have not received your completed questionnaire.

People have mixed expectations on IT use in CFR, but have these expectations been realised? Although we have already received a great number of completed questionnaires from other participants, it very much depends on you and others who have not yet responded whether we will be able to generate more meaningful conclusions. This is because we believe that quite different stories can be told by you and others in this group.

For this reason I am now sending you another copy of the questionnaire in case you cannot find the previous one. May I urge you to complete and return it as soon as possible.

I would like to thank you in advance for your help in this study. If you have already responded, I apologise for any inconvenience caused by this letter.

Yours sincerely

Jason Ze Zhong Xiao

Appendix 4-3: The Ferber Test of Non-response Bias

The Ferber test (Ferber, 1948/1949) is based on the returned questionnaires. It assumes that non-responses can be approximated by later responses. Therefore, any differences on a certain issue between responses and non-responses would be reflected in those between early responses and later ones. To carry out the test, the researcher keeps a chronicle of the returns and applies a suitable random order test to determine the presence of bias in the returns. A statistically significant value in the test indicates the existence of bias. Ferber recommended two specific tests: (1) the Spearman rank correlation analysis for ordinal, interval or ratio variables, (2) a kind of 'runs' test suitable for nominal data. However, the idea of the Ferber test is to see if the order of replies has any association with a characteristic of the respondent or his/her organisation. Therefore, if the Spearman rank correlation analysis can be used for ordinal, interval or ratio variables, the contingency table analysis can equally be applied for nominal data.

In this study, the order in which the questionnaires were returned is recorded under the variable named ORDER which is tabulated in Table Q34 of Appendix 5-1. The relationships between ORDER and other variables are examined. The coefficients are displayed in Table 4-3-1. Since some of these variables such as *company size* (SALE) are either ratio or ordinal, their relationships with ORDER are measured by Spearman correlation coefficients (*rho*) as shown in the second row. Since other variables such as *listing status* and *respondent's position* are nominal, their relationships are examined by a contingency table analysis using Cramer's measure of associations (V).

Table 4-3-1 shows that only the association between ORDER and respondent's position is statistically significant, and even here the association is very weak. Therefore, it is inferred that there was little non-response bias in the data.

Table 4-3-1: Ferber's Test of Non-response Bias

	Spearman's *rho*	Cramer's *V*
Company size	.115	
Financial reporting strategy	.036	
Market competitiveness	-.007	
Certainty of business environment	.047	
Information demand from internal users	-.051	
Information demand from external users	.001	
Internal reporting change (IRC)	-.005	
External reporting Change (ERC)	.057	
ITUSE	.056	
Extent of computerisation	.084	
Years of IT use	.076	
Types of IT-based systems in use	-.015	
Innovative feature	.106	
Workstation to staff ratio	.062	
User satisfaction	-.068	
Objective achievement	-.035	
Level of IT integration	.062	
Types of IT applied	.061	
Management compensation plan	-.033	.164
Company type		.181
Head office versus divisional office		.109
Closeness between business and IT		.132
Listing status		.147
Respondent's position		.196*

Note: (1) * significant at 0.05, (2) ITUSE is an aggregated variable from individual IT use variables, (3) IRC and ERC are aggregated variables from individual indicators of internal and external reporting change.

The procedures of the Spearman correlation analysis and Cramer's *V* measure of association (Elifson *et al.*, 1982) are as follows. The Spearman correlation analysis comprises the following steps: (1) ranking the values of the variables, (2) computing the differences in the ranks, (3) squaring each difference, (4) summing the squared difference, and (5) substituting the resulting values into the equation:

$$rho = 1 - \{6\sum D_i^2 / N(N^2 - 1)\}$$

where D_i = the difference between the ranks and N = the number of ranked pairs. The value of rho lies between -1 to 1. The closer *rho* is to 0, the weaker the relationship between the two variables. On the contrary, the closer rho is to -1 or 1, the stronger the relationship. A negative value of *rho* suggests a negative association, while a positive value indicates a positive association.

Cramer's V is a measure of the association for nominal variables based on the Chi-Square test X^2 :

$$V = \sqrt{\{X^2 / N(k-1)\}}$$

where X^2 is a test for the hypothesis that the row and column variables are independent, and is calculated by summing over all cells the squared residuals divided by the expected frequencies, using the formula:

$$X^2 = \sum_i \sum_j \frac{(O_{ij} - E_{ij})^2}{E_{ij}}$$

N is the sample size and k is the lower of the number of the levels of the two variables. The value of V ranges from 0 when the variables are independent to 1 when they are perfectly related.

Appendix 4-4: The Interview Schedule

Introduction

Company: ____

Time: _____________ **Date:** ___________ **Month:** __________________

Introducing the research: As you know, we have undertaken a mail questionnaire survey of the impact of information technology on corporate financial reporting. The purpose of this interview is to obtain some contextual and in-depth information which could not be acquired via the postal questionnaire survey.

Before we start, I'd like to ask if I can record our conversation. If you feel that a particular piece of information should not be recorded, please let me know and I will stop the recorder. Our conversation will be kept confidential. Under no circumstance will your name or your company's name be identified in any publication from this research.

Interviewee:

Name: ____________________ Position: ___________________________

Q1. How long have you been in the company?

Q2. (If not a financial director or accountant), Are you involved in financial reporting?

Q3. (If not a IT manager), have you anything to do with IT development in the company?

Part 1: IT Use in Accounting

Instruction: The interviewee should be given the mail questionnaire that he or she filled out

Q4. Could you describe briefly the history of IT use in accounting in you company?

Q5. You indicated in Question 1 of the mail questionnaire that accounting has been fractionally_, largely_, or fully_ computerised in your company, what do accountants do now?

Q6. In Question 4 of the mail questionnaire, you answered that your company have used IT in accounting as (a) a substitute for manual operations, (b) a substitute for manual operations but improving on them_, (c) doing what could not be done before_, (d) doing things innovatively_. Could you provide more details?

Q7. (If applicable) In Question 6 of the mail questionnaire, you commented that users of IT-based accounting systems were (a) a little dissatisfied_, (b) very dissatisfied_. Could you tell me why?

Q8. (If applicable) In Question 7 of the mail questionnaire, you commented that objectives of IT-based accounting systems were (a) not met_, (b) far from being met_. Could you tell me why?

Q9. In Question 8 of the mail questionnaire, you answered that your company's major IT applications in accounting are (a) separate from each other_, (b) integrated with each other_, (c) integrated with other MISs_, or (d) integrated with EDI systems_. Could you describe how the systems are separated or integrated?

Q10. Has there been any influence on IT use in accounting from accounting regulators (such as the stock exchange, the professional bodies, the government)?

(Instruction: EDGAR will be introduced and discussed if time allows. In the USA, SEC has installed a system called EDGAR. It requires listed companies file mandatory financial reports electronically: either on-line or on tape or floppy disks. The ultimate goal is to release this information to anyone with a PC via the database on EDGAR).

Q11. About specific technologies in use. In Questions 3 and 9 in the mail questionnaire, you indicated that your company has used some information technologies. Individually, what are they mainly used for? What are their effects? Is there any problem?

Q12. How are the IT resources organised and controlled and how is an investment in IT for accounting purposes decided?

Q13. What plans do you have regarding further use of IT in accounting?

Part 2: The Role of IT in Accounting Method Choice and Change

Q14. Could you give some examples concerning a change of accounting policy or method in your company in recent years? Why such change?

Q15. What do you have to do when there is a change?

Q16. Does IT have a role to play in the accounting choice process? What role does it play?

Q17. Could you give an example where an accounting change was caused by IT use?

Q18. In Questions 16 and 17, you indicated that IT enabled your company to use multiple methods to account for some transactions. You gave an example(s) of (a) income measurement (HCA/CCA)_, (b) costing (absorption/variable)_, (c) stock valuation (LIFO/FIFO)_, (d) foreign currency transaction_, (e) depreciation_, (d) other_. Do you actually use multiple methods for the transaction(s) you specified?

Part 3: Financial Reporting

Instruction: explain internal reporting and external reporting to the interviewee.

Q19. What aspects of internal reporting have experienced the greatest changes in, say, the last 10 years or since you joined the company?

Q20. What are the major factors that have led to these changes?

Q21. ***(Instruction: A separate page with the following options should be presented to the interviewee).*** Which aspects of internal reporting do you think IT has had the greatest effect on?

*(a) Data processing efficiency_*	*(b) Information contents_*
*(c) Information cost_*	*(d) Reporting timeliness_*
*(e) Reporting frequency_*	*(f) Access_*
*(g) Information presentation_*	*(h) Freedom from error_*

Q22. Who is the most important group of external users of the company's financial reports? Why? Does your company have to provide extra information to such a group?

Q23. What benefits does your company expect from the provision of information to this group? Does it get that benefits?

Q24. Apart from annual reports, what other financial reports does the company publish? Does the company receive additional information requirements from any external users?

Q25. What is your company's policy toward the most important group of external users regarding the extent of information disclosure?

Q26. What are the aspects of external reporting which have experienced the greatest changes in the last 10 years in your company? What are the major factors that have led to these changes?

Q27. ***(Instruction: A separate page with the following options should be presented to the interviewee).*** Which aspects of external reporting has IT had the greatest effect on?

*(a) Data processing efficiency_*	*(b) Information contents_*
*(c) Information cost_*	*(d) Reporting timeliness_*
*(e) Reporting frequency_*	*(f) Access_*
*(g) Information presentation_*	*(h) Freedom from error_*

Q28. Do you think that there is any need to improve external reporting?

Part 4: About the Company

Q29. Could you give me an indication of the structure of your company?

Q30. To enable me to understand better the above information you give me, could you talk about the main business of the company, such as its market, your company's strength and weakness, critical factors that affect the business?

Q31. In Question 28 of the mail questionnaire, you stated that your company used the following **management compensation plan:** (a) None_, (b) Bonus_, (c) Share option_, (d) Both bonus and share option_, and/or (e) Others_. What are the objectives of these schemes? And what do you think of their effects?

Part 5: Definitions

Accounting change: A change meriting disclosure and explanation in published financial reports, seen as a change in (1) an accounting principle, (2) an accounting estimate, or (3) the reporting entity.

Accounting choice: A decision made in selecting accounting principle and bases in order to set an accounting policy.

Accounting principles: (1) A general term for the concepts, rules, methods, and procedures of accounting; (2) The body of doctrine associated with accounting, serving as an explanation of current practices and as guide in the selection of conventions and procedures.

