IT Management Sophistication in Small Business: Its Definition, Measurement and Relationship with IT Impact

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Computers are useless. They can only give you answers.

Pablo Picasso

Any sufficiently advanced technology is indistinguishable from magic.

Arthur C. Clarke

***I am thinking about something much more important than bombs.
I am thinking about computers.***

John Von Neumann

ABSTRACT

This research deals with information technology (IT) management in small businesses. Although IT management in large businesses has been extensively researched, only a handful of studies have focused on the small business sector.

There are three specific objectives of this research:

(a) to characterise IT management sophistication in small business,

(b) to develop and validate a comprehensive instrument to measure this construct, and

(c) to develop a model that explains the relationship between IT management sophistication and the IT impact, in the context of small business.

The characterisation of the construct is based on the work of Raymond and Pare (1992) who explored the concept of IT sophistication within the context of small businesses. This study adopted a multi-method investigative approach, combining both case study research and survey methods. The study population was New Zealand's small chartered accountancy firms. Initially, a pool of indicators representing IT management sophistication in small business was derived on the basis of case study analysis. These indicators were used as the basis for drafting the measurement instrument which was tested within a wider population in the quantitative phase of the investigation. The second generation multivariate analytical technique, Partial Least Square (PLS) modelling, was used in the study's survey data analysis phase.

This research characterised IT management sophistication in small business under three sub-dimensions: IT planning, IT controlling and IT leading. These factors were represented by nineteen indicators. The validity and reliability of the measurement instrument was examined in the PLS data analysis. A PLS model explaining the relationship between IT management sophistication, technological sophistication, and informational sophistication on one hand with IT impact on the other, in the context of small business was derived.

The characterisation of IT management sophistication in small business will be useful for the researchers to understand this complex construct more clearly. The measurement instrument can be used to examine further the different aspects of IT management in small businesses. The model that related the study constructs will aid understanding the associated links between them. Practitioners will be able to use these results to improve upon their IT managerial practices to derive a greater impact of IT, which can, in turn, result in achieving higher organisational performance.

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Introduction

1.1 Chapter Overview

This chapter provides an introduction to the research, summary of key research finding and the organisation of this thesis: Information technology (IT) management sophistication in small business: Its definition, measurement and relationship with IT impact. Firstly, the background to the study is presented and then the research objectives are outlined. Next, the significance of the research and the methodology employed in the investigations are sketched out. The chapter concludes with an outline of the remaining chapters in this thesis.

Chapter Contents

1.2 Background

The advances in information technology (IT), and the increasing number and range of applications available, place considerable demands on information systems management (Angell & Smithson, 1991). In certain industries information technology is used to gain competitive advantage (Porter & Millar, 1985). IT is the principal tool for providing services in certain other business sectors like banking and accounting firms.

The importance of the study of management of information systems in organisations has been emphasised by several researchers including Henderson and Venkatraman (1993), Galliers (1991) and Allen (1982). Mata, Fuerst and Barney (1995) suggest that IT managerial skills are one attribute that has potential for providing sustainable competitive advantage. Allen (1982) pointed out that:

> Computers and their related technologies do indeed hold almost unlimited potential for business, but only for those that learn to manage them well. Information systems are in trouble in many companies today because of poor management practices and inadequate attention and direction from senior executives. Still more systems will be in trouble tomorrow. (Allen, 1982, p937)

The attention of MIS researchers was drawn to the 'managerial sophistication of the MIS department' in the early 1980s. In particular, IS researchers were interested in the technological sophistication and managerial (or organisational) sophistication of the MIS department. Cheney and Dickson (1982) defined *organisational sophistication* of MIS department as the planning, organising, and controlling activities associated with managing organisation's computer resource. One of the most important results of this research was that the:

> ...user performance (i.e. user information satisfaction, user job satisfaction, and system quality) appears to be very much influenced by the managerial sophistication of the organisation's MIS department, but not much influenced by their technical sophistication (Cheney & Dickson ,1982, p181).

Although the sophistication of IT and its management in the context of large businesses has been extensively explored, few studies are available in this area of information systems (IS) research within the small business sector (e.g. Raymond, 1987; Raymond & Pare, 1992). This research focuses on this vital area of information system's research: the *management of information technology* in the *small business sector.*

1.3 IT Management in Small Business

Small firms are increasingly moving towards computer based information systems with the advent of personal computers and the falling prices and popularisation of technology. Small firms themselves also perceive that IT plays a significant part in their own innovation (Fuller, 1996). El Louadi (1998) emphasised the importance of managing the IT resource in small businesses in an effective manner, and stated that:

> ...the issue, however, is not whether small businesses have computers, but how they use them. (El Louadi, 1998, p181)

The complexity and nature of managerial styles, IT adoption, management and the use of innovative technologies (e.g. IT) in small businesses may depend on a number of factors. These may include the age and maturity of the firm, and the technological sophistication and complexity of applications (Churchill & Lewis, 1993; Rizzoni, 1991; Cragg & King, 1993)

According to Raymond and Pare (1992) overall IT sophistication in small businesses can be characterised under four dimensions as given in Figure 1.1 (see page 32-33 for details).

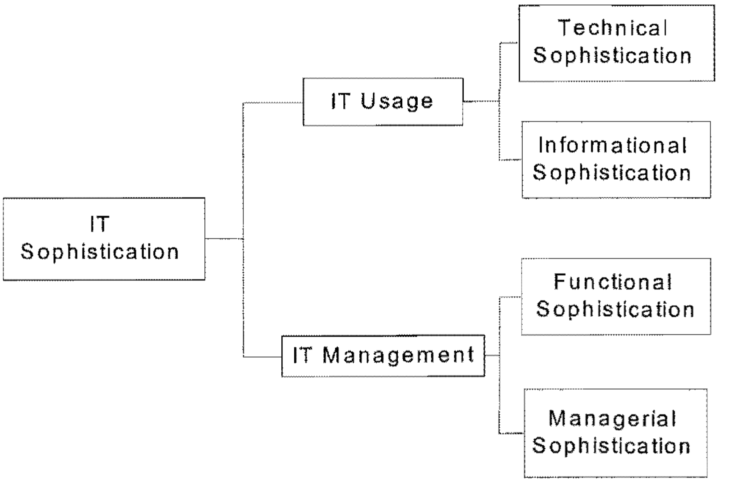

Figure 1.1 Dimensions of IT Sophistication (Raymond and Pare, 1992, p.7)

This research focuses on the area of IT management according to the Raymond and Pare's (1992) model.

1.4 Research Objectives

The aim of this research is to explore the process of IT management by characterising the concept of *IT management sophistication* within the context of small businesses. With respect to Raymond and Pare's (1992) characterisation (see figure 1.1), this research aims to further explore the IT management sub-dimension of IT sophistication in the small business sector.

Development of a comprehensive instrument to measure the *IT management sophistication in small business* construct is the major objective of this research.

This research is also aimed at positing a model that explores the relationship between IT management sophistication and the impact of IT on the firm's performance, within the context of small business.

Accordingly, this research is aimed at answering three specific research questions.

1. *What is 'IT management sophistication' in small businesses?*
2. *How should we measure 'IT management sophistication' in small businesses?*
3. *To what extent does 'IT management sophistication' help explain the impact of IT, in the context of small business?*

1.5 Research Approach

Considering the diverse nature of the research objectives, this study adapted a multi-method approach to investigation that involved a combination of both case study and survey research methods. Initially a comprehensive literature review was conducted to formulate the research objectives. The procedures suggested by Churchill (1979) for developing better measures were used as a guide in the process of instrument development.

Small chartered accounting (CA) firms in New Zealand formed the study population. Firstly, a number of case studies were conducted to gain an in-depth understanding of the contemporary ground level issues related to IT management sophistication. The case study analysis identified a pool of indicators that potentially represent the *IT management sophistication in small firms* construct.

This qualitative investigation phase was followed by a large scale mail survey of small CA firms in New Zealand. The survey and the associated data analysis were aimed at assessing the validity and reliability of the results of the qualitative phase of the research in a in a wider setting. In addition to the measures of IT management sophistication, measures relating to technological sophistication, informational sophistication and IT impact were also incorporated in the survey instrument. This was aimed at gathering data for the development of the model required by the third objective of this research.

For the analysis of survey data, the second generation multivariate analytical technique, *PLS modelling,* was used. Split-sampling techniques were used first to develop and assess PLS models and then to verify their validity and reliability. This multi-method approach of investigation fitted well with the research objectives.

1.6 Summary of Key Findings

This research characterises *"IT management sophistication in small business"* under three major sub-dimensions, namely *IT planning, IT leading and IT controlling.* The indicators that represent the three sub-dimensions of *IT management sophistication in small business* have been determined (see Table 1.1).

Sub-dimension	**Indicators (in the item statements as appeared in the original instrument)**
IT Planning	Our firm recognises IT planning as an important part of the overall business planning process.
	Our IT plans are very detailed.
	We use a rigorous IT planning process within our firm.
	Our IT system is designed to be closely aligned with the overall objectives of the firm.
	Our IT plans are frequently reviewed to accommodate the changing needs of the firm.
	Our firm is continuously searching for and evaluating new IT developments for their potential use in the firm.
	In our firm, IT is used to improve the firm's competitive position.
IT Leading	IT management within our firm is characterized by strong leadership.
	Our managers have created a vision among the staff for achieving IT objectives.
	Our managers have inspired staff commitment towards achieving IT objectives.
	Our managers have directed the efforts of staff towards achieving IT objectives.
	Our firm is committed to providing staff with appropriate IT training.
	Our top management believes that IT is critical to the success of our business.
IT Controlling	We closely monitor the progress of our IT projects.
	We closely monitor the performance of our IT system(s).
	We have comprehensive procedures in place for controlling the use of IT resources. (e.g., who can use specific software or access specific databases).
	We have comprehensive procedures in place for maintaining the security of information stored in our computers.
	In our firm, the roles and responsibilities for IT direction and development are clearly defined.
	Our firm has formal procedures for the acquisition and/or development of new IT systems.

Table.1.1 Sub-dimensions of IT Management Sophistication in Small Business and their Indicators

The second major outcome of this research is an instrument to measure IT management sophistication in small businesses. This instrument is comprised of a set of item statements presented in the form of Likert scale questions. The indicators associated with the three sub-dimensions have formed the basis for respective measures (i.e. the questionnaire items). The validity and reliability of the instrument have both been verified and the results have confirmed that the instrument is well-founded. These findings relate to the first and second objectives of this research.

Development of a model that relates *IT management sophistication* and *IT impact* along with *technological sophistication* and *informational sophistication* (four study constructs) is the third major contribution of this research (see figure 1.2). This research model has conceptualized and provided evidence for empirically mapping the complex relationships among *IT management sophistication, technological sophistication, informational sophistication* and *IT impact* (see Chapter 8, for details).

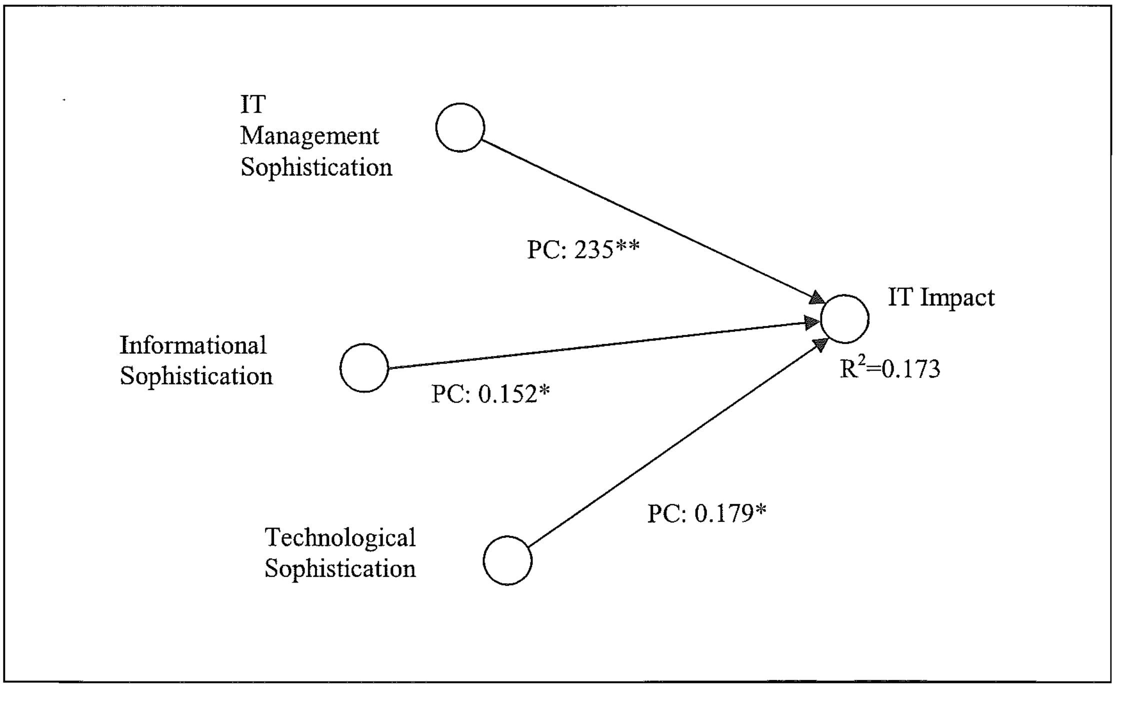

Figure 1.2. Model Relating the Four Constructs

1.7 Importance of Research and Contribution

The importance of small business sector has been well documented. For example:

> New Zealand has been characterized as nation of small business because many of the enterprises are small ....Thus the importance of small business in the economic development of New Zealand need not be laboured (Vos & Nyamori, 1997, p30).

A number of researchers have emphasized the importance of research on IT in small business. (Cragg, 1986, Iacovou, Benbasat, & Dexter, 1995). According to Mata et al. (1995), sophisticated IT managerial skills are a key attribute that can provide sustained competitive advantage. Raymond and Pare (1992) have also stressed the importance of developing valid measures of IT sophistication. So far, neither a comprehensive definition nor a valid and reliable instrument to measure this construct have been developed. Standard definitions and the use of valid, reliable instruments to measure constructs are vital for the progress of research (Nunnally, 1978). This research contributes towards bridging the knowledge gap in this important area of IS research relating to IT management, within the context of small businesses.

This research concluded that the *IT management sophistication in small business* construct can be characterised under three major sub-dimensions; *IT planning, IT leading and IT controlling.* An instrument comprised of nineteen indicators to measure IT management sophistication in small businesses was derived and the validity and reliability of measures were confirmed. This will be of interest to both practitioners and IS researchers. Characterisation of IT management sophistication in small business and the associated instrument can be used by IS researchers to further explore the relationships between this variable and other associated variables such as organisational performance and competitive advantage. Practitioners may be able to gain insights related to the stronger and weaker areas (e.g. sub-dimensions) of the IT management processes in their small firms. Such insights may be useful for the managers to formulate appropriate strategies to address the IT managerial issues that would lead to improved effectiveness of their information systems. The overall objective of such improvements may be directed towards improved organisational success and thus potential competitive advantage.

The ultimate objective of good IT management practices is to achieve better performance in the organisation. The second part of the research was aimed at understanding the influence of *IT management sophistication* to *IT impact* in the small business sector. In turn, IT impact is supposed to shape organisational performance. This research model conceptualized and provided empirical evidence to understand the complex relationships among *IT management sophistication* and *IT impact* along with *technological sophistication* and *informational sophistication*. While providing researchers the opportunity to examine the validity of the model, it will also enable them to further examine the relationship between IT management and organisational performance.

1.8 Organisation of the Thesis

This section outlines the contents of the rest of the thesis chapters.

Chapter 2: Literature Review

Background literature for conceptualising IT management sophistication in small business is presented within this chapter. The importance of this construct in explaining the organisational performance with respect to IT is also highlighted. The literature review shows that the construct *IT management sophistication in small business* has not been clearly defined in prior research, and that a reliable and valid instrument to measure the construct is not available.

Chapter 3: Research Problem

The research problem is conceptualised on the basis of literature review in this chapter. The research objectives are also derived. Characterising IT management sophistication in small business and developing a valid and reliable instrument to measure this construct was the major emphasis of this research. Development of a model relating IT management sophistication, technological sophistication and informational sophistication, with IT impact was identified as the third objective of the research.

Chapter 4: Research Approach

This chapter presents an overview of the research methods employed in this study. Since this research adopted a multi-method approach for investigation a number of research methods and techniques were used. This chapter sets the background for understanding such methods and techniques and provides criteria for data analysis and related interpretations. For example, a brief review of case study research and the process of instrument development in social research are presented.

Chapter 5: Characterisation of IT Management Sophistication: Qualitative Phase

This chapter presents details of qualitative methods employed in this research. Firstly, the particulars of the case study investigations are presented with details of the study population (i.e. small CA firms). The data collection approach and characteristics of the case study firms are also described. Subsequently, the case study findings are reviewed in light of the relevant past IS research literature to arrive at a pool of potential indicators representing IT management sophistication in small business. This embodies the case study data analysis section.

Chapter 6: Survey Design and Data Preparation

As indicated above, the major part of this investigation was based on a large scale survey of small CA firms in New Zealand. Survey design including the measures, survey instruments, questionnaire pre-test and survey administration are initially detailed. The data preparation section dealing with non-response bias analysis, selection of the research sample from the raw survey data set and formation of split-samples is presented next.

Chapter 7: Development and Assessment of the PLS Model for the IT Management Sophistication Construct.

This chapter details the development and assessment process of the PLS model that embodied the *IT management sophistication in small business* construct. The development of the PLS measurement and structural model was initiated with the survey dataset of the first split sample. Then the PLS model was subjected to a rigorous assessment process to ascertain its structural significance and the validity and reliability of associated measures. The second split-sample data set was then used to re-construct the PLS model so derived, for verifying the previous validity and reliability assessments. This investigation resulted in three major factors; *IT leading, IT planning and IT controlling* that represent IT management sophistication in small business.

Chapter 8: Development and Assessment of the Overall Model

This chapter is devoted to examining the process of development of the overall model relating the constructs IT management sophistication, technological sophistication and informational sophistication with IT impact within the context of small businesses. The total dataset of the survey (i.e. both split-samples combined) was used to derive this PLS model. As in the previous analyses the structural significance, validity and reliability of associated measures were examined in the assessment process.

Chapter 9: Discussion of Findings

This chapter reviews the findings of the current research in light of past research relevant to the topic area. The review particularly concentrates on the outcomes of the survey data analysis using PLS modelling techniques. The PLS analysis resulting in the characterisation of *IT management sophistication in small business,* and on positing a model that examines *IT management sophistication, technological sophistication* and *informational sophistication* with *IT impact* within the context of small businesses.

Chapter 10: Conclusions, Limitations and Suggestions for Future Research

This last chapter of the thesis provides a brief review of the research objectives, research methodology and the contributions of the study. Limitations of this research are outlined and the chapter concludes with a series of suggestions for future research.

1.9 Chapter Summary

The introduction to the research study and the organisation of this thesis were presented in this chapter. A brief background to the research was given, and the research objectives, key findings of the research, importance of the research and the methodology employed in the investigations were outlined. The contents of the forthcoming chapters were summarised in this chapter as a guide to the rest of the thesis.

Chapter 2

Literature Review

2.1 Chapter Overview

This literature review is mainly aimed at conceptualising *IT management sophistication in small business.* Characteristics of small businesses are presented first to provide the background to the context of the study. IT management and the evolution of IT management practice are discussed next. In comparative terms much research has been done on IT in large firms, and therefore, it is worth examining the applicability of the findings of large business research to the small business environment. Furthermore, this review deals with IT management sophistication in the light of its impact on organisational performance and explores the inter-relationships.

Chapter Contents

2.2 Small Business Sector

The focus of this study is IT management in the small business sector. Therefore, understanding the nature and characteristics of *small businesses* is imperative for this research. This section covers the unique characteristics, diversity and definition of small business. The applicability of the research findings of large businesses within the small business context is also outlined.

2.2.1 Characteristics of Small Businesses

Small businesses are quite different and unique in their own right. Researchers assert that small businesses cannot merely be viewed as small sub-systems or miniature versions of large businesses. They are quite different and unique in their own right (Chen, 1993; Dandridge, 1997; Welsh & White, 1981). Some small businesses may often have the characteristics of families or homesteads(Chen, 1993).

Small businesses differ from their larger counterparts in a number of ways. The following points are cited as examples to this effect:

- Simplicity of management structure is evident in small businesses (Bolton, 1971). Small businesses have the unique advantages related to their size and flexibility. For example they can make rapid changes in basic orientation and swift implementation of major decisions (Bergeron & Raymond, 1992).
- Small businesses are frequently associated with the independence of its owners, sometimes at the cost of its own growth (Jennings & Beaver, 1998).
- Small businesses face problems in obtaining finance and are described as being resource-poor (Rodwell & Shadur, 1988; McMahon, 1990; Bergeron & Raymond, 1992). They lack both resources and expertise to best manage all aspects of business (McMohan, 1990). These may impact upon the ability of small businesses to employ highly paid specialist staff. For example, very few small firms are able to employ systems analysts (Montazemi, 1988).
- Small businesses suffer from not having the necessary expertise required to raise funds (Bolton, 1971).
- The management process in small firms appears to be unique. In small businesses, the management process is characterised by the highly personalised preferences, prejudices and attitudes of the owner /manager. On the other hand in large businesses the management processes have been the subject of substantial academic research resulting in various models and constructs (Jennings & Beaver, 1998). Graeme and Harry (1994) states that small firms are more likely to engage in informal management practices than to adopt sophisticated planning and control techniques.

- In small businesses, the owners' energies are concentrated on activities related to products and services, sometimes at cost of attention to management issues (Bolton, 1971).
- Small businesses more frequently engage in short-term, operational planning rather than long term strategic planning (Fann & Smeltzer, 1989).
- Small businesses have the ability to respond to customer needs faster than large firms, mainly due to their flexibility in decision making (Bolton, 1971).

Further more, Bergeron and Raymond (1992) have found that the human and information resources needed to thoroughly analyse the internal activities of a small business and its environment including markets, competitors and strategic position are lacking in small firms. Small businesses also offer only a limited number of products or services to a very specific market. Since they have very little control over their extra-organisational environment and the industry, small businesses usually face greater environmental uncertainty (Bergeron and Raymond,1992). Holmes, Kelly and Cunningham (1991) concluded that the information requirements of small firms (referred to as the information cycle) vary with the life cycle or growth stage of the firm. The strategic orientation and managerial style also change with the growth of a small firm (Merz et al., 1994).

A number of factors having significant effect on the performance of small businesses have been identified. Among them are the following management related factors: (a) quality of management (Yusuf, 1995); (b) management style (Aquino, 1990); (c) management competence (Martin & Staines, 1994); (d) managerial practices (Cragg & King, 1993). Gadenne (1998) confirmed that different management practices, or strategies, are associated with small firm performance across major industry types.

Small businesses therefore possess unique characteristics and differ from large businesses in many respects. Such differences may be seen in several forms such as business objectives, management structure, resource availability and the influence of the top management on decision making.

2.2.2 Diversity of Small Businesses

Small businesses are quite diverse and the researchers have classified small businesses in a number of ways. For example, Smith and Gannon (1987) based their classification on the type of entrepreneur and Stevenson and Jarillo (1990) based theirs on the management style of entrepreneur. Miller (1983) identified three types of firms, namely, simple, organic and planning. This classification is based on contextual variables namely, environment, information processing ability, organisational structure and decision-making processes. Proposing a six type taxonomy[1] of small firms with respect to technological innovation, Rizzoni (1991) concluded that the influence of the entrepreneur (owner manager) and the inter-firm relations are two important factors that have an effect on the innovative attitude and success of small firms.