CD-ROM: A version of high-fidelity audio optical recording disk employed as a read only memory device for computers, using laser beam as reading device. Typically, 12 centimetres in diameter, can store 540 mbytes on a single side. Transfer rate is of the order of 600 kbytes per second and access time from first to last block is 1.5 seconds.

Decision support systems (DSS): Are interactive computer-based facilities that assist decision making in less structured situations. DSS differ from TPS and MIS in that they do not always support an ongoing process and in that they are designed to facilitate the solution of less-structured problems. Like MIS, DSS involve models of business activity. Unlike MIS, however, DSS models are often quite complex. They are also dynamic.

Electronic Data Interchange (EDI): Systems with the ability to transfer information such as orders and invoices from one computer to another over a communications network. Aim to eliminate the redundant paperwork and delays in response time inherent in mail and other delivery services.

Executive information systems (EIS) or executive support systems (ESS): Support the information needs of very senior executives by summarising and presenting data at the highest levels of aggregation. An EIS employs transactions data that have been filtered and summarised into a form useful for the top executives in the organisation. A successful one, however, also requires the use of large quantities of soft data such as assessments, rumour, opinions, and ideas.

Expert systems (ES): Provide advice and assistance on semi-structured problems. They use reasoning to render advice, make recommendations, or diagnose problems. To do this, they process input data against a knowledge base. In most expert systems today, the knowledge base consists of a set of rules.

Graphics package: Software packages designed for graphics applications. They require the user to interact in real-time or to produce a command file, or program, which is processed by the package to produce the graphics display.

Hypermedia: The integration of graphics, sound, video, or any combination into a primarily associative system of information storage and retrieval.

Hypertext: A metaphor for presenting information in which text, images, sounds, and actions become linked together in a complex, non-sequential web of associations that permits the user to browse through related topics, regardless of the presented order of the topics.

Image processing: Computer-based analysis, manipulation, storage, and display of graphical images from sources such as photos, drawings, and video. Consists of image input, processing and output.

Local area network (LAN): A high-band width, bi-directional communications network that operates over a limited geographic area, typically an office building or a college campus. It comprises a cable network linking the constituent nodes which correspond to user workstations equipped with a physical network interface device.

Management information systems (MIS): Broadly defined, MIS are the development and use of effective information systems in organisations. Narrowly defined, MIS are information systems that facilitate management by producing structured, summarised reports on a regular and recurring basis. The outputs are produced routinely and used primarily for controlling activities, though they can also be used for planning and organising.

Speech recogniser: Systems that receive spoken word inputs and identify the message. The outputs can be used to initiate appropriate actions or responses.

Speech synthesiser: Systems that produces a sound corresponding to spoken words according to stored text or commands.

Transaction processing systems (TPS): Support day-to-day operations by maintaining detailed records. These systems help a company conduct its operations and keep track of its activities. At the heart of a company's business. Key business functions, such as ticket reservation, order entry, checks, accounts receivables and payroll, depend on TPS.

Wide area network (WAN): A comprehensive multi-mode network connecting large numbers of terminals and computers spread over a wide area.

Appendix 4-5: Characteristics of Interviewees and their Companies

This appendix presents the characteristics of the mail questionnaire survey respondents who offered to be interviewed (volunteers), those who were actually interviewed (interviewees), and their companies. The purpose of this appendix is to show that the companies which took part in the interviews were representative.

1. Characteristics of Volunteers and Interviewees and Their Companies

Table 4-5-1: Location of Volunteers and Interviewees

Location	No. of Volunteers	No. of Interviewees
Bedworth, Nuneaton, Coventry	1	1
Durham	1	
Exeter	1	1
Farnborough	1	
Glasgow	2	1
Greenholme Mills, North Yorkshire	1	
Ipswich, Suffolk	1	
Leeds	1	1
Leek, Staffordshire	1	1
London	11	5
Market Harborough, Leicestshire	1	
Medmenham, Buckshire	1	1
Newcastle	1	1
Paignton	1	1
Perth	1	
Princethorpe, Warwickshire	1	
Surrey	2	
Swindon, Wiltshire	1	
Wembley	1	
Windsor	1	1
Total	32	14

Table 4-5-2: Company Type

Company Type	No. of Volunteers	No. of Interviewees
Parent company	17 (53.1%)	7 (50.0%)
Subsidiary	9 (28.1%)	3 (21.4%)
Both parent and subsidiary	4 (12.5%)	2 (14.3%)
Neither parent nor subsidiary	2 (6.3%)	2 (14.3%)
Total	32 (100%)	14 (100%)

Note: Comparable to Table Q23 in Appendix 5-1

Table 4-5-3: Listing Status

Listing Status	No. of Volunteers	No. of Interviewees
Listed	19 (59.4%)	8 (57.1%)
Unlisted	13 (40.6%)	6 (42.9%)
Total	32 (100%)	14 (100%)

Note; Comparable to Table q26 in Appendix 5-1

Table 4-5-4: Company Size

Size	No. of Volunteers	No. of Interviewees
Unknown	2 (6.3%)	2 (14.3%)
Large	10 (31.2%)	2 (14.3%)
Medium	15 (46.9%)	6 (42.9%)
Small	5 (15.6%)	4 (28.6%)
Total	32 (100%)	14 (100%)

Note: Comparable to Table Q35 in Appendix 5-1

Table 4-5-5: Financial Reporting Strategy

Financial Reporting Strategy	No. of Volunteers	No. of Interviewees
Suppressing	5 (16.1%)	2 (14.3%)
Ritualism	9 (29.0%)	6 (42.9%)
Informational	17 (54.8%)	6 (42.9%)
Total	31 (100%)	14 (100%)

Note: Comparable to Table Q27 in Appendix 5-1

Table 4-5-6: Management Compensation Plan

Management Compensation Plan	No. of Volunteers	No. of Interviewees
None	6 (22.2%)	4 (30.8%)
Bonus	7 (25.9%)	4 (30.8%)
Share options	4 (14.8%)	2 (15.4%)
Bonus and share options	10 (37.0%)	3 (23.0%)
Total	27 (100%)	13 (100%)

Note: Comparable to Table Q28 in Appendix 5-1

Table 4-5-7: Position of Volunteers and Interviewees

Position	No. of Volunteers	No. of Interviewees
Financial director (controller)	16 (50.0%)	6 (42.9%)
Accountant	8 (25.0%)	4 (28.6%)
IT manager	4 (12.5%)	1 (7.1%)
Managing director	2 (6.3%)	1 (7.1%)
Company secretary	1 (3.1%)	1 (7.1%)
Company consultant	1 (3.1%)	1 (7.1%)
Total	32 (100%)	14 (100%)

Note: Comparable to Table Q33 in Appendix 5-1

2. IT use in volunteer's and interviewee's company

Table 4-5-8: Computerisation Extent

Extent of Computerisation	No. of Volunteers	No. of Interviewees
About half	3 (9.4%)	
Largely	13 (40.6%)	7 (50.0%)
Fully	16 (50.0%)	7 (50.0%)
Total	32 (100%)	14 (100%)

Note: Comparable to Table Q1 in Appendix 5-1

Table 4-5-9: Years of IT Use

Years of IT Use	No. of Volunteers	No. of Interviewees
0-5 years	8 (25.8%)	6 (42.9%)
6-10 years	15 (48.4%)	4 (28.6%)
11-15 years	5 (16.1%)	3 (21.4%)
16 or more years	3 (9.7%)	1 (7.1%)
Total	31 (100%)	14 (100%)

Note: Comparable to Table Q2 in Appendix 5-1

Table 4-5-10: Type of IT-based Systems in Use

Types of IT-based Systems in Use	No. of Volunteers	No. of Interviewees
1 type	1 (3.1%)	
2 types	20 (62.5%)	12 (85.7%)
3 types	8 (25.0%)	1 (7.1%)
4 or more types	3 (9.4%)	1 (7.1%)
Total	32 (100%)	14 (100%)

Note: Comparable to Table Q3 in Appendix 5-1

Table 4-5-11: Innovative Feature of IT Use

Innovative Feature of IT Use	No. of Volunteers	No. of Interviewees
Substitute	3 (9.4%)	2 (14.3%)
Improving	20 (62.5%)	9 (64.3%)
Differently	5 (15.6%)	2 (14.3%)
Innovatively	4 (12.5%)	1 (7.1%)
Total	32 (100%)	14 (100%)

Note: Comparable to Table Q4 in Appendix 5-1

Table 4-5-12: Workstation to Staff Ratio

Ratio	No. of Volunteers	No. of Interviewees
Ratio < 0.5	1 (3.3%)	
0.5 ≤ Ratio < 1	5 (16.7%)	3 (21.4%)
Ratio = 1	22 (73.3%)	11 (78.6%)
Ratio > 1	2 (6.7%)	
Total	30 (100%)	14 (100%)

Note: Comparable to Table Q5 in Appendix 5-1

Table 4-5-13: User Satisfaction

User Satisfaction	No. of Volunteers	No. of Interviewees
Very dissatisfied	1 (3.1%)	1 (7.1%)
A little dissatisfied	11 (34.4%)	5 (35.7%)
Almost satisfied	15 (46.9%)	7 (50.0%)
Fully satisfied	5 (15.6%)	1 (7.1%)
Total	32 (100%)	14 (100%)

Note: Comparable to Table Q6 in Appendix 5-1

Table 4-5-14: Objective Achievement

Objective Achievement	No. of Volunteers	No. of Interviewees
Not met	6 (18.7%)	3 (21.4%)
Almost met	24 (75.0%)	10 (71.4%)
Fully met	2 (6.3%)	1 (7.1%)
Total	32 (100%)	14 (100%)

Note: Comparable to Table Q7 in Appendix 5-1

Table 4-5-15: Level of IT Integration

Level of IT Integration	No. of Volunteers	No. of Interviewees
Separate from each other	18 (56.3%)	9 (64.3%)
Integrated with each other	14 (43.8%)	4 (28.6%)
Integrated with other MIS	8 (25.0%)	2 (14.3%)
Integrated with EDI	3 (9.4%)	0
Total (using valid cases)	32 (134.5%)	14 (107.2%)

Note: Comparable to Table Q8 in Appendix 5-1

Table 4-5-16: Types of IT Applied

Types of IT Applied	No. of Volunteers	No. of Interviewees
1-3 types	1 (3.1%)	1 (7.1%)
4-6 types	14 (43.8%)	7 (50.0%)
7-9 types	14 (43.7%)	6 (42.9%)
10 or more types	3 (9.4%)	
Total	32 (100%)	14 (100%)

Note: Comparable to Table Q9 in Appendix 5-1

Appendix 5-1: Frequency Tabulation of Survey Responses

This appendix consists of frequency tables on survey responses to the questionnaire. The order of the tables follows that of the questions in the questionnaire. All the percentages in the tables are based on valid cases.