Small businesses have also been characterised in terms of 'stages of growth' models to explain their development. For example, Churchill and Lewis (1983) identified five stages[2] of small business growth on the basis of management styles: direct supervision, supervised supervision, functional, divisional, and line and staff. Scott and Bruce (1987) also proposed a five stage growth model[3] in which the emphasis was the diversity of top management roles, management styles and organisation structures.

Applicability of the contingency approach of organisational research into IT in small business has been of interest to researchers. The contingency approach emphasises the multi-variate nature of organisations and attempts to interpret and understand how they operate under varying conditions. However, it is sufficient at this stage to view a small business as a diverse entity and to be aware that research on IT management in small business needs to take this element into account (Weill & Olson, 1989).

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[1] Rizzoni, A. (1991) – Small firm taxonomy: (1) Static (2) Traditional (3) Dominated (4) Imitative (5) Technology based (6) New technology based.

[2] Churchill and Lewis (1983) - Five stages of Small Business Growth (1) Existence (2) Survival (3) Success (4) Take-off (5) Resource maturity

[3] Scott and Bruce (1987) - Five stages of Small Business Growth , (1) Inception (2) Survival, (3) Growth (4) Expansion (5) Maturity

Since small businesses are quite diverse, the associated research studies should take this fact into consideration. For example, Scott and Bruce (1987) proposed that small business studies should consider a wide variety of environmental, organisational and managerial attributes that potentially contribute to a firm's success and growth. This characteristic may have an impact on generalisation of findings of small business research.

2.2.3 IT and Small Business

Information technology and its applications in small business has also been of interest to researchers from the mid 1980s onwards (Cragg, 1986; Cragg & King, 1988; DeLone, 1988; Lefebvre & Mason, 1997; Montazemi, 1987; Raymond, 1987). Literature supports the view that the ownership and use of information technology in small firms is increasing. Further, the management in small firms perceives that IT plays a significant part in their own innovation (Fuller, 1996). Cragg and King (1993) observed that the need for better information and improved enthusiasm for technology by owners acts as a motivating force for IT adoption in small businesses. On the other hand, inadequate resources, particularly finance, managerial time, and internal expertise, have been identified as the forces that discourage IT growth in small firms (Cragg & King, 1993). Raymond (1987) examined the relationship between certain characteristics and management information system sophistication in small business, and recommended the use of longitudinal rather than cross-sectional studies for gaining a deeper understanding of the dynamics of information systems.

It has been reported that the main use of micro computers is moving from record keeping (word processing and book keeping) to decision making such as financial modelling and data management (Chen, 1993). Several researchers have shown that IT can provide competitive advantage in the small business context. For example, Fuller (1996) asserted that IT has the potential for providing competitive advantage for small business, but only a few firms were able to realise this potential. Furthermore, Harrison, Mykytyn and Riemenschneider (1997) found strong evidence to support the view that small business executives adopt IT to improve their competitive advantage.

Naylor and Williams (1994) found that small firms are more successful with IT than is generally believed. Small firm information systems have moved beyond elementary software applications. For example, small firms incorporate IT into future business plans. There are also suggestions that IT is used to assist the development of new products and the creation of new markets for small firms.

IT plays a major role in small businesses today. The significance of research into IT in small businesses needs no further emphasis, when considering the importance of the small business sector in countries like New Zealand[4].

2.2.4 Applicability of Large Business Research Findings

The research findings, managerial practices and the theories used to explain various phenomena related to *small* businesses need not be identical to those of *large* businesses because of the unique characteristics of small firms. For example, the management of a small business is mostly shaped by the activities of the CEO as he/she is generally the owner (Chell, Heworth & Brealey, 1991). Julian (1995) asserted that new technology acquisition, acquisition of information, technological scanning and monitoring by small and large firms cannot be compared. It is an entrepreneurial act for small firms and does not resemble the behaviour of large firms.

Small firms also use different channels of information according to their objectives. They use 'networks' to overcome their limits of information transfer. Fann and Smeltzer (1989) reported that the customers, suppliers/vendors and competitors are the top three external sources of information for small businesses. They, also, asserted that small business owners/managers may not be using competitor analysis to the extent advocated in business literature.

Merz and Sauber (1995) maintain that studies on small business management need not be limited to the attributes of planning, organising, staffing and control functions as in the case of most studies on large businesses. It is important to examine these issues under the situations specific to varying structural and growth conditions of small firms.

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[4] Bollard (1988) pointed that New Zealand is a nation of small business.

However, Falconer's (1997) study of different size groups (small - with 20 to 99 employees, medium - with 100 to 499 employees, and large - over 500 employees) revealed that it does not appear necessary to treat organisational size groups differently when researching information systems planning and development. They came to this conclusion on the basis of a research of Australian businesses using a large mail survey.

There has been a vast research tradition with respect to IT in the large business sector. Cragg and King (1993) examined whether the models used to describe growth for large-firm computing are relevant to small firms. They have used Nolan's growth processes to examine the computing developments in small firms. The research concluded that it may be possible to build the influencing factors into a model that could explain the IT growth in some small firms. However, it was unlikely that one growth model would apply to all types of small firms (Cragg and King, 1993). Therefore, although research findings relating to large businesses may not be directly applicable to the small business sector, it is quite useful to examine how the findings relating to studies of IT in large businesses are relevant to small business IT management.

2.2.5 Definition of a Small Business

The literature suggests that there is no precise and globally accepted definition of a *small business* (Watson & Everett, 1996). The number of owners, extent to which the business is geographically localised, size relative to industry leaders and the absolute size are certain dimensions used in characterising a firm to be "large" or "small". While size of a firm can be measured in multiple ways, the number of employees continues to be the most commonly-used criterion (Regnier, 2000; Storey, 1994).

The definition of a small business varies from country to country (Regnier, 2000). For example, a small business is defined as fewer than 500 employees in the US, fewer than 200 in the UK and several other countries (Broadbent & Weill, 1997). Those firms having 10 to 99 employees are classified as small businesses according to the European Commission definition (Bridge & Peal, 1999; Storey, 1994).

In Australia, the owner managed independent firms with less than 20 employees are regarded as small businesses. (Department of Communications Information Technology and the Arts, Australia, 2000). A more contemporary Australian definition of small business differentiates between the sectors of operation. For example, in the manufacturing sector a small business may have up to 100 employees, while in the services sector the number is limited to 20 employees. The independence of ownership (i.e. not a part of a larger enterprise) and having only a small share of the market (i.e. does not hold a dominance in the market in its field of operation) are also treated as are important criteria for a business to be regarded as "small" (Bolton, 1971).

Devlin (1984) used a statistical approach to establish a definition of a small business for New Zealand. He asserted that the average number of employees considerably very with the sector in which the business is operated. Accordingly, Devlin (1984) classified the firms less than 50 employees in manufacturing sector as small in the context of New Zealand businesses. Similarly, the criteria for classification of small businesses the wholesale and retail sector was less than 25 employees, and 10 in the service sector. This shows that the criterion level (i.e. number of employees) used to define a small business depends on the sector of operation.

The lower limit on the number of employees was also of concern to researchers since the characteristics of very small and family businesses are also different from *small businesses* in general. The term micro-business has been used by researchers to differentiate businesses that have less than 5 employees from small businesses in general (Chau & Pedrsen, 2000; Daily & Dollinger, 1993).

IS researchers in the small business sector were not immune to this controversy of small business definition. They have used those definitions of small business that are applicable within the context of the research study. For example, researchers of IT and small business in New Zealand have treated privately owned enterprises with less than 50 employees as small (Bollard, 1988; Cragg, 1986; Zinatelli, Cragg & Caveye, 1996). Raymond, Pare and Bergeron (1995) have surveyed firms having more than 20 and less than 250 employees in their small business IT research in Canada. In Australia, an annual study on the use of computers and e-commerce in small and medium enterprises (SMEs) defines a small business as having 1-19 employees

(Survey of Computer technology and E-Commerce in Australian Small and Medium Businesses, 2000).

A recent study on IT in small service-oriented firms in Australia has used 20 as the upper limit of number of employees (Chau & Pedrsen, 2000). A Waikato University study on professional accounting firms in New Zealand has recognised owner operated firms with more than 5 and less than 30 employees as small (Peursem, Wells & L'Huiller, 1999).

It can be seen that small business IS researchers in New Zealand whose studies dealt with the manufacturing sector, have treated independently managed firms employing less than 50 persons as small businesses. In the studies dealing with services sector 20 employees has been identified as the upper boundary to characterise small businesses. Certain studies have treated the firms employing less than 5 persons as *micro-business*, and hence been excluded from the small business. Not many prior research studies based on small service oriented firms[5] in New Zealand focused on IT are available. Therefore, the size category for defining the small business in this study was determined taking into consideration a number of other related factors (see page 144). However, initially this research treated *the independently managed CA firms employing less than 50 persons as small businesses.*

2.3 Management of Information Systems

This section aims to clarify the term *IT management* as it is used in this research. The commonly used terms related to the overall theme of this research, such as *information technology* and *information systems* are also defined first to assist the task of conceptualising *IT management.*

2.3.1 Relevant Definitions

In the context of information systems research, *information technology* (IT) refers to computer systems including hardware, software, data and telecommunications, and user support services including training and help lines (Goodhue, 1995).

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[5] The study population of this research was small chartered accountancy firms in New Zealand.

Information systems are the means by which organisations and people, utilising information technologies, gather, processes, store, use and disseminate information (UKAIS Newsletter, 1997).

IT use is defined as the application of IT within an organisation's operational and strategic activities (Ives & Jarvenpaa, 1991). In this regard, the extent to which IT takes the form of cost reduction, management support, strategic planning, and competitive thrust applications are implicated in *IT use* (Boynton, Jacobs & Zmud, 1994). The implications of the introduction of computers (i.e. *IT use*) in the management function and the management of computer related activities in organisations has been of interest to researchers for over four decades (Churchill, Kempster & Uretsky, 1969; Martin & Staines, 1994; Nolan, 1973; Nolan, 1982).

IT infrastructure is another related term used in IS literature. *IT infrastructure* is defined as the shared information services delivery base within an organisation that is built around:

(a) Information technologies such as hardware, software, telecommunications, and data management technologies; and

(b) A specific body of knowledge, skill set, and experience that provides policies, planning, design, construction, and operation capability necessary for viable delivery of information services (Byrd, Sambamurthy & Zumuid, 1995).

2.3.2 Scope of IT Management

Generally four major themes of research have been of interest to IS researchers. They were the management of investments, the management of quality, the management of change, and the *management of technology organisation* (De & Mathew, 1999). The *management of technology organisation* relates to the roles, tasks and composition of technology management personnel and the structure of the organisation to optimally use IT. The three interrelated terms used in IS literature with respect to the *management of technology organisation* are: *IT management, IS management* and *information management*. These terms are examined in this section with the view to gaining a clearer understanding of management of information technology.

In broad terms, the practice of *IT management* in large organisations refers to the managerial efforts associated with planning, organising, controlling and directing the introduction and use of IT within an organisation (Boynton et al., 1994). This characterisation is in agreement with the definition of 'management' described in classical management literature expressed as a process of four functions, namely planning, organising, leading, and controlling[6] (Bedeian, 1989; Schermerhorn, 1989). Reich and Benbasat (1996) conceptualised IT management as addressing the issues related to the business domain and the IT domain and their coordination, in a broader sense.

On the other hand IBM corporation consultants identified 42 IT management processes as a result of a multi-year project. These factors were presented under eleven major processes, grouped under three levels of operational, tactical and strategic[7] (Boynton et al., 1992). It may be noted that this characterisation corresponds to the three managerial levels (i.e. operational, middle and strategic) captured in the management pyramid, representing the hierarchical structure of organisations.

According to Osterle, Brenner and Hilbers, K. (1991) *Information management* relates to the management of an enterprise's information processing. The fundamental responsibility of information management is to ensure that the enterprise recognizes and harnesses the potential of information as a resource and of IT. Three interrelated sub-areas of information management have been identified. They are: IT conscious corporate management, IT resource management and Information systems management (see Figure 2.1).

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6 (a) Planning: determining what is to be achieved, setting goals, and identifying appropriate action steps; (b) Organising: allocating and arranging human and material resources in appropriate combinations to implement plans; (c) Leading: guiding the work efforts of other people in directions appropriate to action plans; (d) Controlling: monitoring performance, comparing results to goals, and taking corrective action (Bedeian, 1989; Schermerhorn, 1989).

7 IT management processes identified by IBM study:

Strategic Level Processes:	**Tactical level processes:**	**Operational Level Processes:**
Strategic planning and control	Development planning	Development and maintenance control
	Management planning	Resource Control
	Service planning	Service Control
	Resource Planning	Development and maintenance
		Administration services
		Information services

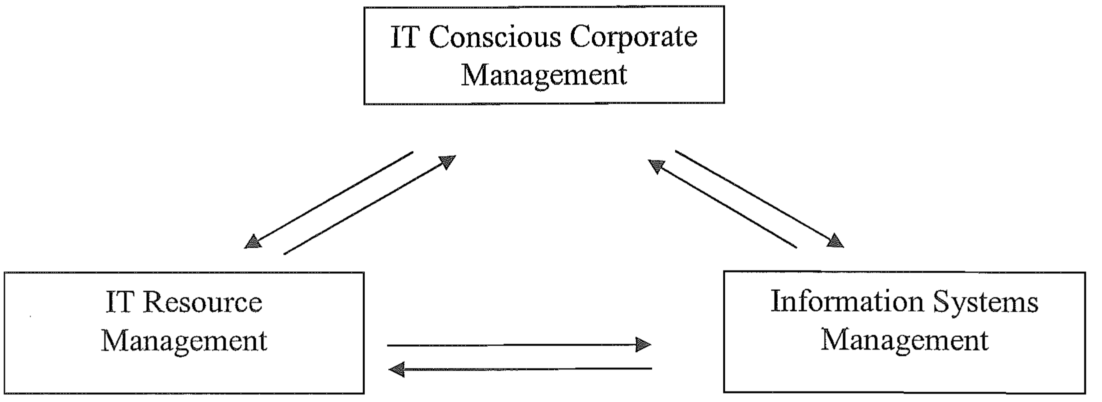

Figure 2.1 Three sub-areas of Information Management (Osterle et al., 1991).

IT conscious corporate management means recognising the potential of IT and implementing this potential in new business strategies; IT resource management views information processing from a logical conceptual standpoint. It concentrates on the development and operation of the information system; Information systems management views the IS from the standpoint of personnel and the technical structure for developing the IS. *Information systems management* consists of the development and operation of an enterprise's IS. The tasks of IS management are: architecture planning, integration, top management involvement, user department involvement, decentralisation, linking the organisation and IS, project portfolio management, modification management and system implementation. (Osterle et al., 1991). This is a border view of *information management* compared to Earl's (1989) characterisation.

Earl (1989) conceptualised information management as a process comprised of planning, organisation and control of information resources (see Figure 2.2.)

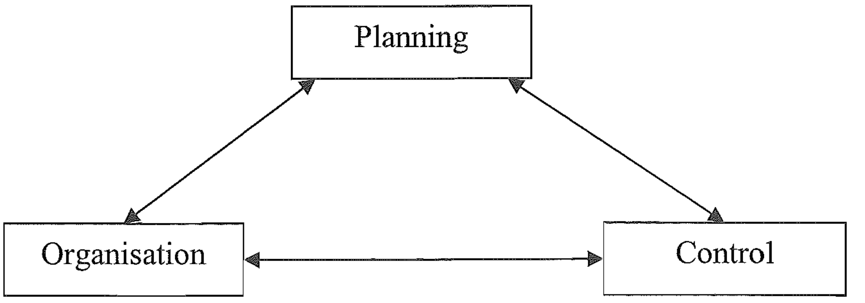

Figure 2.2 Earl's Characterisation of Information Management (Earl, 1989)

These three activities are required to be interdependent and the effective management of information requires the three facets are aligned. Furthermore, management of IT resources should not be confined solely to the specialist's technical skills and it requires the extra dimension of leadership (Earl, 1989). This view of *information management* closely resembles the definition of *IT management* presented by Boynton et al. (1994).

Managing of the IT resource as a competitive weapon (also referred to as *strategic management of IT*) is another area of interest to IS/IT researchers. For example, Benjamin et al. (1984), Ives and Learmonth (1984), Kettinger et al. (1994), McFarlan (1984), Porter and Miller (1985), and Segars, Grover and Kettinger (1994) are of the view that IT can contribute to the business success as a strategic resource. It has been reported that the rapidly developing and diverse opportunities to employ computers to increase productivity and to gain competitive advantage have brought strategic importance to the application and management of computer technology (Nolan, 1982). Fletcher and Wright (1997) argued that organisations which are aware of the changing nature of competition and the use of IT by competitors are more likely to gain a competitive advantage. While there are many examples of successful use of IT for competitive advantage, there are also many examples where IT investments resulted in no significant impact (Henderson, 1990).

The above discussion relating to the management of information technology brings together different views of management of information and information technology in organisations. The characterisation of information management by Osterle et al. (1991) takes a broader view of this concept. This view, which also generally corresponds with Earl's (1989) conceptualisation on the whole, broadly incorporates the management of IT resources including personnel and technical infrastructure, strategic IT management, and management of information systems. In research aimed at understanding and characterising the concept of IT management in small firms, it is advisable to take a broader view and not to be confined to predetermined limitations. Therefore, the term *IT management* used in this research aims to cover the broader meaning of management of IT, IS and information in an organisation, similar to the definition of information management by Osterle et al. (1991).

2.3.3 Understanding IT Management

This section brings together the literature on IT management in large and small businesses, with the view to exploring the characterisation of IT management in small firms. Examination of issues related to IT management in both large and small firms are equally important at this stage of investigation. The examination of the issues, functions and processes related to *IT management* will lay the foundation for exploring the concept of *IT management sophistication.*

Table 2.1 summarises a number of attempts to characterise IT management in which the underlying issues of IT management are listed in columns under particular researchers. Though some of these studies are not directly aimed at defining *IT management*, the dimensions examined in these studies form a comprehensive list of factors that should be taken into consideration in characterising the process of IT management. For example, the key issues in information systems management from a New Zealand perspective (Davis et al., 1995), and key issues in small business IT management (Pollard & Hayne, 1998) have been included in Table 2.1. Such issues identified by IT practitioners, and related professionals, provide insights for understanding contemporary IT management practices. IT/IS managers of large New Zealand firms have recognised that information systems alignment with business strategy, competitive advantage, IS staff skills, managing end-user computing, telecommunications, and security and control are relevant IT management issues (Davis, et al. 1995).

(a) Dimensions of Information Management (Earl, 1989)	(b) Tasks for Managing Computer Activity (Nolan, 1973)	(c) Factors of IT Management Processes (Boynton et al., 1994)	(d) Framework for IT Management (Galliers & Sutherland, 1991)	(e) Key Issues in IS Management in New Zealand (Davis et al., 1995)
• Planning • Organising • Control	• Planning • Organising • Control	• Project management • Strategic Management • Service Control • Service Planning • Resource Planning • IS services • IS Function Management • Development Maintenance	• Strategy • Structure • Systems • Staff • Style • Skills • Super-ordinate goals	• IS and business alignment • IS staff skills • Competitive advantage • End-user computing • Telecommunica tions • Security and control • Identifying projects • Measuring IS effectiveness • Open systems • Application proliferation

Table 2.1 (Part A) Key Aspects of IT Management

Notes:

(a) Earl's (1989) characterisation of information management was based on the large organisations in Europe.

(b) Nolan (1973), an early IS researcher, examined the maturity of IT in large firms. Proposing a stage hypothesis of IT maturity Nolan identified these tasks of managing computer activity (also see page 29).

(c) Boynton et al. (1994) surveyed organisations belonging to GUIDE international (a professional association of commercial organisations that operate computers manufactured by IBM) and identified eight factors as tasks of the IT management process (also see page 21).

(d) Galliers and Suthreland (1991) presented a revised '*stages of growth*' model for information systems management and strategy formulation. They identified a seven 'S' framework to elucidate how the management of information systems evolve with growth.

(e) Davis et al. (1995) published the results of a Delphi study to understand and prioritise the critical IS management issues in New Zealand. The first ten key issues of IS management faced by IS/IT professionals are listed above. These are of relevance to the current study since the research was conducted in New Zealand.

(f) Core IS Capabilities (Feeny & Willcocks, 1998)	(g) Measures of IT Management Sophistication (Sabherwal & Kris, 1994)	(h) Measures of IT Management Sophistication (Guptha, Karimi & Somers,1997)	(i) Key Issues in IS Management in Small Firms (Pollard & Hayne, 1998)	(j) Dimensions of IT Management (Raymond & Pare, 1992)
• IS/IT Leadership • Business systems thinking • Relationship building • Architecture planning • Making technology work • Informed buying • Contract facilitation • Contract monitoring • Vendor development	• IS planning • Top management involvement (in planning) • IS performance evaluation • IS manager's knowledge of business plans • Top management's knowledge of IT	• IT planning mode • IT control mode • IT organisation • IT integration	• IS for competitive advantage • IS project management • Software development • Responsive IT infrastructure • Aligning IS • Technological change • Communication networks • Business process redesign • Educating users • IS human resource	• Organisational objectives • Top management implications • IT investment • IT adoption • Presence of consultants • IT planning • IT control • IT evaluation • IS personnel • Role of IS function • Decision level • Type of development • Position of IS

Table 2.1 (Part B) Key Aspects of IT Management

Notes:

(f) Feeny and Willcocks (1998) presented nine core IS capabilities based on the experience of large US based companies. They stated that these capabilities 'are required both to underpin the pursuit of high-value-added applications of IT and to capitalise on the external market's ability to deliver cost effective IT services'.

(g) Sabherwal and Kris (1994) examined organisational critical success factors and IT capability in large academic institutions in the US. These five factors formed the basis for their measures of IT management sophistication (also see page 41).

(h) Guptha et al. (1997) measured IT management sophistication in large US companies in the financial service industry using 20 measures grouped under these four dimensions.

(i) Pollard and Hayne (1998) examined the key issues of IS management in small firms in Canada following the Delphi technique. The ten most critical issues that small firms expect to face in the 1995-2000 era are given above.

(j) Raymond and Pare (1992) attempted to characterise IT management sophistication in small Canadian businesses.

The diversity of different aspects of IT management identified by these different researchers suggests that there is no commonly accepted characterisation of the term 'IT management'. However, planning, organising and control are common to many of the frameworks characterising IT management, although some include aspects not shared by the others. For example IS/IT leadership, relationship building and business systems thinking are identified as core IS capabilities by Feeny and Willcocks (1998), but these aspects are not incorporated in characterising IT management by Earl (1989), Nolan (1973) and Guptha et al. (1997). Both Sabahawal and Kris (1994), and Raymond and Pare (1992) have recognised the involvement of top management in IT planning (and also other matters related to IT management) is an important factor that leads to success of information systems in organisations.

Lack of similarity in the IT management processes between large and small firms is also evident. For example, while large firms are concerned with IT management issues such as architecture planning, contract monitoring and IS function management (Feeny & Willcocks, 1998), small firms deal with issues such as educating the users, involvement of external consultants and implications of top management (Pollard & Hayne, 1998).

The importance of external expertise in IT management and implementation has been highlighted by several researchers (Fink, 1998; Gable, 1996; Thong et al., 1996). This factor is of special relevance to small firms where the knowledge and skill base is poor compared to large firms. Thong et al. (1997) observed that small businesses rely on consultants and vendors in IS projects implementation, and IS effectiveness is positively related to the consultant's effectiveness in such firms. Similar effect was observed with respect to the impact of external advisors on financial performance in small businesses. Kent, (1994) found that financial performance was positively related to using management advisory services from external advisors, in small Australian pharmacies.

In a study of small and medium sized enterprises in north-west England, Naylor (1994) concluded that the differences in success lay in managerial factors such as flexibility of approach and commitment to innovation. They also found that the successful use of IT in small firms does not depend entirely on their planning procedures or on the level of sophistication of software, but also on the skills of management to interact with the information system.