Section 1: IT Application in Accounting

Table Q1: Extent of Computerisation

Extent of Computerisation	Small		Medium Sized		Large		Total	
	Cnt	%	Cnt	%	Cnt	%	Cnt	%
Marginally	2	2.2	2	1.6	1	1.5	5	1.6
About half	5	5.5	5	4.0	1	1.5	13	4.2
Largely	39	42.9	56	45.2	19	29.2	125	40.6
Fully	45	49.5	61	49.2	44	67.7	165	53.6
Total	91	100.0	124	100.0	65	100.0	308	100.0

Note: (1) Cnt stands for count in all the tables. (2) From Tables Q1 to Q9, the frequencies for companies whose size is unknown are not shown separately but are included in the row totals.

Table Q2: Years of IT Use

Years of IT Use	Small		Medium Sized		Large		Total	
	Cnt	%	Cnt	%	Cnt	%	Cnt	%
0-5 years	32	35.2	11	9.1	5	7.8	56	18.4
6-10 years	44	48.4	57	47.1	12	18.8	126	41.5
11-15 years	15	16.5	37	30.6	18	28.1	74	24.3
16 or more years			16	13.2	29	45.3	48	15.8
Total	91	100.0	121	100.0	64	100.0	304	100.0

Table Q3a: Types of IT-Based Accounting Systems

Types of IT-Based Systems	Small		Medium Sized		Large		Total	
	Cnt	%	Cnt	%	Cnt	%	Cnt	%
Transaction systems	88	96.7	122	99.2	62	95.4	299	97.4
Decision support systems	75	82.4	110	89.4	63	96.9	275	89.6
Expert systems	12	13.2	15	12.2	15	23.1	46	15.0
Executive info systems	28	30.8	30	24.4	40	61.5	108	35.2
Other systems	3	3.3	1	.8	4	6.2	10	3.3
(valid cases)	(91)		(123)		(65)		(307)	
Total	206	226.4	278	226.0	184	281.1	738	240.5

Note: The total percentages exceed 100% because the question is a multiple choice one.

Table Q3b: Number of Types of IT-Based Accounting Systems

Number of Types of IT-Based Systems	Small		Medium Sized		Large		Total	
	Cnt	%	Cnt	%	Cnt	%	Cnt	%
1 type	14	15.4	11	8.9	4	6.2	30	9.8
2 types	47	51.6	75	61.0	19	29.2	157	51.1
3 3ypes	24	26.4	31	25.2	26	40.0	88	28.7
4 or more types	6	6.6	6	4.9	16	24.6	32	10.4
Total	91	100.0	123	100.0	65	100.0	307	100.0

Table Q4: Innovative Feature of IT Use in Accounting

Innovative Feature of Use	Small		Medium Sized		Large		Total	
	Cnt	%	Cnt	%	Cnt	%	Cnt	%
Substituting	10	11.0	11	9.1	2	3.1	26	8.5
Improving	56	61.5	79	65.3	42	64.6	193	63.3
Differently	17	18.7	18	14.9	10	15.4	47	15.4
Innovatively	8	8.8	13	10.7	11	16.9	39	12.8
Total	91	100.0	121	100.0	65	100.0	305	100.0

Table Q5: Ratio of Workstation to Accounting Staff

Workstation to Staff Ratio	Small		Medium Sized		Large		Total	
	Cnt	%	Cnt	%	Cnt	%	Cnt	%
Ratio < 0.5	5	5.7	12	9.8	2	3.3	20	6.7
0.5 ≤ Ratio < 1	13	14.9	15	12.3	12	19.7	45	15.1
Ratio = 1	63	72.4	84	68.9	44	72.1	211	70.8
Ratio > 1	6	6.9	11	9.0	3	4.9	22	7.4
Total	87	100.0	122	100.0	61	100.0	298	100.0

Table Q6: User Satisfaction

User Satisfaction	Small		Medium Sized		Large		Total	
	Cnt	%	Cnt	%	Cnt	%	Cnt	%
Very dissatisfied	1	1.1	4	3.2	4	6.2	9	2.9
A little dissatisfied	13	14.3	27	21.8	9	13.8	54	17.6
Almost satisfied	65	71.4	79	63.7	42	64.6	203	66.1
Fully satisfied	12	13.2	14	11.3	10	15.4	41	13.4
Total	91	100.0	124	100.0	65	100.0	307	100.0

Table Q7: Objective Achievement

Objective Achievement	Small		Medium Sized		Large		Total	
	Cnt	%	Cnt	%	Cnt	%	Cnt	%
Far from being met			1	.8			1	.3
Not met	10	11.6	18	14.9	4	6.5	36	12.2
Almost met	64	74.4	90	74.4	50	80.6	225	76.0
Fully met	12	14.0	12	9.9	8	12.9	34	11.5
Total	86	100.0	121	100.0	62	100.0	296	100.0

Table Q8: Level of IT Integration

Level of IT Integration	Small		Medium Sized		Large		Total	
	Cnt	%	Cnt	%	Cnt	%	Cnt	%
Separate from each other	30	33.3	46	37.1	27	41.9	113	37.0
Integrated with each other	51	56.7	59	47.6	33	52.4	157	51.5
Integrated with other MISs	22	24.4	29	23.4	33	52.4	92	30.2
Integrated with EDI	10	11.1	11	8.9	15	23.8	39	12.8
(Valid cases)	(91)		(123)		(65)		(305)	
Total	113	125.6	145	116.9	108	171.4	401	131.5

Note: The total percentages exceed 100% because the question is a multiple choice one.

Table Q9a: Types of IT Applied in Accounting

Types of IT Applied	Small		Medium Sized		Large		Total	
	Cnt	%	Cnt	%	Cnt	%	Cnt	%
Word processor	74	81.3	107	86.3	59	90.8	260	84.4
Personal computer	73	80.2	120	96.8	64	98.5	283	91.9
Minicomputer/mainframe	39	42.9	93	75.0	55	84.6	203	65.9
Local area network	61	67.0	65	52.4	59	90.8	204	66.2
Wide area network	7	7.7	17	13.7	28	43.1	56	18.2
Laser scanner	7	7.7	15	12.1	10	15.4	32	10.4
Optical disk/CD-ROM	4	4.4	11	8.9	13	20.0	31	10.1
Graphics software	25	27.5	60	48.4	42	64.6	135	43.8
Accounting software	88	96.7	122	98.4	65	100.0	303	98.4
Spreadsheet/FMP	86	94.5	120	96.8	64	98.5	297	96.4
CASE	3	3.3	12	9.8	11	16.9	27	8.8
External database	16	17.6	24	19.4	29	44.6	78	25.3
Hypertext/hypermedia					1	1.5	1	.3
Image processing systems	2	2.2	3	2.4	4	6.2	9	2.9
Voice messaging systems	3	3.3	2	1.6	8	12.3	13	4.2
Other IT	2	2.2	1	.8	1	1.5	4	1.3
(Valid cases)	(91)		(124)		(65)		(308)	
Total	490	538.5	772	622.6	513	789.2	1936	628.6

Note: The total percentages exceed 100% because the question is a multiple choice one.

Table Q9b: Number of Types of IT Applied in Accounting

Number of types of IT Applied	Small		Medium Sized		Large		Total	
	Cnt	%	Cnt	%	Cnt	%	Cnt	%
1-3 types	12	13.2	3	2.4			17	5.5
4-6 types	58	63.7	74	59.7	19	29.2	163	52.9
7-9 types	19	20.9	41	33.1	31	47.7	105	34.1
10 or more types	2	2.2	6	4.8	15	23.1	23	7.5
Total	91	100.0	124	100.0	65	100.0	308	100.0

Table Q10: On-line Access to Accounting Information

Users Groups	0%		1-10%		11-30%		31-50%		51-70%		>70%		valid	miss
	Cnt	%	Cnt	%	Cnt	%	Cnt	%	Cnt	%	Cnt	%	case	case
Manager	86	29.6	57	19.6	32	11.0	28	9.6	15	5.2	73	25.1	291	20
Institutional share-holders	249	97.7	2	.8			1	.4	1	.4	2	.8	255	56
Individual share-holders	247	93.6	2	.8	3	1.1	3	1.1	1	.4	8	3.0	264	47
Suppliers & customers	229	85.5	24	7.0	2	.8	4	1.5	2	.8	7	2.6	268	43
Creditors	243	90.3	12	4.5			3	1.1	1	.4	10	3.7	269	42
Employees	96	33.3	80	27.8	34	11.8	23	8.0	14	4.9	41	14.2	288	23

Note: The total percentages exceed 100% because the question is a multiple choice one.

Section 2: The Role of IT in Accounting Method Choice and Change

Table Q11: IT Use in Predicting Method Change Consequences

Use IT to Predict Results	Frequency	% on Valid Cases
Always	56	18.5
Often	80	26.4
Occasionally	113	37.3
Never	54	17.8
Not applicable	3	Missing
No answer	5	Missing
Total (Valid cases 303)	311	100.0

Table Q12: IT and Accounting Method Switching Cost

Cost of a Change	Frequency	% on Valid Cases
Less costly	99	33.2
Same	63	21.1
More costly	30	10.1
Don't know	106	35.6
Not applicable	9	Missing
No answer	4	Missing
Total (Valid cases 298)	311	100.0

Table Q13: IT and Smoothness of Accounting Method Change

Smoothness of a Change	Frequency	% on Valid Cases
Easier	158	53.7
Same	46	15.6
More difficult	19	6.5
Don't know	71	24.1
Not applicable	8	Missing
No answer	9	Missing
Total (Valid cases 294)	311	100.0

Table Q14: IT and Complexity of Accounting Methods

Use of Complicated Methods	Frequency	% on Valid Cases
More	105	35.5
Same	87	29.4
Less	3	1.0
Don't know	101	34.1
Not applicable	6	Missing
No answer	2	Missing
Total (Valid cases 296)	311	100.0

Table Q15: IT Impact on Data Volume Handling

Significance of Data Volume as a Consideration	Frequency	% on Valid Cases
More	71	23.4
Same	75	24.8
Less	115	38.0
Don't know	42	13.9
Not applicable	6	Missing
No answer	2	Missing
Total (Valid cases 303)	311	100.0

Table Q16: IT Impact on Use of Multiple Methods

More Use of Multiple Methods	Frequency	% on Valid Cases
Yes	137	45.2
No	139	45.9
Don't know	27	8.9
Not applicable	6	Missing
No answer	2	Missing
Total (Valid cases 296)	311	100.0