Fink (1998) was of the opinion that the management effort towards IT in small firms is negligible when compared to large firms. Though the IT managerial processes may differ, it is not proper to infer that small businesses have absolutely no practices to manage their IT. For example, in a study of contemporary management practices in IT companies, Rodwel and Shadur, 1997 confirmed that the practices related to human resource management are more sophisticated than one may be led to believe. Cragg and King (1993) found that while many small firms have experienced growth with respect to the number and type of IT applications, only minor changes have been observed in the management of IT in small firms (Cragg & King, 1993). Raymond and Pare (1992) identified that the management of IT was a major dimension of IT sophistication. The managerial issues pertaining to IT in small businesses have been highlighted by several other researchers including El Louadi (1998), and Pollard and Hayne (1988). The indicators used in the characterisation of IT management in large firms may therefore not be appropriate within the small business context.

Analysis of two small firm studies; Pollard and Hayne (1988) and Raymond and Pare. (1992) cited in Table 2.1, also showed little agreement with respect to the characterisation of IT management. Although the objectives of these two studies were somewhat different, comparison of their outcomes provide useful incites regarding the issues related to IT management. For example, Pollard and Hayne (1998) included IS for competitive advantage and IS project management a key issues whereas Raymond and Pare (1992) identified consultants' involvement as an important aspect of IT management.

Although there are certain commonalities in characterisation of IT management, it is evident that a commonly accepted means to define IT management in small firms has not evolved. The general management sub-themes, *planning, organising, controlling and leading* with respect to IT management may provide the basis for characterisation of this concept in broad terms. However, this research takes the view that the specific aspects of these sub-themes have to be examined in detail to identify a way of characterisation of IT management in small firms. Common to these studies is the notion that IT management comprises a number of sub-functions and may be viewed as a multidimensional construct.

2.4 IT Maturity

Sophistication of IT management is the principal theme in this research. The term 'sophistication' is used here to mean the managing of information systems in a more mature, superior, clever and advanced fashion. In IS literature the term sophistication and maturity has sometimes been used to mean the same concept (e. g. Guptha et al., 1997; Karimi et al., 1996). Therefore, a review of literature related to IT maturity is quite relevant to this research. Accordingly, the literature on previous research on the sophistication of IT in general, and IT management in particular, with respect to both large and small business sectors is reviewed in this section.

2.4.1 'Stages of Growth' Models

Nolan (1973), being one of the earliest researchers in the field, presented the *stage hypothesis of IT maturity* in organisations based on data processing expenditure. Accordingly, IT growth in organisations follows four stages, namely:

Stage I	Initiation (computer acquisition);
Stage II	Contagion (intense system development);
Stage III	Control (proliferation of controls);
Stage IV	Integration (user service orientation).

The nature of the tasks of managing the EDP (electronic data processing) organisation, characterised by controlling, organising and planning, vary with different stages of growth. This implies that the management orientation of IT varies with the maturity of IT in the firm. In 1974, Gibson and Nolan restated the *stage hypothesis* and identified three growth processes, namely, building an application portfolio, building an EDP organisation, and building an EDP planning and control system. Although there were several suggestions for improvement to Nolan's model, most researchers recognised the concept of stages with respect to IT maturity and have also adopted this concept to explore various themes in IS research (Benbasat, Dexter & Mantha, 1980; Benbasat et al., 1984; Galliers, 1991; Cragg & King, 1993; Drury, 1983; Gibson & Nolann, 1974; King & Kramer, 1984; Lucas & Sutton, 1977). Benjamin et al. (1984) asserted that this was an important piece of research that presented a framework for IS professionals to follow in managing computer resources

(Benjamin et al., 1984). This research centred on Nolan's stage hypothesis and suggested that IT management process can be characterised under three main areas namely organising, controlling and planning (Benbasat et al., 1980).

IT maturity was re-conceptualised by McFarlan (1984) in the form of a technology assimilation model. The overall IT diffusion process was described in this model and has also illustrated the evolution of IT management strategies as firms move toward IT maturity. Accordingly, the IT diffusion process is segmented into four phases, namely, technology identification and investment, technology learning and adaptation, rationalisation or management control, and maturity or widespread technology transfer (McFarlan, 1984).

Six stages[8] have been identified by Galliers and Sutherland (1991) in their revised stages of growth model of IT maturity. They characterised IT management in the form of a seven 'S'; framework as indicated on page 24.

Successful computer use is not something that will come with increased maturity, merely due to the passage of time, but rather success is effected by implementing a series of activities which are applied to computerisation over time. These efforts and activities include top management involvement, planning and controlling (DeLone, 1988). It can be seen that IT maturity (or IT sophistication) is not merely a function of time, but refer to the richness with respect to a number of factors (e.g. well thought about planning and improved controlling IT resources) related to the managerial processes of Information systems.

It can be seen with these examples that IT management also matures with the growth of IS in organisations. As the role of IT changes within an organisation, leadership, organisational design, and management processes also change (Raghunathan, Raghunathan & Tu, 1999). Though the characterisation of IT management may differ from researcher to researcher, the process of evolution, maturity or sophistication of management of IT has been clearly established.

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[8] Galliers and Sutherland (1991) : Six stages of IS maturity; (i) Acquisition of hardware, software and other IT resources (ii) IT audit; find out and meet user needs (reactive) (iii) Top-down IS planning (iv) Integration, coordination and control (v) Environmental scanning and opportunity seeking (vi) Maintain comparative strategic advantage, Monitor futures, Interactive planning.

2.4.2 IT Management Sophistication in Small Business

Three previous attempts to characterise IT management sophistication by IS researchers have been identified. Two of these studies, Guptha et. al (1997) and Sabherwal and Kris (1994), examined this construct in the context of large organisations. The research based on small manufacturing firms in Canada by Raymond and Pare (1992) provided valuable insights for the understanding of IT management sophistication within small business context. This section reviews the concept of IT management sophistication primarily dealing with these three research findings.

Similar to the concept of IT management, characterisation of *IT management sophistication* has also not been consistent in IS literature. This variation may have been caused by the inconsistency in characterisation of IT management as seen earlier in section 2.3.3. It has also been observed that the term IT sophistication and IT management sophistication has sometimes been used interchangeably.

For example Karimi et al. (1996) have used the terms *IT maturity* and *IT management sophistication* to mean an identical concept[9]. They wrote:

> IT maturity is used here to characterise firms in terms of their evolution in planning, organising, control, and integration aspects of there IS function (p 63)

Surprisingly, these researchers used the term *IT management sophistication* to portray the identical concept in 1997. They wrote:

> IT management sophistication or maturity is used here to characterise firms in terms of their evolution in planning, organising, control, and integration aspects of there IS function (Guptha et al., 1997, p 400).

However, Guptha et al.'s (1997) research has made a valuable contribution towards characterisation of IT management sophistication in large firms. As indicated on page 25, they examined IT management sophistication under four modes, namely IT planning, IT control, IT organisation and IT integration.

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[9] It may be emphasised here that this interchangeable use of terms does not impact on their research content.

Another term used in IS research is *IT infrastructure sophistication.* This refers to the extent to which the core infrastructure technologies have been embedded into the organisation's value-chain activities (Byrd et al., 1995). The notion of *sophistication* in this definition is associated with the *value-chain activities* of the organisation. It implies that the notion of sophistication of IT management may also be associated with the activities related to organisational performance.

Sabherwal and Kris (1994) asserted that IT management sophistication represents the extent to which the management of IT function meets the strategic requirements of the organisation. Greater IT management sophistication is characterised by IT managers being aware of the organisation's long term plans; the organisation's future plans being explicitly considered during IS planning; and the extent to which IS planning takes an organisation's future plans into account. Furthermore, the higher level of top management participation in IT planning leads to greater sophistication of IT management. Top management is expected to have a more comprehensive knowledge about IT in the organisation with sophisticated IT management.

Both these studies of IT management sophistication have recognised that a greater strategic use of IT coincided with higher levels of management sophistication. Strategic IT management dealing with managing the IT resource as a competitive weapon has been supported by a number of researchers (Benjamin et al., 1984; McFarlan, 1984; Porter & Millar, 1985; Segars, Grover & Kittinger, 1994). Guptha et al. (1997) confirmed that the level of IT management sophistication in large, information-intensive financial services varies with their competitive strategy.

Strategic management of information technology has been identified as a critical dimension of small firm competitiveness (Lefebvre, Mason & Lefebvre, 1997). There exists a strong potential for using IT not only at the operational level but also at the administrative and strategic levels in small and medium sized firms. IT can be used as a strategic resource by small and medium enterprises to maintain their competitiveness and attain a leading position within their sector activity (Bergeron & Raymond, 1992).

This implies that at the higher levels, IT management sophistication in large firms should work towards managing IT for strategic purposes. Sophisticated IT management is strategically oriented and integrated with an organisation's competitive strategy (Ramaswami, Nilakantha & Flynn, 1992). It has been observed that in order to fully realise the competitive advantage created by the strategic use of IT, the organisations must have appropriate IT management strategies. These strategies should be formulated in such a way that they accommodate organisation culture, technology status, and business strategy (Raghunathan et al., 1999). Boynton et al. (1994) confirmed that managerial IT knowledge was critical for bringing about high IT usage and to move beyond obvious applications to strategic uses.

Therefore, a study of IT managerial sophistication cannot ignore the strategic aspects of the IT managerial process. However, it may be noted here that Henderson (1990) has reported:

> ...while there are many examples of how investments in technology yielded significant competitive advantage, there are also many examples where such investments resulted in no measurable impact (Henderson, 1990, p 7).

The characterisation of the overall IT sophistication by Raymond and Pare (1992) may be a useful starting point in characterising IT management sophistication within the context of small business. They conceptualised *IT sophistication* (or maturity) as a construct which refers to the nature, complexity and interdependence of two sub-dimensions (see Figure 2.3) namely *IT usage* and *IT management*. IT usage, in turn, is defined in terms of t*echnological sophistication* and i*nformational sophistication*. Similarly, IT management is defined in terms of two sub dimensions namely *functional sophistication* and *managerial sophistication*.

Basically, technological sophistication is a reflection of the number or diversity of technologies used by small businesses. This is mainly concerned with the degree of complexity of hardware, software systems and development tools used by the firm. Informational sophistication is characterised in terms of portfolio of applications and integration of applications. The IT usage dimension appears to address the *'what'* aspects of IT sophistication, in which the technological sophistication factor attempts to answer the question *'What technology is used?'* The informational sophistication dimension addresses issues related to *'For what are these technologies used?'*

The management sub-dimension of IT sophistication addresses the issues arising from the *'how'* aspects of IT systems in the firm. The Functional sophistication is characterised in terms of the structural aspects and IT implementation process, attempting to answer the question: *'How are IT systems structured and organised?'* The managerial sophistication relates basically to the mechanisms employed to plan, control and evaluate present and future applications of IT in the firm. Accordingly, this factor relates to the question of *'How is IT managed?'*.

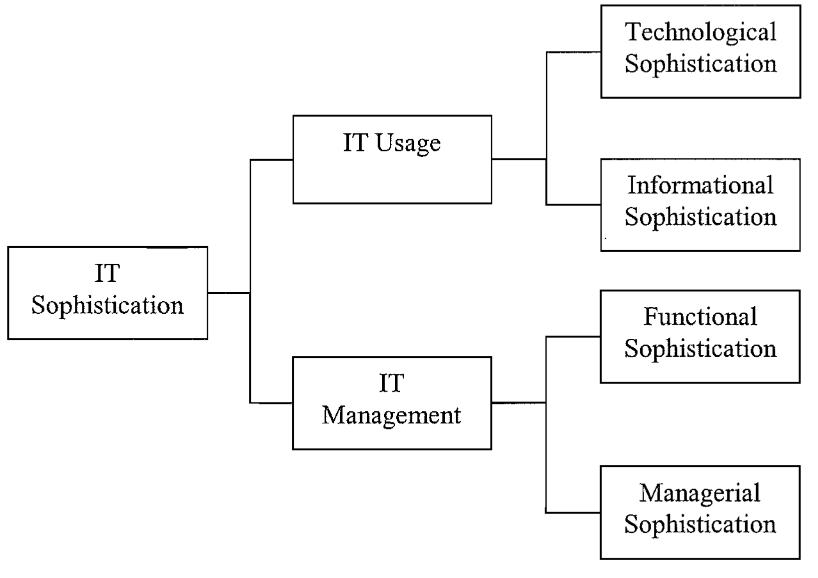

Figure 2.3. Dimensions of IT Sophistication (Raymond & Pare, 1992)

A review of literature on IT growth, IT management and its sophistication shows that the term IT sophistication represents the overall evolutionary process of IT in organisations. The evolution, maturity or growth of management aspects of IT may be characterised under IT management sophistication. It is evident that IT sophistication relates directly to the concept of IT management sophistication and in effect the latter may be conceptualised as a subset of overall IT sophistication.

Raymond and Pare (1992) identified IT managerial sophistication in small businesses as a subset of overall IT sophistication. However, there is no widely accepted characterisation of this construct, particularly in the small business context.

2.4.3 Measurement of IT Management Sophistication

Three instruments used to measure *IT management sophistication* have been identified in the literature:

(a) Guptha et al. (1997) –used in the information-intensive large financial-services organisations,

(b) Sabherwal and Kris (1994) –used in large higher educational institutes,

(c) Raymond and Pare (1992) –used in small manufacturing firms.

(See Table 3.2 on page 53 for the particular indicators.)

As discussed earlier, although the term *IT management sophistication* was used in these three instruments, they were meant to measure somewhat related but different constructs. As can be expected the instruments used to measure IT management sophistication[10] in the three research studies cited above have wide variations. Instruments used by Guptha et al. (1997) and Sabherwal and Kris (1994) were applicable to large firms. The only instrument to deal with small firms was presented by Raymond and Pare (1992).

The instrument used by Guptha et al. (1997) had 21 items, grouped under four factors namely, IT planning mode, IT control mode, IT organisation and IT integration. The reliability levels reported in this instrument validation were reasonably high. However, this instrument was primarily developed for "information-intensive" large financial-services organisations, within which IT is considered to have a high degree of strategic relevance. This industry has information-enriched product lines that focus considerable corporate attention on effective IT management. The researchers indicated that the findings may not apply to firms in less information-sensitive industries, in which IT plays a supportive role. Considering that the research findings relating to large businesses may not be directly applicable to the small business sector (see page 16), and the narrow focus of the Guptha et al.'s (1997) instrument due to its specific purpose, fresh research is required to establish its appropriateness for

[10] Raymond and Pare (1992) characterise *IT management* as a major sub-dimension of *IT sophistication*. They use the term *IT managerial sophistication* to reefer to one of the two sub-factors of *IT management* sub-dimension. The term *IT management sophistication* used by Guptha, et al. (1997) and Sabehrwal and Kris (1992) refers to the broader aspect of IT management sub-dimension of IT sophistication.

measuring IT management sophistication within the small business sector. However, as pointed out earlier investigating into such measures is quite useful in a study leading to development of an instrument measuring IT management sophistication in small business.

The Sabherwal and Kris (1994) instrument had five items derived from past research. This research as mentioned by researchers was limited to large academic institutions in the United States. Also, it was observed that the focus of the study was to investigate the alignment between critical success factors and IT capability, and little priority was given to ascertaining (or reporting) details of validity and reliability assessments of the IT management sophistication instrument.

The Raymond and Pare (1992) instrument was the only one more broadly focused on the small business sector. However, it appears that this instrument has certain weaknesses with respect to measuring the *IT management sophistication in small business* construct, and they are outlined below:

(a) As indicated earlier, their objective was to characterise the broader concept of the overall IT sophistication, rather than measuring the sophistication of management of information systems.

(b) Although reliability levels of the relevant measures have been reported, some were found to be weak.

(c) Furthermore, since the instrument was developed in the 1990-1992 period, over a decade ago, the rapid developments in the IT sector may call for an update of the instrument. It fails to address certain contemporary issues of small business IT management. For example, there are no questionnaire items that address IS for competitive advantage and IS project management (Pollard & Hayne, 1998) in the Raymond and Pare's (1992) instrument.

(d) It can be seen that this instrument was not particularly designed to measure IT management sophistication in small business, but forms a part of a broader questionnaire that examines the overall issues of IT sophistication. In practice, this makes the instrument difficult to use for investigative purposes.

(e) Raymond and Pare's (1992) characterisation examines the IT management under two sub-dimensions, namely, *managerial sophistication* and *informational sophistication*. These two sub-dimensions do not agree with more recently developed characterisations of IT management sophistication (e.g. Guphta et al., 1977 instrument refers to four dimensions, planning, controlling, organisation and integration), and also with characterisations of IT management by several other researchers (e.g. Nolan, 1973; Earl, 1989). This leads to question whether two sub-dimensions is sufficient to characterise IT management sophistication in small business.

(f) Raymond and Pare (1992) themselves have called for further refinement of their model and the development of appropriate measures of IT management sophistication. They pointed out that:

> Further analysis of the IT sophistication construct and further validation of preliminary measures presented here are thus a pre-requisite to an eventual utilisation by researchers and practitioners (Raymond and Pare 1992, p 13).

Therefore, although the instruments indicated above were useful in this study, it can be asserted that none of them could serve as a valid and reliable instrument that measures IT management sophistication in small business, which is a construct that needs a refined definition.

2.5 IT Management Sophistication and IS Success

This section explores the conceptual link between IT management sophistication and the success of information systems. Successful use of a resource should invariably have an impact on the performance of an organisation. Therefore, the impact of IT on organisational performance is also examined. Very large investments related to IT in the past two decades demonstrate the importance placed on the information systems in organisations. Therefore, understanding the factors behind IS success is of vital importance to IS researches as well as for the practitioners.

Although companies progressively invest in IT, researchers are not fully convinced that there is a direct link between IT investment and organisational performance. For example, IS researchers have indicated:

> Businesses continue to invest enormous sums of money in computers and related technologies, presumably expecting a substantial payoff (Hitt & Brynjolfsson, 1996).
>
> Corporations have invested billions of dollars in IT over the last 20 years. ... Despite the substantial investment in IT by corporations, direct linkage between technology investment and increases in productivity and performance has been extremely elusive (Byrd & Marshall, 1997).

On the other hand, Bhatacherjee & Hirchheim (1997) have found that:

> In the SigmaOil case, cost reduction, greater flexibility, greater data processing capability, and increased responsiveness were drivers of organisational change, and C/S (client/server) technology was seen as the ideal technological solution to meet these needs (Bhatacherjee & Hirchheim, 1997, p. 43)

Furthermore, Dedrick, Gurbaxani and Kraemer (2003) quotes a number of other rigorous studies with larger sample sizes, that IT investments contribute to firm productivity, and show higher gross marginal returns than non-IT investments. The productivity impacts of IT investments vary among different companies. Derick et al. (2003) have also reported on two major factors that may impact upon this difference:

a. Idiosyncratic firm characteristics such as market position, rigidities in cost structure, brand recognition and leadership abilities of key executives, which may change over time. These are not easily manipulated by management in the short run.

b. The specific features of organisational structure, strategy, and management practices. These factors can be compared across companies. Furthermore, the management of the firm can directly influence these features. Restructuring, introducing new management control systems, redesign of processes and employee training are certain strategies that can be adopted to make an influence.

With regard to the impact of IT, it has been suggested that an intermediate variable may have an influence on organisational performance. This relationship is also implied in Weill and Olsons' (1989) representation of contingency theory in MIS research as given in Figure 2.4. Accordingly the MIS variables such as management, implementation, structure and development impact on MIS performance, which in turn have an effect on organisational performance (Weil & Olson, 1989). This supports Byrd and Marshall's (1997) view that a new research paradigm should focus on exploring the conditions and/or types of organisations in which IT investments lead to positive performance gains.

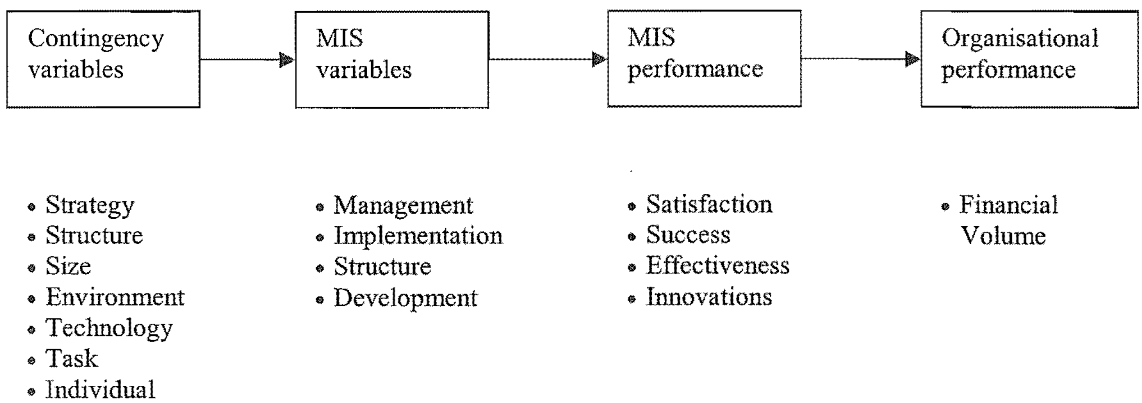

Figure 2.4 Representation of Contingency Theory in MIS Research
(Weil & Olson, 1989)

Studies on IT maturity in large organisations reveal that success of IT resources and the performance levels of organisations vary at different stages of growth (e.g. (Nolan, 1973). In the context of small firms Raymond, Pare and Bergeron (1993) and Raymond, Pare and Bergeron (1995) have concluded that IT sophistication has a positive relationship with organisational performance.

Some companies are reaping much greater productivity from their IT investments than other firms. Rai, Patnayakuni and Patnayakuni (1997) identified that simplification and redesign of management processes are key requirements for improving effectiveness of organisations through IT investments. Reasons behind the success of these companies lie with their deployment of the IT resource. What is relevant here is not *how much* is spent on IT but *the way* it is spent (McKeen, Smith & Parent, 1997). Gaining a deeper understanding of the relationship between IT and organisational performance, and identifying the respective intervening variables that may explain the relationships are of importance for effective use of IT resources in a more productive manner.

Mahmood (1994) analysed hard data pertaining to two groups of organisational units- 'efficient' and 'inefficient' and also concluded that the more important issue related to IT investment and performance is not *what* has been spent but *how* it has been spent. These inferences suggests that the management of information technology has much to do with IS success and thereby organisation performance. McKenney and McFarlan (1982) assert that technology innovation will stagnate if not managed properly (McKenney & McFarlan, 1982).

DeLone and McLean (1992) presenting the IS success model show that system quality and information quality (of information systems) influence the individual impact and that lead to organisational impact. They later add another variable, service quality, to the 1992 IS success model to explain the IS success (DeLone and McLean, 2003). On the other hand, one can assert that quality improvement (of information systems) may be influenced by the standard of (IT) management practices.

In research based on multiple case studies, Mata et al. (1995) concluded that managerial IT skills is one attribute[11] that can provide a sustainable competitive advantage. Accomplishment of sustainable competitive advantage with IT applications may be more of a process of building organisational infrastructure as opposed to being an early adapter of the latest technologies (Kettinger et al., 1994). The capability of IT to enhance competitive advantage derives from careful management of three key IT assets, namely, a highly competent IT human resource, a reusable technology base, and a strong partnering relationship between IT and business management (Ross , Beath & Goodhue, 1996).

IS researchers have recognised and emphasised the importance of integrating IS planning and business planning as early as the 1970s (King, 1978). Henderson and Venkatraman (1993) proposed that the success of an organisation depends on the power of 'fit' between different components of IT and business strategy. They presented the strategic alignment model which incorporated IS and business strategies with the external and internal components of the management processes of the firm.