Table Q17: Examples of the Use of Multiple Methods

Use of Multiple Methods	Frequency	% on Valid Cases
Income measurement	56	42.4
Stock valuation	60	45.5
Depreciation	82	62.1
Costing	65	49.2
Foreign currency translation	58	43.9
Other areas	8	6.1
Total (Valid cases 132)	329	249.2

Note: The total percentage exceeds 100% because it is based on valid cases

Table Q18a: IT and Definition of Internal Users Information

Better Definition	Frequency	% on Valid Cases
Yes	257	84.5
No	30	9.9
Don't know	17	5.6
Not applicable	4	Missing
No answer	3	Missing
Total (Valid cases 285)	311	100.0

Table Q18b: IT and Definition of External Users Information

Better Definition	Frequency	% on Valid Cases
Yes	67	23.5
No	118	41.4
Don't know	100	35.1
Not applicable	10	Missing
No answer	16	Missing
Total (Valid cases 285)	311	100.0

Table Q19: IT and External Reporting Strategy

Relationship with Strategy	Frequency	% on Valid Cases
Nothing to do with ERS	179	60.9
Implementing ERS	25	8.5
Reinforcing ERS	84	28.6
Effecting changes in ERS	10	3.4
Total (valid cases 294)	298	101.4

Note: (1) ERS denotes external reporting strategy. (2) The total percentage exceeds 100% because it is based on valid cases

Table Q20: IT and Accounting Decision

Effect on Decisions	Frequency	% on Valid Cases
More efficient	168	55.4
More effective	159	52.5
No effect	71	23.4
Less efficient	3	1.0
Less effective	0	0.0
Total (Valid cases 303)	401	132.3

Note: The total percentage exceeds 100% because it is based on valid cases

Section 3: IT and Accounting Disclosure

Table Q21a: Change in Information Reported to Managers

Internal Reporting	Much More		More		No Change		Less		Much Less		Change/No Direction		Valid Cases	Miss-ing Cases
	Cnt	%	Cnt	%	Cnt	%	Cnt	%	Cnt	%	Cnt	%		
XFOR11	163	56.6	94	32.6	21	7.3					10	3.5	288	23
XEXT11	50	18.5	100	36.9	111	41.0	3	1.1	2	.7	5	1.8	271	40
XCOM11	83	29.9	122	43.9	64	23.0	2	.7			7	2.5	278	33
XNON11	53	19.5	98	36.0	110	40.4	7	2.6			4	1.5	272	39
XSTR11	68	25.4	111	41.4	83	31.0	1	.4	1	.4	4	1.5	268	43
XSEG11	60	23.0	97	37.2	96	36.8	3	1.1	2	.8	3	1.1	261	50
XTAI11	87	32.3	107	39.8	66	24.5	5	1.9			4	1.5	269	42
XFRE11	130	46.6	89	31.9	52	18.6	1	.4			7	2.5	279	32
XTIM11	152	54.1	94	33.5	27	9.6	1	.4			7	2.5	281	30
XAUD11	70	24.9	113	40.2	88	31.3	3	1.1			7	2.5	281	30
XACS11	39	14.8	116	44.1	103	39.2	1	.4			4	1.5	263	48
XAVA11	59	21.5	120	43.8	86	31.4	1	.4	1	.4	7	2.6	274	37
XUND11	56	20.4	128	46.7	78	28.5	5	1.8	1	.4	6	2.2	274	37
XPRE11	104	37.8	121	44.0	41	14.9	4	1.5			5	1.8	275	36
XCOS11	36	13.6	98	37.1	69	26.1	49	18.6	10	3.8	2	.8	264	47

Note: (1) The total percentages exceed 100% because the question is a multiple choice one.
(2) The variables are defined in the List of Abbreviations.

Table Q21b: IT importance in Change in Information Reported to Managers

Internal Reporting	Very Important		Important		Some Effect		Not Important		Important/ No degree		Valid Cases	Miss-ing Cases	No Reply Need-ed
	Cnt	%	Cnt	%	Cnt	%	Cnt	%	Cnt	%			
ZFOR12	154	58.1	89	33.6	19	7.2	1	.4	2	.8	265	46	21
ZEXT12	39	24.8	65	41.4	39	24.8	14	8.9			157	154	111
ZCOM12	71	34.1	104	50.0	28	13.5	4	1.9	1	.5	208	103	64
ZNON12	46	29.1	57	36.1	43	27.2	11	7.0	1	.6	158	153	110
ZSTR12	53	29.3	79	43.6	39	21.5	9	5.0	1	.6	181	130	83
ZSEG12	47	29.0	87	53.7	20	12.3	7	4.3	1	.6	162	149	96
ZTAI12	82	41.6	93	47.2	16	8.1	5	2.5	1	.5	197	114	66
ZFRE12	133	59.6	77	34.5	10	4.5	2	.9	1	.4	223	88	52
ZTIM12	154	61.6	85	34.0	8	3.2	1	.4	2	.8	250	61	27
ZAUD12	74	39.2	85	45.0	26	13.8	3	1.6	1	.5	189	122	88
ZACS12	45	28.7	76	48.4	33	21.0	2	1.3	1	.6	157	154	103
ZAVA12	75	40.5	89	48.1	17	9.2	2	1.1	2	1.1	115	196	86
ZUND12	46	23.8	104	53.9	37	19.2	5	2.6	1	.5	193	118	78
ZPRE12	96	41.7	96	41.7	31	13.5	6	2.6	1	.4	230	81	41
ZCOS12	57	29.8	98	51.3	24	12.6	11	5.8	1	.5	191	120	69

Note: (1) The total percentages exceed 100% because the question is a multiple choice one.
(2) Cases under "No reply needed" are also included in missing cases.
(3) The variables are defined in the List of Abbreviations.

Table Q22a: Change in Information Disclosed to External Users

External Reporting	Much More		More		No Change		Less		Much Less		Change/No Direction		Valid Cases	Miss-ing Cases
	Cnt	%	Cnt	%	Cnt	%	Cnt	%	Cnt	%	Cnt	%		
XFOR21	58	25.2	67	29.1	101	43.9					4	1.7	230	81
XEXT21	43	19.4	57	25.7	119	53.6	1	.5			2	.9	222	89
XCOM21	31	13.5	77	33.6	118	51.5					3	1.3	229	82
XNON21	24	10.7	61	27.2	136	60.7	1	.4			2	.9	224	87
XSTR21	23	10.3	58	26.0	136	61.0	4	1.8			2	.9	223	88
XSEG21	31	14.0	76	34.2	112	50.5	1	.5	1	.5	1	.5	222	89
XTAI21	20	9.1	63	28.6	130	59.1	5	2.3			2	.9	220	91
XFRE21	35	15.3	77	33.6	111	48.5	3	1.3			3	1.3	229	82
XTIM21	53	22.5	89	37.7	87	36.9	2	.8			5	2.1	236	75
XAUD21	39	17.0	74	32.3	109	47.6	3	1.3	1	.4	3	1.3	229	82
XACS21	21	9.6	47	21.5	146	66.7	3	1.4	1	.5	1	.5	219	92
XAVA21	11	5.0	34	15.5	167	76.3	4	1.8	1	.5	2	.9	219	92
XUND21	25	11.0	81	35.7	114	50.2	4	1.8			3	1.3	227	84
XPRE21	60	26.1	68	29.6	94	40.9	4	1.7	1	.4	3	1.3	230	81
XCOS21	16	7.2	79	35.6	103	46.4	20	9.0	3	1.4	1	.5	222	89

Note: (1) The total percentages exceed 100% because the question is a multiple choice one.
(2) The variables are defined in the List of Abbreviations.

Table Q22b. IT importance in Change in Information Disclosed to External Users

External Reporting	Very Important		Important		Some Effect		Not Important		Important/ No Degree		Valid	Miss-sing	No Reply Need-ed
	Cnt	%	Cnt	%	Cnt	%	Cnt	%	Cnt	%	cases	cases	
ZFOR22	59	46.8	54	42.9	10	7.9	3	2.4			126	185	101
ZEXT22	34	33.7	41	40.6	19	18.8	7	6.9			101	210	119
ZCOM22	31	28.7	56	51.9	18	16.7	3	2.8			108	203	118
ZNON22	15	17.2	34	39.1	25	28.7	13	14.9			87	224	136
ZSTR22	16	18.8	36	42.4	24	28.2	9	10.6			85	226	136
ZSEG22	24	22.4	57	53.3	18	16.8	8	7.5			107	204	112
ZTAI22	23	26.4	45	51.7	14	16.1	5	5.7			90	221	130
ZFRE22	44	38.6	61	53.5	5	4.4	4	3.5			114	197	111
ZTIM22	65	44.5	67	45.9	8	5.5	6	4.1			147	164	87
ZAUD22	38	32.2	57	48.3	15	12.7	8	6.8			118	193	109
ZACS22	22	31.0	34	47.9	8	11.3	7	9.9			71	240	146
ZAVA22	18	36.0	24	48.0	4	8.0	4	8.0			50	261	167
ZUND22	22	19.5	59	52.2	22	19.5	10	8.8			113	198	114
ZPRE22	48	35.6	57	42.2	17	12.6	13	9.6			135	176	94
ZCOS22	28	23.9	63	53.8	16	13.7	10	8.5			117	194	103

Note: (1) The total percentages exceed 100% because the question is a multiple choice one.
(2) Cases under "No reply needed" are also included in missing cases
(3) The variables are defined in the List of Abbreviations.

Section 4: Financial Reporting Environment

Table Q23: Types of Companies

Types of Companies	Frequency	% on Valid Cases
Parent companies (P)	171	55.5
Subsidiary (S)	67	21.8
Both P and S	45	14.6
Neither P nor S	25	8.1
No answer	3	Missing
Total (Valid cases 308)	311	100.0

Table Q24. Head Office Separate from Divisions

Head Office and Divisions Separate	Frequency	% on Valid Cases
Yes	168	54.2
No	142	45.8
No answer	1	Missing
Total (Valid cases 310)	311	100.0

Table Q25: The Place of Work

Head or Divisional Office	Frequency	% on Valid Cases
Head office	150	84.7
Divisional office	27	15.3
No answer needed	132	Missing
No answer	2	Missing
Total (Valid cases 177)	311	100.0

Table Q26a: Listing Status

Listing Status	Frequency	% on Valid Cases
Listed	177	57.3
Unlisted	132	42.7
No answer	2	Missing
Total (Valid cases 309)	311	100.0

Table Q26b: Which Stock Exchanges

Stock Exchange	Frequency	% on Valid Cases
London International	141	88.7
London: USM	10	6.3
New York	1	.6
Dutch	1	.6
Mixed	5	3.1
Other	1	.6
No answer needed	132	Missing
No answer	20	Missing
Total (Valid cases 159)	311	100.0

Table Q27: External Reporting Strategy

Strategy	Frequency	% on Valid Cases
Suppressing	16	5.4
Ritualism	151	51.2
Informational	128	43.4
Not applicable	4	Missing
No answer	12	Missing
Total (Valid cases 295)	311	100.0

Table Q28: Management Compensation Plan

Incentive Scheme	Frequency	% on Valid Cases
None	61	23.0
Bonus (B)	60	22.6
Share option (S)	46	17.4
Both B and S	98	37.0
Other	2	Missing
Not applicable	7	Missing
No answer	37	Missing
Total (valid cases 265)	311	100.0

Table Q29-a: Professional Qualification of Accountants

Percentage of Qualified Staff	Frequency	% on Valid Cases
0-5%	67	22.3
6-10%	40	13.3
11-30%	77	25.7
31-50%	43	14.3
51-70%	31	10.3
>70%	42	14.0
Not applicable	2	Missing
No answer	9	Missing
Total (Valid cases 300)	311	100.0

Table Q29-b: IT Training Received by Accountants

Percentage of Staff Received Training	Frequency	% on Valid Cases
0-5%	44	15.1
6-10%	28	9.6
11-30%	40	13.7
31-50%	36	12.3
51-70%	34	11.6
>70%	110	37.7
Not applicable	3	Missing
No answer	16	Missing
Total (Valid cases 292)	311	100.0

Table Q30: Closeness between Business and IT

Technological Orientation	Frequency	% on Valid Cases
IT underpin business	122	40.0
Produce IT products	8	2.6
Manage business with IT	172	56.4
Other	3	1.0
Not applicable	1	Missing
No answer	5	Missing
Total (Valid cases 305)	311	100.0

Table Q31a: Certainty of Business Environment

Level of Certainty	Frequency	% on Valid Cases
Very uncertain	31	10.3
Quite uncertain	108	35.8
Relatively certain	148	49.0
Rather predictable	15	5.0
Not applicable	1	Missing
No answer	8	Missing
Total (Valid cases 302)	311	100.0

Table Q31b: Market Competitiveness

Level of Competitiveness	Frequency	% on Valid Cases
Very competitive	172	56.8
Quite competitive	104	34.3
Mildly competitive	19	6.3
Not competitive	8	2.6
Not applicable	1	Missing
No answer	7	Missing
Total (Valid cases 303)	311	100.0

Table Q32-a: Internal Demand for Financial Information

Change in Internal Demand	Frequency	% on Valid Cases
Increased dramatically	148	49.0
Increased steadily	143	47.4
not noticeably different	11	3.6
Not applicable	3	Missing
No answer	6	Missing
Total (Valid cases 302)	311	100.0

Table Q32-b: External Demand for Financial Information

Change in External Demand	Frequency	% on Valid Cases
Increased dramatically	66	22.4
Increased steadily	135	45.9
not noticeably different	92	31.3
fallen steadily	1	.3
Not applicable	5	Missing
No answer	12	Missing
Total (Valid cases 294)	311	100.0

Table Q33: Respondent's Position

Position	Frequency	% on Valid Cases
Financial director	161	53.5
Accountants	56	18.6
Executive/manager	32	10.6
IT manager	26	8.6
Company secretary	19	6.3
Other	7	2.3
No answer	10	Missing
Total (Valid cases 301)	311	100.0

Table Q34: Time order of questionnaire returns

Time of Arrival	Frequency	% on Valid Cases
June14	7	2.3
June15	31	10.0
June16	16	5.1
June17	26	8.4
June18	29	9.3
June21	15	4.8
June24	1	0.3
July00	182	58.5
July11	4	1.3
Total(Valid cases 311)	311	100.0

Table Q35: Company Size

Size	Frequency	% on Valid Cases
Small	91	32.4
Medium sized	126	44.8
Large	64	22.8
Unknown	30	Missing
Total (Valid cases 301)	311	100.0

Table Q36: Gearing

Gearing (%)	Frequency	% on Valid Cases
0 to 10	38	14.3
11 to 50	80	30.2
51 to 100	69	26.0
101 or more	78	29.4
Unknown	46	Missing
Total (Valid cases 265)	311	100.0

Appendix 5-2: Wilcoxon Matched-Pairs Signed-Ranks Test Comparing IRC Items with ERC Items

This appendix contains the results of the Wilcoxon Matched-Pairs Signed-Ranks Test. The purpose of this test is to see if internal reporting change (IRC) are greater than external reporting change (ERC). This test is non-parametric, that is, it does not assume a normal distribution of the sampled population. It applies when (1) only two variables are involved; (2) the two variables are non-categorical, that is, they are either ordinal, interval or ratio; and (3) the values of the two variables are from the same cases (Bryman and Cramer, 1994).

This procedure ranks all the values from both variables, compares the size of a value from one of the variables with that from the other, and sums those differences with the same signs. If there are no differences between the two samples, then the number of positive signs should be similar to that of the negative ones. The results show that in all the aspects but information cost, IRC is greater than ERC. The variables used here are defined in the **List of Abbreviations**.

Table 5-2-1: Wilcoxon Matched-Pairs Signed-Ranks Test

XFOR11
with XFOR21

Mean Rank	Cases	
63.08	114	- Ranks (XFOR21 LT XFOR11)
39.00	8	+ Ranks (XFOR21 GT XFOR11)
	103	Ties (XFOR21 EQ XFOR11)

	225	Total

Z = -8.7879 1-Tailed P = .0000

Table 5-2-2: Wilcoxon Matched-Pairs Signed-Ranks Test

XEXT11
with XEXT21

Mean Rank	Cases	
44.43	60	- Ranks (XEXT21 LT XEXT11)
46.17	29	+ Ranks (XEXT21 GT XEXT11)
	129	Ties (XEXT21 EQ XEXT11)

	218	Total

Z = -2.7146 1-Tailed P = .0033

Table 5-2-3: Wilcoxon Matched-Pairs Signed-Ranks Test

XCOM11
with XCOM21

Mean Rank	Cases	
60.30	99	- Ranks (XCOM21 LT XCOM11)
55.32	19	+ Ranks (XCOM21 GT XCOM11)
	107	Ties (XCOM21 EQ XCOM11)

	225	Total

Z = -6.6049 1-Tailed P = .0000

Table 5-2-4: Wilcoxon Matched-Pairs Signed-Ranks Test

XNON11
with XNON21

Mean Rank	Cases	
42.48	64	- Ranks (XNON21 LT XNON11)
40.37	19	+ Ranks (XNON21 GT XNON11)
	138	Ties (XNON21 EQ XNON11)

	221	Total

Z = -4.4312 1-Tailed P = .0000

Table 5-2-5: Wilcoxon Matched-Pairs Signed-Ranks Test

XSTR11
with XSTR21

Mean Rank	Cases	
56.77	95	- Ranks (XSTR21 LT XSTR11)
43.00	14	+ Ranks (XSTR21 GT XSTR11)
	110	Ties (XSTR21 EQ XSTR11)

	219	Total

Z = -7.2422 1-Tailed P = .0000

Table 5-2-6: Wilcoxon Matched-Pairs Signed-Ranks Test

XSEG11
with XSEG21

Mean Rank	Cases	
40.42	57	- Ranks (XSEG21 LT XSEG11)
37.00	21	+ Ranks (XSEG21 GT XSEG11)
	141	Ties (XSEG21 EQ XSEG11)

	219	Total

Z = -3.8028 1-Tailed P = .0000

Table 5-2-7: Wilcoxon Matched-Pairs Signed-Ranks Test

XTAI11
with XTAI21

Mean Rank	Cases	
57.22	103	- Ranks (XTAI21 LT XTAI11)
48.22	9	+ Ranks (XTAI21 GT XTAI11)
	106	Ties (XTAI21 EQ XTAI11)

	218	Total

Z = -7.9255 1-Tailed P = .0000

Table 5-2-8: Wilcoxon Matched-Pairs Signed-Ranks Test

XFRE11
with XFRE21

Mean Rank	Cases	
63.03	111	- Ranks (XFRE21 LT XFRE11)
38.50	10	+ Ranks (XFRE21 GT XFRE11)
	105	Ties (XFRE21 EQ XFRE11)

	226	Total

Z = -8.5500 1-Tailed P = .0000

Table 5-2-9: Wilcoxon Matched-Pairs Signed-Ranks Test

XTIM11
with XTIM21

Mean Rank	Cases	
63.53	116	- Ranks (XTIM21 LT XTIM11)
47.50	8	+ Ranks (XTIM21 GT XTIM11)
105	105	Ties (XTIM21 EQ XTIM11)

	229	Total

Z = -8.7154 1-Tailed P = .0000

Table 5-2-10: Wilcoxon Matched-Pairs Signed-Ranks Test

XAUD11
with XAUD21

Mean Rank	Cases	
49.30	69	- Ranks (XAUD21 LT XAUD11)
40.40	24	+ Ranks (XAUD21 GT XAUD11)
	133	Ties (XAUD21 EQ XAUD11)

	226	Total

Z = -4.6592 1-Tailed P = .0000

Table 5-2-11: Wilcoxon Matched-Pairs Signed-Ranks Test

XACS11
with XACS21

Mean Rank	Cases	
48.92	80	- Ranks (XACS21 LT XACS11)
49.38	17	+ Ranks (XACS21 GT XACS11)
	120	Ties (XACS21 EQ XACS11)

	217	Total

Z = -5.5305 1-Tailed P = .0000

Table 5-2-12: Wilcoxon Matched-Pairs Signed-Ranks Test

XAVA11
with XAVA21

Mean Rank	Cases	
55.94	108	- Ranks (XAVA21 LT XAVA11)
58.17	3	+ Ranks (XAVA21 GT XAVA11)
	105	Ties (XAVA21 EQ XAVA11)

	216	Total

Z = -8.6312 1-Tailed P = .0000

Table 5-2-13: Wilcoxon Matched-Pairs Signed-Ranks Test

XUND11
with XUND21

Mean Rank	Cases	
51.14	74	- Ranks (XUND21 LT XUND11)
42.11	23	+ Ranks (XUND21 GT XUND11)
	126	Ties (XUND21 EQ XUND11)

	223	Total

Z = -5.0663 1-Tailed P = .0000

Table 5-2-14: Wilcoxon Matched-Pairs Signed-Ranks Test

XPRE11
with XPRE21

Mean Rank	Cases	
57.36	92	- Ranks (XPRE21 LT XPRE11)
49.42	19	+ Ranks (XPRE21 GT XPRE11)
	116	Ties (XPRE21 EQ XPRE11)
	—	
	227	Total

Z = -6.3818 1-Tailed P = .0000

Table 5-2-15: Wilcoxon Matched-Pairs Signed-Ranks Test

XCOS11
with XCOS21

Mean Rank	Cases	
44.39	45	- Ranks (XCOS21 LT XCOS11)
43.58	42	+ Ranks (XCOS21 GT XCOS11)
	131	Ties (XCOS21 EQ XCOS11)
	—	
	218	Total

Z = -.3534 1-Tailed P = .7238

Appendix 5-3: Kruskal-Wallis Analysis of the Difference in IT Use

This appendix tests if there is any significant difference among large, medium sized and small companies in IT use. The statistical procedure used is Kruskal-Wallis analysis because all the IT use variables are coded as ordinal. The variables used here are defined in the List of Abbreviations.