[11] Four attributes that can provide competitive advantage are capital requirements, proprietary technology, technical IT skills, managerial IT skills (Mata et al., 1995).

The implications of the fit between the business strategic orientation and the information systems strategic orientation have been examined in North American financial services and manufacturing firms by Chan (1992). This research confirmed that the alignment of IS strategy and business strategy positively influenced IS success and thereby the business performance of organisations. The primary concern of organisations for effective strategic IT management should be to integrate the IT strategic planning process with the general strategic management process (Kovacevic & Majluf, 1993).

If computers are managed properly, they can contribute to the success of small business operations. DeLone (1988) concluded that planning of computer applications and having basic controls are important for success in small firm computing. Investigating small and medium sized firms, Raymond et al. (1995) found that IT sophistication is positively related to structural sophistication. They also identified that IT usage is positively related to organisational performance, and the relationship between IT management and structural sophistication is stronger in high performing firms than in poor performers. High performing small firms combine a highly strategic orientation with a highly strategic IT management (Bergeron, Raymond & Rivard, 2001).

Organisations with more sophisticated management of IT had a closer alignment between critical success factors and IT capability. These factors have a significant relationship with organisational performance. Sabherwal and Kris (1994) [12] who concluded this proposition, based on large educational institutions, indicated that they

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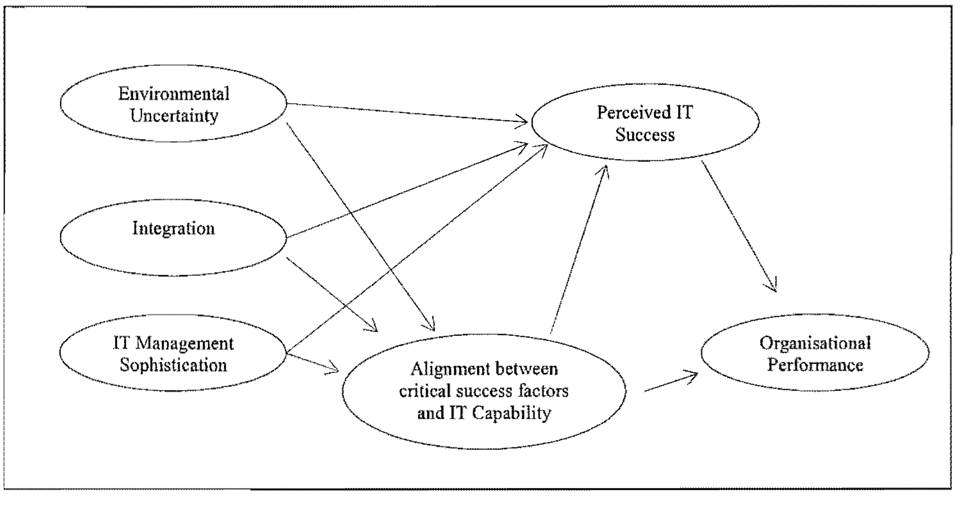
[12] Research model of Sabherwal and Kris (1994)



were keen to see whether this relationship would hold true in business organisations. Among other factors, the research model of Sabherwal and Kris (1994) linked IT management sophistication to organisational performance through perceived IT success and alignment between critical success factors and IT capability.

The other relevant observation is that a higher level of information systems sophistication positively influences the level of systems success within an organisation (Raymond, 1990). They also substantiated with empirical evidence, the claim that organisational context is important for information systems success. Here the information systems sophistication refers to the overall IT sophistication as later conceptualised by Raymond and Pare (1992), under two broad dimensions - technological and management sophistication. This indicates that IT management sophistication is a critical variable that explains the IS success of an organisation. Raymond's (1990) study pointed out the need for further research on this area by sampling organisations with varied sizes and context rather than concentrating only on large organisations with a high level of maturity and IS sophistication.

Literature suggests that IT managerial sophistication may be an important link between IT input and organisational performance. Hitt and Brynjolfsson (1996) using a comparative approach to examine IT value, concluded that the effective management of IT may have a direct link to productivity benefits for the firm. No productivity gains can be expected without skilled people and management of IT (Nolan, 1982). In this respect, Raymond (1990) concluded that the managers of small and medium-sized businesses will be in a better position to effectively manage the assessment, adoption and utilisation of information technology when they have a clearer understanding of the practices of IT management required to increase IS sophistication and success (Raymond, 1990). Hence, studies on the effect of IT on organisational performance can concentrate on IT management sophistication as a potential factor that may act as the intermediary variable.

Here, IS success is defined as the *extent to which a given information system actually contributes to achieving organisational goals* (Hamilton & Chervany, 1981). In this manner IS success signifies the effect of IT on organisational performance. Thong et al.'s extensive studies on small businesses have used perpetual measures of system usage, user satisfaction, application impact and organisational impact as surrogates of

IS success (Thong et al., 1996; Thong et al., 1997; Yap, Soh & Raman, 1992; Yap, Thong & Raman, 1994). The organisational impact of IT or IT impact provides an indicative measure of IS success[13].

2.6 Chapter Summary

The key findings of the literature review aimed at providing the background for conceptualising IT management sophistication in small business may be summarised as follows:

- Small businesses possess unique characteristics and differ from large businesses in many respects.
- IT plays a major role in small businesses today.
- The research findings related to large businesses may not be directly applicable to the small business sector. However, they provide useful insights towards investigations of the small business sector.
- Although there are certain commonalities in characterisation of IT management, particularly in the large business sector, no commonly accepted definition of IT management in small businesses has evolved. The general management sub-themes, planning, organising, controlling and leading with respect to IT management may provide a useful basis for characterisation of IT management in small businesses.
- The term IT sophistication represents the overall evolutionary process of information technology in organisations. The phrase "IT management sophistication" refers to the evolution, maturity and growth of management of information technology in an organisation.
- A commonly accepted definition of IT management sophistication in small business is not available, and a valid and reliable instrument to measure the *IT management sophistication in small business* construct is yet to be derived.

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[13] Further discussion on measures of IS success in the form of IT impact is given in the section 3.3.1 of Chapter 3.

Chapter 3

Research Problem

3.1 Chapter Overview

This chapter details the conceptualisation of the research problem aimed at determining the objectives of this study. The primary concern of this study was to explore the gap in the IS literature with respect to IT management sophistication in small business and its measurement. Therefore, the main objectives of this research were identified as expounding the definition of *IT management sophistication in small business* and developing a valid and reliable instrument to measure this construct.

The relationship between this construct (IT management sophistication in small business) and the impact of information technology within the organisation (termed *IT impact)*- was also examined in addition to the above primary objective. This was a step toward understanding the links between the IT management sophistication construct and the effectiveness of IT in small firms. It may be noted that although these items of investigation were broadly related, the specific objectives are somewhat diverse.

Chapter Contents

3.2 IT Management Sophistication in Small Business

3.3 Relationship of IT Management Sophistication with IT impact

3.4 Chapter Summary

3.2 IT Management Sophistication in Small Business

It was observed in Chapter 2 that both IT management and its sophistication within a small business context are of keen interest to IS researchers and practitioners. IT management sophistication was seen as a possible link that may explain the relationship between IT input and organisation success (Mata et al., 1995; Rai et al., 1997; Reich & Bembasat, 1996; Bergeron et al., 2001; Sabherwal & Kris, 1994). The review of literature highlighted two key gaps in research regarding IT management sophistication in small firms:

(a) The lack of consensus in the definition of IT management sophistication in small firms, (See Chapter 2, pages 28) and

(b) The lack of a valid and reliable instrument for measuring this construct (See Chapter 2, pages 36-37)

These observations pointed toward exploring the concept of IT management sophistication in small business.

3.2.1 Characterisation of IT Management Sophistication in Small Business

It has been shown that there is no agreement with respect to the conceptualisation of IT management in small firms amongst IS researchers. There is a vast variability with respect to the factors (or indicators) of IT management as determined by different researchers (See Table 3.1). The literature review highlighted the fact that a diverse range of aspects needs to be considered in a study of IT management (refer sections 2.3.3 and 2.4.2 of Chapter 2).

Small businesses have unique characteristics. They are also substantially diverse. It was observed that research findings and theories explaining the organisational behaviours and managerial applications of the large business sector may not be directly adopted by small firms (refer section 2.2.4 of Chapter 2). However, the findings of large business related research provide useful insights and could be taken as a reasonable starting point for small business IT management research. The applicability of such large business research findings to small business context needs to be empirically verified. For example, if the relevance of the concept of planning, which has been identified as a key factor of IT management in large firms, is to be explored, the real life issues and indicators that reflect the planning process in today's small businesses have to be examined. Furthermore, the issues specific to the study population and the environment within which IT systems are used need to be taken into account. A richer array of relevant factors and indicators that characterise this construct have to be unearthed and empirically tested to identify key factors. Bergeron (2001) also emphasised the importance of defining relevant IT management characteristics in terms of critical issues.

In an attempt to explore a construct like IT management sophistication in small business, it is important to refer to past literature as well as to identify the specific issues experienced by the practitioners in the current context to explore the dimensions that characterise the construct. Churchill (1995) asserts that exploratory research is necessary when little is known about a phenomenon. It is particularly important when there are no reliable and valid measures of a construct (Patton, 1980). Such an approach is relevant in this case, not only because it is a relatively new concept, but also due to the fact that IT and its management has been undergoing a rapid change during the past few decades.

Research into IT management and its sophistication in small firms by Raymond and Pare. (1992) laid a strong foundation in this respect (see Section 2.4.2.of Chapter 2). They conceptualised IT management sophistication as a major sub-dimension of overall IT sophistication (see Figure 3.1). Furthermore, Raymond and Pare (1992) characterised IT management sophistication under two dimensions, namely, functional sophistication and managerial sophistication.

This research attempts to extend Raymond and Pare's (1992) approach to characterising the *IT management sophistication* construct by incorporating a richer array of factors applicable to small business IT management. As pointed out in chapter 2, this research takes a broader view of characterising IT management sophistication, without limiting it self to two sub-dimensions (i.e. functional sophistication and managerial sophistication) as determined by Raymond and Pare (1992). Most of the key issues that represent different aspects of small business IT management as identified by Pollard and Hayne (1992) have not been included in the measures by of Raymond and Pare, 1992 (see Table 3.1). IS for competitive advantage, IS project management, software development, responsive IT infrastructure, aligning IS, technological change, communication networks, business process redesign and educating users are examples of such aspects that have not been included in the Raymond and Pare' s(1992) instrument.

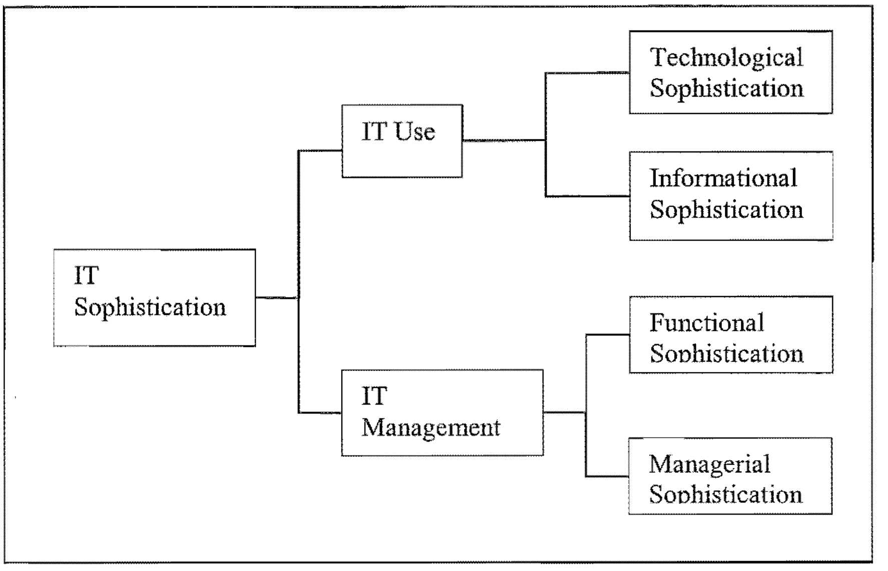

Figure 3.1. Raymond and Pare's (1992) Characterisation of IT Sophistication

Furthermore, certain aspects of small business IT management could not fit into the Raymond and Pare's (1992) classification under two dimensions. (i.e. *Functional sophistication* - structural aspects of the IS function and IT implementation process; and the *managerial sophistication* - mechanisms employed to plan, control and evaluate present and future application. Issues related to certain core IS capabilities (e.g. IS/IT leadership) identified by Feeny and Willcocks (1998) are not represented in Raymond and Pare's (1992) model. The only reference to IS/IT leadership in the Raymond and Pare's (1992) model is a measure on "top management implications", and a more in-depth examination to this key sub-theme of management may be required in characterising IT management sophistication.