Kruskal-Wallis analysis is designed to test for differences among the means (or other location parameter) of populations based on independent random samples which may be ranked. Strictly it assumes the populations are identical (apart from possible differences among the means), but there is no assumption of normality.

Suppose there are k independent random samples of size n_i (i = 1, 2, ..., k) and total sample size n, we rank all the observations and determine T_i, the total rank for sample i. To test

H_0 : population means equal, against

H_1 : not all population means equal,

we calculate

$$KW = \frac{12}{n(n+1)} \sum_{i=1}^{k} \frac{T_i^2}{n_i} - 3(n+1).$$

Under H_0 KW follows approximately a chi-square distribution with (k-1) degrees of freedom (Kvanli *et al.*, 1992).

Table 5-3-1: Kruskal-Wallis One-Way Anova

BEXT extent of computerisation by SIZE (company size)

Mean Rank	Cases		
133.79	91	SIZE = 1	Small
134.78	124	SIZE = 2	Medium Sized
160.81	65	SIZE = 3	Large
	280	Total	

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
5.3322	2	.0695	6.8475	2	.0326

Table 5-3-2: Kruskal-Wallis One-Way Anova

BYRS years of IT use by SIZE (company size)

Mean Rank	Cases		
91.77	91	SIZE = 1	Small
145.36	121	SIZE = 2	Medium Sized
191.96	64	SIZE = 3	Large
	276	Total	

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
60.7899	2	.0000	67.1360	2	.0000

Table 5-3-3: Kruskal-Wallis One-Way Anova

BTYP types of IT systems in use by SIZE (company size)

Mean Rank	Cases		
127.11	91	SIZE = 1	Small
128.45	123	SIZE = 2	Medium Sized
179.91	65	SIZE = 3	Large
	279	Total	

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
20.7461	2	.0000	24.5711	2	.0000

Table 5-3-4: Kruskal-Wallis One-Way Anova

BRAT workstation to staff ratio by SIZE (company size)

Mean Rank	Cases		
136.68	87	SIZE = 1	Small
136.05	122	SIZE = 2	Medium Sized
132.71	61	SIZE = 3	Large

	270	Total	

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
.1037	2	.9495	.1616	2	.9224

Table 5-3-5: Kruskal-Wallis One-Way Anova

BTEC types of IT applied by SIZE (company size)

Mean Rank	Cases		
109.23	91	SIZE = 1	Small
137.61	124	SIZE = 2	Medium Sized
189.78	65	SIZE = 3	Large

	280	Total	

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
37.8078	2	.0000	46.7841	2	.0000

Table 5-3-6: Kruskal-Wallis One-Way Anova

BFEAT innovative feature of IT use by SIZE (company size)

Mean Rank	Cases		
134.89	91	SIZE = 1	Small
135.48	121	SIZE = 2	Medium Sized
151.30	65	SIZE = 3	Large

	277	Total	

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
2.0051	2	.3669	2.7366	2	.2545

Table 5-3-7: Kruskal-Wallis One-Way Anova

BSTAT level of IT integration by SIZE (company size)

Mean Rank	Cases		
138.21	90	SIZE = 1	Small
129.16	124	SIZE = 2	Medium Sized
159.50	63	SIZE = 3	Large

	277	Total	

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
6.0065	2	.0496	6.5382	2	.0380

Table 5-3-8: Kruskal-Wallis One-Way Anova

BSAT user satisfaction by SIZE (company size)

Mean Rank	Cases		
147.74	91	SIZE = 1	Small
133.72	124	SIZE = 2	Medium Sized
143.29	65	SIZE = 3	Large

	280	Total	

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
1.6741	2	.4330	2.3937	2	.3021

Table 5-3-9: Kruskal-Wallis One-Way Anova

BOBJ objective achievement by SIZE (company size)

Mean Rank	Cases		
138.24	86	SIZE = 1	Small
128.54	121	SIZE = 2	Medium Sized
143.11	62	SIZE = 3	Large

	269	Total	

			Corrected for ties		
Chi-Square	D.F.	Significance	Chi-Square	D.F.	Significance
1.6588	2	.4363	2.9595	2	.2277

Appendix 5-4: Wilcoxon Matched-Pairs Signed-Ranks Test Comparing IT Importance in IRC with That in ERC

This appendix contains the results of the Wilcoxon Matched-Pairs Signed-Ranks Test comparing IT importance in internal reporting items with that in external reporting items. The results show that in four aspects, there is clearly no difference. However, in the remaining 11 aspects there is a significant difference (p values ranging from 0.03 to zero), and IT is more important in internal reporting change than in external reporting change. The variables used here are defined in the **List of Abbreviations.**

Table 5-4-1: Wilcoxon Matched-Pairs Signed-Ranks Test

ZFOR12
with ZFOR22

Mean Rank	Cases	
19.21	26	- Ranks (ZFOR22 LT ZFOR12)
14.50	9	+ Ranks (ZFOR22 GT ZFOR12)
	89	Ties (ZFOR22 EQ ZFOR12)

	124	Total

Z = -3.0220 1-Tailed P = .0013

Table 5-4-2: Wilcoxon Matched-Pairs Signed-Ranks Test

ZEXT12
with ZEXT22

Mean Rank	Cases	
13.45	10	- Ranks (ZEXT22 LT ZEXT12)
14.32	17	+ Ranks (ZEXT22 GT ZEXT12)
	57	Ties (ZEXT22 EQ ZEXT12)

	84	Total

Z = -1.3094 1-Tailed P = .0952

Table 5-4-3: Wilcoxon Matched-Pairs Signed-Ranks Test

ZCOM12
with ZCOM22

	96	Total

Z = -1.2253 1-Tailed P = .1103

Table 5-4-4: Wilcoxon Matched-Pairs Signed-Ranks Test

ZNON12
with ZNON22

Mean Rank	Cases	
11.25	14	- Ranks (ZNON22 LT ZNON12)
6.50	5	+ Ranks (ZNON22 GT ZNON12)
	57	Ties (ZNON22 EQ ZNON12)

	76	Total

Z = -2.5151 1-Tailed P = .0059

Table 5-4-5: Wilcoxon Matched-Pairs Signed-Ranks Test

ZSTR12
with ZSTR22

Mean Rank	Cases	
15.94	24	- Ranks (ZSTR22 LT ZSTR12)
10.50	5	+ Ranks (ZSTR22 GT ZSTR12)
	45	Ties (ZSTR22 EQ ZSTR12)

	74	Total

Z = -3.5678 1-Tailed P = .0002

Table 5-4-6: Wilcoxon Matched-Pairs Signed-Ranks Test

ZSEG12
with ZSEG22

Mean Rank	Cases	
16.79	21	- Ranks (ZSEG22 LT ZSEG12)
12.50	9	+ Ranks (ZSEG22 GT ZSEG12)
	66	Ties (ZSEG22 EQ ZSEG12)

	96	Total

Z = -2.4682 1-Tailed P = .0068

Table 5-4-7: Wilcoxon Matched-Pairs Signed-Ranks Test

ZTAI12
with ZTAI22

Mean Rank	Cases	
13.30	23	- Ranks (ZTAI22 LT ZTAI12)
9.50	2	+ Ranks (ZTAI22 GT ZTAI12)
	55	Ties (ZTAI22 EQ ZTAI12)

	80	Total

Z = -3.8611 1-Tailed P = .0000

Table 5-4-8: Wilcoxon Matched-Pairs Signed-Ranks Test

ZFRE12
with ZFRE22

Mean Rank	Cases	
18.68	33	- Ranks (ZFRE22 LT ZFRE12)
16.50	3	+ Ranks (ZFRE22 GT ZFRE12)
	72	Ties (ZFRE22 EQ ZFRE12)

	108	Total

Z = -4.4539 1-Tailed P = .0000

Table 5-4-9: Wilcoxon Matched-Pairs Signed-Ranks Test

ZTIM12
with ZTIM22

Mean Rank	Cases	
23.54	39	- Ranks (ZTIM22 LT ZTIM12)
19.50	6	+ Ranks (ZTIM22 GT ZTIM12)
	94	Ties (ZTIM22 EQ ZTIM12)
	—	
	139	Total

Z = -4.5207   1-Tailed P = .0000

Table 5-4-10: Wilcoxon Matched-Pairs Signed-Ranks Test

ZAUD12
with ZAUD22

Mean Rank	Cases	
19.18	17	- Ranks (ZAUD22 LT ZAUD12)
16.89	18	+ Ranks (ZAUD22 GT ZAUD12)
	65	Ties (ZAUD22 EQ ZAUD12)
	—	
	100	Total

Z = -.1802   1-Tailed P = .4285

Table 5-4-11: Wilcoxon Matched-Pairs Signed-Ranks Test

ZACS12
with ZACS22

Mean Rank	Cases	
8.67	9	- Ranks (ZACS22 LT ZACS12)
7.00	6	+ Ranks (ZACS22 GT ZACS12)
	43	Ties (ZACS22 EQ ZACS12)
	—	
	58	Total

Z = -1.0223   1-Tailed P = .1533

Table 5-4-12: Wilcoxon Matched-Pairs Signed-Ranks Test

ZAVA12
with ZAVA22

Mean Rank	Cases	
8.55	11	- Ranks (ZAVA22 LT ZAVA12)
6.50	4	+ Ranks (ZAVA22 GT ZAVA12)
	32	Ties (ZAVA22 EQ ZAVA12)

	47	Total

Z = -1.9311 1-Tailed P = .0268

Table 5-4-13: Wilcoxon Matched-Pairs Signed-Ranks Test

ZUND12
with ZUND22

Mean Rank	Cases	
17.39	23	- Ranks (ZUND22 LT ZUND12)
12.00	8	+ Ranks (ZUND22 GT ZUND12)
	69	Ties (ZUND22 EQ ZUND12)

	100	Total

Z = -2.9787 1-Tailed P = .0015

Table 5-4-14: Wilcoxon Matched-Pairs Signed-Ranks Test

ZPRE12
with ZPRE22

Mean Rank	Cases	
26.04	37	- Ranks (ZPRE22 LT ZPRE12)
21.79	12	+ Ranks (ZPRE22 GT ZPRE12)
	79	Ties (ZPRE22 EQ ZPRE12)

	128	Total

Z = -3.4915 1-Tailed P = .0003

Table 5-4-15: Wilcoxon Matched-Pairs Signed-Ranks Test

ZCOS12
with ZCOS22

Mean Rank	Cases	
13.31	18	- Ranks (ZCOS22 LT ZCOS12)
12.21	7	+ Ranks (ZCOS22 GT ZCOS12)
	78	Ties (ZCOS22 EQ ZCOS12)

	103	Total

Z = -2.0718 1-Tailed P = .0192

Appendix 6-1: Reliability Analysis of the IT Use, IRC and ERC Indices

This appendix presents the results from an reliability analysis of IT use index, IRC index and ERC index. The variables are defined in the **List of Abbreviations.**

Table 6-1-1: Reliability Analysis of the IT Use Index - Scale (Alpha)

Statistics for	Mean	Variance	Std Dev	No of Variables
Scale	23.7561	10.8505	3.2940	9

Item-total Statistics	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
BEXT	20.2813	8.7874	.4361	.2414	.5707
BTYP	21.3676	8.2374	.4322	.2693	.5639
BYRS	21.3784	8.5708	.2460	.2304	.6227
BTEC	21.3245	8.5273	.4472	.3052	.5643
BRAT	20.9504	10.2427	.0440	.0606	.6537
BSTAT	21.7266	8.4160	.3889	.1899	.5762
BFEAT	21.4180	9.1262	.2203	.0696	.6222
BSAT	20.8353	9.3450	.2827	.3197	.6044
BOBJ	20.7669	9.5091	.3550	.3096	.5949

Reliability Coefficients 9 items Alpha = .6265 Standardised item alpha = .6395

Table 6-1-2: Reliability Analysis of IT Use Index - Scale (Alpha)

Statistics for	Mean	Variance	Std Dev	No of Variables
Scale	21.0007	10.2155	3.1962	8

Item-total Statistics	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
BEXT	17.5147	8.2830	.4169	.2311	.6069
BTYP	18.6021	7.5857	.4472	.2805	.5927
BYRS	18.6091	7.7758	.2914	.2068	.6444
BTEC	18.5601	7.9505	.4427	.3001	.5974
BSTAT	18.9720	7.7536	.4144	.1894	.6025
BFEAT	18.6685	8.6456	.1938	.0582	.6635
BSAT	18.0741	8.7679	.2809	.3127	.6369
BOBJ	18.0042	8.9102	.3545	.3069	.6259

Reliability Coefficients 8 items Alpha = .6529 Standardised item alpha = .6687

Table 6-1-3: Reliability Analysis of the IRC Index - Scale (Alpha)

Statistics for	Mean	Variance	Std Dev	No of Variables
Scale	14.4059	41.7716	6.4631	15

Item-total Statistics	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
XFOR11	12.8954	38.0604	.4174	.2803	.8218
XEXT11	13.6569	36.7557	.4499	.2626	.8196
XCOM11	13.3556	36.9192	.4546	.2736	.8193
XNON11	13.6987	37.5055	.3649	.1980	.8250
XSTR11	13.4895	35.9820	.5455	.3444	.8134
XSEG11	13.6109	37.2387	.3748	.2701	.8246
XTAI11	13.3933	36.1976	.4910	.3240	.8168
XFRE11	13.1548	35.8037	.5551	.5960	.8127
XTIM11	12.9874	37.0124	.5025	.5293	.8168
XAUD11	13.5063	36.4947	.4894	.3884	.8171
XACS11	13.6653	36.6018	.5378	.4054	.8146
XAVA11	13.5649	36.6250	.4956	.3703	.8168
XUND11	13.5188	36.4440	.5030	.3774	.8162
XPRE11	13.1799	36.3667	.5456	.3781	.8139
XCOS11	14.0042	38.4496	.1672	.0814	.8444

Reliability Coefficients 15 items Alpha = .8296 Standardised item alpha = .8381

Table 6-1-1: Reliability Analysis of the IT Use Index - Scale (Alpha)

Statistics for	Mean	Variance	Std Dev	No of Variables
Scale	8.1095	54.2980	7.3687	15

Item-total Statistics	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
XFOR21	7.3333	47.1133	.5722	.4435	.9062
XEXT21	7.4925	47.0412	.6219	.4729	.9041
XCOM21	7.5174	47.3809	.6497	.5753	.9032
XNON21	7.6517	48.2581	.5926	.4610	.9052
XSTR21	7.6716	47.0816	.6942	.5365	.9018
XSEG21	7.5473	48.3590	.5240	.3906	.9075
XTAI21	7.7114	48.4863	.5809	.3876	.9056
XFRE21	7.5323	47.0302	.6858	.7351	.9020
XTIM21	7.3383	46.1750	.7307	.7363	.9002
XAUD21	7.4726	46.6305	.6477	.5475	.9032
XACS21	7.7612	47.9327	.6225	.5637	.9042
XAVA21	7.9104	49.5519	.5657	.4689	.9064
XUND21	7.5373	47.1599	.6712	.5936	.9025
XPRE21	7.3234	46.0599	.6375	.5887	.9038
XCOS21	7.7313	49.7675	.3460	.2068	.9142

Reliability Coefficients 15 items Alpha = .9105 Standardised item alpha = .9122

Appendix 6-2: Relationships among Individual IT Use and CFR Variables

The variables used in this appendix are defined in the **List of Abbreviations.**

Table 6-2-1: Spearman Correlation Coefficients among Individual IT Use and IRC Variables

IRC Items	BEXT	BYRS	BTYP	BTEC	BRAT	BSTAT	BFEAT	BSAT	BOBJ
XFOR11	.166**	.060	.126*	.229**	.069	.045	.124*	.083	.079
XEXT11	.056	.092	.111	.115	.000	.026	.084	.053	.085
XCOM11	.079	.043	.094	.165**	.057	.137*	.197**	.081	.117
XNON11	.014	.042	.037	.158**	.029	.163**	-.066	-.028	.008
XSTR11	.219**	.067	.229**	.210**	.044	.166**	.094	.035	-.022
XSEG11	.191**	.172**	.101	.180**	.046	-.002	.105	-.012	.046
XTAI11	.167**	.114	.228**	.252**	.019	.168**	.160**	.040	.146*
XFRE11	.116	-.030	.123*	.121*	-.052	.219**	.137*	.171**	.042
XTIM11	.073	.041	.120*	.144*	-.061	.163**	.127*	126*	.043
XAUD11	-.023	-.155*	.028	.026	.103	.006	.128*	.075	.056
XACS11	-.001	-.021	.076	.166**	.035	.142*	.105	-.019	.015
XAVA11	.124*	.083	.166**	.257**	.029	.250**	.126*	.036	.071
XUND11	.019	-.038	.099	.076	.064	.120	.152*	.135*	.047
XPRE11	.118	.024	.154*	.189**	.137*	.028	.105	.092	.064
XCOS11	.059	.046	.173**	.096	.116	.081	.022	.036	.031

Note: The smallest number of cases used in this analysis is 258.

Table 6-2-2: Spearman Correlation Coefficients between Individual IT Use and ERC Variables

ERC Item	BEXT	BYRS	BTYP	BTEC	BRAT	BSTAT	BFEAT	BSAT	BOBJ
XFOR21	.066	-.019	.108	.008	.036	-.023	.014	-.080	-.030
XEXT21	.051	.032	.105	.087	-.028	.031	.055	-.060	.029
XCOM21	.037	.078	.163*	.142*	.047	.136*	-.016	-.011	.018
XNON21	.014	.100	.185**	.323**	.081	.195**	-.084	-.088	.054
XSTR21	.009	.046	.156*	.123	.071	.101	.000	.035	.041
XSEG21	.145*	.246**	.099	.203	.009	.074	.019	-.041	.103
XTAI21	.018	.053	-.001	.133	.067	.029	-.008	-.085	.071
XFRE21	.029	.028	.145*	.019	.060	-.049	-.003	.038	-.059
XTIM21	.031	.115	.123	.119	-.041	-.002	.013	-.021	.000
XAUD21	.017	.018	.053	.108	-.011	.039	.008	-.025	.048
XACS21	-.086	.122	.054	.118	.049	.058	-.030	-.061	-.003
XAVA21	-.075	-.015	.011	-.039	.017	.064	-.066	.022	.089
XUND21	.045	.112	.097	.147*	.094	.046	.048	-.058	-.052
XPRE21	.068	.190**	.127	.216**	.036	.002	.005	-.048	.012
XCOS21	-.059	.176**	.112	.188**	.097	.161*	-.027	-.027	-.040

Note: The smallest number of cases used in this analysis is 217.

Appendix 6-3: Principle Components Analysis and Factor Analysis

The objective of principle components analysis (PCA) is to describe *k* variables X_1, X_2, ..., X_k in terms of *k* new uncorrelated variables or components Y_1, Y_2, ..., Y_k by way of an orthogonal transformation (Jolliffe, 1986). The qualification for the components being "uncorrelated" is important since it means that the variables are measuring different "dimensions" in an index. In performing a PCA, it is hoped that the first few components (fewer than the original number of variables) can explain most of the variation in the original data. If this is the case, they are used in subsequent analysis, providing considerable data reduction. In mathematical terms, the relationships between the original variables and the components can be written as

$$Y_i = C_{i1}X_1 + C_{i2}X_2 + \ldots + C_{ik}X_k \quad (\mathrm{i} = 1, 2, \ldots, \mathrm{k})$$

where the *C*s are coefficients used to combine the components, the Ys are the components, and the *X*s are the original variables.

The basic assumption of factor analysis is that observed correlations between the original variables result from their sharing some underlying factors, and the objective of the method is to identify these factors based on the observable variables (Lawley and Maxwell, 1971). Factor analysis thus formally resembles PCA in that it also seeks to describe a set of original variables X_1, X_2, ..., X_k in terms of a smaller number of factors F_1, F_2, ... F_m where ($k > m$). In mathematical terms, the relationships between the original variables and the factors can be expressed as

$$X_i = C_{i1}F_1 + C_{i2}F_2 + \ldots + C_{im}F_m + E_i \quad (\mathrm{i} = 1, 2, \ldots, \mathrm{k})$$

where the *C*s are the coefficients or loadings used to measure the extent that a factor is related to an original variable and to combine the *m* factors, the *F*s are termed the common factors, and E_i is called the unique factor representing sources of variation affecting only the variable X_i.

A major difference between PCA and factor analysis is that the former is variance-oriented while the latter is covariance-oriented. That is, in successful applications of PCA only a few components are needed to represent most of the variation in the original variables, whereas the hallmark of a successful factor analysis is that a few factors can well represent the covariance structure among the original variables (Johnson and Wichern, 1992). Another difference lies in the direction of analysis. With PCA, one works from the original variables towards reducing the dimensions of variation in the data and giving components a physical meaning. In contrast, one starts from a model when factor analysis is applied and sees if it fits the data (Kendall, 1961). In other words, PCA is model-free while factor analysis is dependent on a model (Manly, 1986). However, the difference is often blurred in practice because the directions of data analyses are not all that clean-cut. In fact, two ways of using factor analysis (exploratory and confirmatory) have been identified, each of which works in a different direction (Bryman and Cramer, 1994). Moreover, PCA is often used as one of many factor extraction methods in a factor analysis. That is, PCA is used to produce as many components as the original variables in the first instance and then factor analysis rotates only a specified number of components to obtain factors and estimate a score for each factor. This is the case with the Statistical Package for Social Scientists (SPSS) (Norusis, 1993) which is used in this study. The main reason for rotating the principal components resulting from a PCA is to obtain factors that are easier to interpret.

Three factor rotation methods are available, namely varimax, equamax and quartimax (Jackson, 1991; Norusis, 1993). The varimax method intends to enhance the interpretability of the factors by minimising the number of variables that have high loadings on a factor, while the quartimax method attempts to ease the interpretation of variables by minimising the number of factors needed to explain a variable. The equamax method is a combination of the varimax method which simplifies the factors, and the quartimax method which simplifies the variables.

Appendix 6-4: Testing the Difference between or among Correlations

Three statistical procedures are used to investigate differences between or among correlation coefficients in Section 2 of this chapter. These are used only as a guide to the significance of differences, as strictly they assume multivariate normality with calculations based on Pearson correlation coefficients.

Each method is introduced with references, followed by its application relevant to the hypotheses discussed in Chapter 7.

1. Testing the difference between two correlations coefficients

To test the equality of two population correlation coefficients

$$H_0 : \rho_1 = \rho_2$$

based on sample correlation coefficients r_1 and r_2 determined from independent samples of size n_1 and n_2, we use

$$Z = (z_1 - z_2) \Big/ \sqrt{\frac{1}{(n_1 - 3)} + \frac{1}{(n_2 - 3)}}$$

where $z_i = \frac{1}{2}\log_e[(1 + r_i)/(1 - r_i)]$ (i = 1, 2), which is referred to as Fisher's transformation. Under H_0, Z follows the standard normal distribution (Wetherill, 1981).

This method is used for testing aspects of Hypotheses 2 to 6. The results are summarised in Table 6-4-1.

Table 6-4-1: Z Test of the Difference between Two Correlations

Hypothesis	Coefficient	Sample Size	Z Value	Notes
H2: (Table 6-5)	0.381	83	1.47⊕	1) One-sided critical value is 1.28 at 0.10, 1.64 at 0.05, and 2.33 at 0.01.
	0.184	118		
	0.381	83	1.71*	
	0.098	56		
	0.184	118	0.53	
	0.098	56		
H3: (Table 6-6)	0.297	48	2.06*	2) ⊕ denotes significant at 0.10, * at 0.05, and ** at 0.01.
	-0.065	100		
	0.297	48	0.56	
	0.196	69		
	0.196	69	1.65*	
	-0.065	100		
H4: (Table 6-7)	0.156	111	0.26	
	0.122	124		
H5: (Table 6-9)	0.255	115	1.85*	
	0.008	105		
	0.225	115	0.45	
	0.097	11		
H6: (Table 6-10)	0.337	48	1.66*	
	0.011	54		
	0.337	48	2.01*	
	-0.130	31		
	0.337	48	1.52	
	0.060	75		

2. Testing the difference among three or more correlation coefficients

To test the null hypothesis

$$H_0 : \rho_1 = \rho_2 =, \ldots, = \rho_k$$

based on sample correlation coefficients r_1, r_2, ..., r_k determined from independent samples of size n_1, n_2, ..., n_k, we use

$$X^2 = \sum_{i=1}^{k} (n_i - 3)(z_i - \bar{z})^2$$

where $z_i = \frac{1}{2}\log_e[(1+r_i)/(1-r_i)]$ (i = 1, 2, ..., k), and $\bar{z} = \frac{\sum(n_i - 3)z_i}{\sum(n_i - 3)}$. Under H_0, X^2 follows the chi-square distribution with (k-1) degrees of freedom (Wetherill, 1981). This formula is used for investigating Hypotheses 2, 3, 5, and 6. The results are summarised in Table 6-4-2.

Table 6-4-2: X^2 Test of the Difference among Three or More Correlations

Hypothesis	Coefficients	Sample sizes	X^2 Value	CV at 0.10	CV at 0.05
H2: (Table 6-5)	0.381 0.184 0.098	83 118 56	3.47	4.61(df=2)	5.99 (df=2)
H3: (Table 6-6)	0.196 -0.065 0.297	69 100 48	5.19♦	4.61(df=2)	5.99(df=2)
H5: (Table 6-9)	0.097 0.255 0.008	11 115 105	3.49	4.61(df=2)	5.99(df=2)
H6: (Table 6-10)	0.337 0.011 -0.133 0.060	48 54 31 75	4.83	6.25(df=3)	7.81(df=3)

Notes: (1) CV: one-sided critical value, (2) df: degrees of freedom, and (3) ♦: significant at 0.10.

3. Testing the difference between two dependent correlation coefficients

To test the equality of two population correlation coefficients, that is correlations involving a common variable, based on sample correlation coefficients r_{13} and r_{23} determined from a sample size n, we use

$$T = (r_{13} - r_{23}) \sqrt{\frac{(n-1)(1+r_{12})}{2(\frac{n-1}{n-3})|R| + \bar{r}(1-r_{12})^3}}$$

where $|R| = (1 - r_{13}^2 - r_{23}^2 - r_{12}^2) + 2\, r_{13} r_{23}\, r_{12}$, and $\bar{r} = (r_{13} + r_{23}) / 2$. Under $H_0 : \rho_{13} = \rho_{23}$, T follows Student's t distribution with (n-3) degrees of freedom (Williams, 1959; Neill and Dunn, 1975).

This test is now applied, with $H_1 : \rho_{13} > \rho_{23}$, to investigate the difference between the two dependent correlation coefficients presented in Table 6-4, i.e. $r_{13} = 0.305$ and $r_{23} = 0.149$. The value of r_{12} is also available which is 0.570. Since the pairwise exclusion method is used to treat the missing values in the Spearman correlation analysis, there are two values for n, namely 236 and 281. To be conservative, 236 is used here for the T test. The result is $T = 2.67$ which by the normal approximation is significant at less than 0.004 in the one-sided test.

Appendix 6-5: Partial Correlation Analysis

This appendix exhibits the results of the partial correlation analyses of the relationships between IT use and IRC, and between IT use and ERC by controlling *company size* (SALE), *information demand from internal users* (IDEM), and *information demand from external users* (EDEM). It is used as a reference for hypothesis testing in Section 2 of Chapter 7. The variables used here are defined in the **List of Abbreviations.**

Table 6-5-1: Partial Correlation Coefficients between IT Use and IRC and between IT Use and ERC

ITUSE and IRCAGG		ITUSE and ERCAGG	
Control SALE	Control SALE, IDEM and EDEM	Control SALE	Control SALE, IDEM and EDEM
.284**(254)	.239** (252)	.114 (214)	.038 (212)

Table 6-5-2: Partial Correlation Coefficients between IT Use and IRC and between IT Use and ERC by Size

Company Size	ITUSE and IRCAGG	ITUSE and ERCAGG
	Control IDEM and EDEM	Control IDEM and EDEM
Small	.351**(77)	.149(65)
Medium	.188*(113)	-.082(96)
Large	.088(49)	.221(43)

Table 6-5-3: Partial Correlation Coefficients between IT Use and IRC and between IT Use and ERC by Listing Status

Listing Status	ITUSE and IRCAGG		ITUSE and ERCAGG	
	Control SALE	Control SALE, IDEM and EDEM	Control SALE	Control SALE, IDEM and EDEM
Listed	.197** (117)	.178(115)	.090 (97)	.016(95)
Unlisted	.330**(133)	.258**(131)	.110 (113)	-.004(111)

Table 6-5-4: Partial Correlation Coefficients between IT Use and IRC, and between IT Use and ERC by Financial Reporting Strategy

Financial Reporting Strategy	ITUSE and IRCAGG		ITUSE and ERCAGG	
	Control SALE	Control SALE, IDEM and EDEM	Control SALE	Control SALE, IDEM and EDEM
Suppressing	.344(9)	.258(7)	.265(7)	.099(5)
Ritualism	.395**(120)	.346**(118)	.228*(101)	.148(99)
Informational	.187*(107)	.170(105)	-.014(95)	-.060(93)

Table 6-5-5: Partial Correlation Coefficients between IT Use and IRC, and between IT Use and ERC by Management Compensation Plan

Management Compensation plan	ITUSE and IRCAGG		ITUSE and ERCAGG	
	Control SALE	Control SALE, IDEM and EDEM	Control SALE	Control SALE, IDEM and EDEM
No plan	.511**(49)	.431**(47)	.311*(42)	.394**(40)
Bonus	.152(49)	.087(47)	-.042(45)	-.226(43)
Share option	-.014(33)	.064(31)	-.219(25)	-.172(23)
Bonus & share option	.171(80)	.207(78)	.024(68)	.055(66)

Table 6-5-6: Partial Correlation Coefficients between IT Use and IRC and between IT Use and ERC by Gearing

Gearing	ITUSE and IRCAGG		ITUSE and ERCAGG	
	Control SALE	Control SALE, IDEMand EDEM	Control SALE	Control SALE, IDEM and EDEM
0% to 10%	.159(23)	.125(21)	-.110(18)	-.242(16)
11% to 50%	.344** (65)	.229(63)	.127(57)	-.088(55)
51% to 100%	.164(62)	.253*(59)	-.069(52)	.041(50)
Over 100%	.430**(62)	.387**(60)	.286*(51)	.213(49)

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