The deeper aspects of using external expertise in small business IT management, in the form of consultant effectiveness and vendor support, as identified by Thong et al. (1997), has also not been incorporated in the Raymond and Pare's characterisation. They have only identified the presence of consultants (i.e. whether the firm employs an IT consultant or not) as a measure of functional sophistication. This somewhat superficial approach to characterisation of IT management sophistication may because of the dissimilarity of their objective to this research.

Having acknowledged the importance of understanding IT management sophistication within a small business context, and to address the gap in IS research towards characterising this construct, this research focused on the *IT management sophistication in small business* construct. This research viewed IT management in small firms from a broader perspective and examined both past research findings and the practical managerial issues applicable to contemporary small firms. The rapid developments of IT applications in business organisations and society in general, and the increased use of IT in small firms also called for such a fortification. The related factors identified in the literature as well as from field observations need to be incorporated into the characterisation process. Therefore, although Raymond and Pare's model was adopted as the basis for conceptualising the research problem, further characterisation of the IT management sophistication construct was left open for exploratory investigation. As indicated earlier, the term *IT management* was meant to cover the broader meaning of management of IT, IS and information in small firms (Section 2.3.2 of Chapter 2).

A common feature of most of the studies relating to IT management was conceptualised as a construct with several sub-dimensions (or factors) as seen in Table 3.1. Therefore, this research took the view that IT management sophistication was a multi-dimensional construct.

The major factors representing the sub-dimensions of IT management were hypothesised to be in-line with the four basic sub-functions of general management namely planning, controlling, organising and leading[14] (Bedeian, 1989; Schermerhorn, 1989), with respect to information systems in the organisation. This conceptualisation has been influenced by the fact that a number of past researchers have used a similar approach for characterising IT management in the context of large businesses. For example, several indicators related to planning, organising, controlling and leading have been used to explain IT management by several researchers. (e.g. See Table 3.1: Nolan,

[14] It may be pointed out that certain other authors have characterised "management" by different ways [e.g. (a) planning, organising, directing and controlling (Sisk,1973; Scanalan & Keys,1979); (b) planning, organising, commanding, coordinating and controlling (Fayol, 1984)]. However, these somewhat different characterisations appear to address the a set of closely similar activities of management. Furthermore, several past researches have used factors like planning, organising and controlling to glide characterising IT management.

1973, Earl, 1989, Boyenton et al., 1994, Guptha et al., 1997, Raymond & Pare, 1992, Feeny & Willcocks, 1998.) It may be noted that this hypothesised primary model acted only as the starting point for the investigation.

(a) Dimensions of Information Management (Earl, 1989)	(b) Tasks for Managing Computer Activity (Nolan, 1973)	(c) Factors of IT Management Processes (Boynton et al., 1994)	(d) Framework for IT Management (Galliers & Southreland, 1991)	(e) Key Issues in IS Management in New Zealand (Davis et al., 1995)	(f) Core IS Capabilities (Feeny & Willcocks, 1998)	(g) Measures of IT Management Sophistication (Sabherwal & Kris, 1994)	(h) Dimensions of IT Management Sophistication (Guptha et al.,1997)	(i) Key Issues in IS Management in Small Firms (Pollard & Hayne, 1998)	(j) Dimensions/ Measures of IT Management (Raymond & Pare, 1992)
• Planning • Organising • Control	• Planning • Organising • Control	• Project management • Strategic management • Service control • Service planning • Resource planning • IS services • IS function management • Development /maintenance	• Strategy • Structure • Systems • Staff • Style • Skills • Super-ordinate goals	• IS and business alignment • IS staff skills • Competitive advantage • End-user computing • Telecommunicati ons • Security and control • Identifying projects • Measuring IS effectiveness • Open systems • Application proliferation	• IS/IT Leadership • Business systems thinking • Relationship building • Architecture planning • Making technology work • Informed buying • Contract facilitation • Contract monitoring • Vendor development	• IS planning • Top management involvement (in planning) • IS performance evaluation • IS manager's knowledge of business plans • Top management's knowledge of IT	• IT planning mode • T control mode • IT organisation • IT integration *(specific measures are given in table 3.2)*	• IS for competitive advantage • IS project management • Software development • Responsive IT infrastructure • Aligning IS • Techno-logical change • Communication networks • Business process redesign • Educating users • IS human resource	MANAGERIAL SOPHISTICATION: • Organisational objectives • Top management implications • IT investment • IT adoption • Presence of consultants • IT planning • IT control • IT evaluation FUNCTIONAL SOPHISTICATION • IS personnel • Role of IS function • Decision level • Type of development • Position of IS • User participation

Table 3.1 Key Factors of IT Management

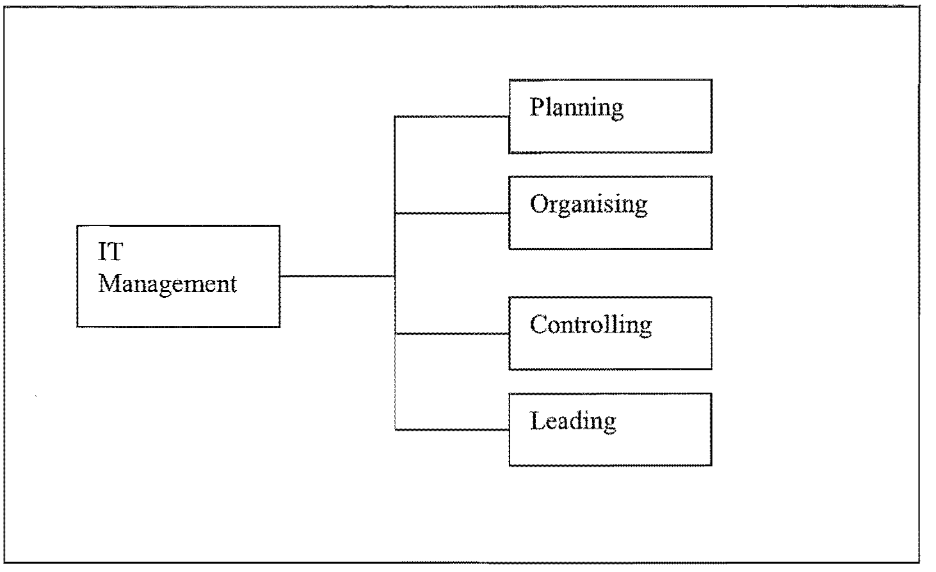

Figure 3.2. Preliminary Research Model Characterising IT Management

As discussed in Chapter 2, the term *sophistication* was meant to describe the notion of extent of maturity, evolution, development and the superiority of the factors associated with characterising IT management, the main study construct in this research (see section 2.4.2 of Chapter 2).

3.2.2 Measurement of IT Management Sophistication in Small Business

As examined in the literature review (see pages 35-37), none of the three available instruments measuring *'IT management sophistication'* (Guptha et al.,1997; Sabherwal & Kris,1994; Raymond & Pare, 1992) were found to be adequate for measuring the construct, *IT management sophistication in small business.* The inadequacy of the above mentioned instruments was obvious in the sense that the construct itself needed conceptualisation, as detailed in Section 3.2.1 above.

However, a review of these instruments offered insights useful in the process of conceptualising the relevant measures and developing the new instrument. (The individual measures of each instrument are presented in Table 3.2 for the purpose of comparison). Sabherwel & Kris (1994) was the simplest with only five measures. Measures of the other two instruments were grouped under a number of sub-dimensions; four in Guptha et al's (1997) and two in Raymond and Pare (1992). A feature common to all these instruments was the measures can be related to planning, controlling and organising. It can be seen that certain items have been grouped differently under various major headings in the three instruments. For example, the items referring to *organisational objectives* and the *objectives of IT systems* that are grouped under managerial sophistication sub-dimension in Raymond and Pare's (1992) model closely resemble the items included under the IT integration sub-dimension of Guptha et al.'s (1997) instrument. The operational definitions of certain factors also vary between the instruments. It is also noted that measures related to the use of external expertise have not been included in the two instruments meant to examine large organisations, but, external expertise has been found to play a major role in the IT management processes with respect to small businesses (Thong et al., 1997; Yap et al., 1994).

As noted in Chapter 2, Raymond and Pare's instrument was also found to be inadequate to examine the IT management sophistication in small business construct (see section 2.4.3). Therefore, the second major objective of this research was identified as the development and validation of an instrument to measure IT management sophistication in small business. It may also be noted that the above two objectives go hand-in-hand and are closely related. For example, the variables that determine the factors characterising the IT management sophistication construct form the basis for developing the pool of measures that will be included in the instrument. Mostly, the outcomes of the initial phases of investigation laid the foundation for the forthcoming phases of investigation and the research methods were determined accordingly.

Sabherwal & Kris (1994)	Guptha et al. (1997)	Raymond & Pare (1992)
• Extent to which IS planning takes institution's future planning into account • Extent to which top management is involved in IS planning • Basis of IS performance evaluation (cost saving verses other objectives) • Extent to which IS managers informed of institution's long term plans • Extent to which top managers are informed about information technology	• **IT planning mode** - Extent to which IT projects support company strategies - Extent to which innovative opportunities of IT are examined continuously - Adequacy of information (knowledge of) on the current use of IT by competitors - Adequacy of information (knowledge of) on the potential use of IT by competitors - Extent of knowledge of coverage and quality of IT systems - Extent of satisfaction with respect to setting IT project priorities • **IT control mode** - Having clear responsibility and authority for IT direction and development - Having clear responsibility and authority for IT operations - Having confidence that IT project proposals are properly appraised - Whether performance of IT function is monitored constantly - Goals and responsibilities - Whether IT function is clear about its performance criteria • **IT organisation** - Extent to which user ideas are given attention in IT planning and implementation - Extent to which the company IT specialists understand the firm's business - Extent to which the structure of IT function fits the organisation - Having constructive IT specialist-user relations • **IT integration** - Extent to which the top management perceives the strategic importance future exploitation of IT - Having top-down planning process linking IS strategy and business needs - Having some IT development resources positioned within business units - Extent to which introduction and experimentation of new technologies taking place at the business unit under business unit's control	• **Managerial Sophistication** - Amount of IT investments (hardware and software) - Presence of IS control measurers - Presence of IS documentation - Presence of IS security measures - Formalisation of IT adoption process - Formalisation of IT planning process - Knowledge of IT costs - Organisational objectives (level 1,2,3) - Post-implementation evaluation (presence of and formality) - Presence of outside consultants - Annual IT budget (amount) - Having IT planning committee - Extent of top management involvement (inactive/active) and attitude (negative/positive) • **Functional Sophistication** - User participation in IS development (Are users involved or not?) - User participation in IS planning - User participation in IS budgeting - User participation in IS needs analysis - Number of roles played by the IS function - % applications developed in-house - Number of internal IS specialist - Localisation of IS function - Autonomy of IS function - Decisional level of applications

Table 3.2 Specific Measures of IT Management Sophistication: A Comparison of Three Instruments

Although these individual instruments were found to be inadequate for the assessment of IT management sophistication construct in the context of small businesses, the measurement items used in these instruments provided useful insights to guide further investigations. These were also useful for conceptualising and operationalising the IT management sophistication construct and its hypothesised dimensions in this research.

The preliminary research model identifying the potential sub-dimensions of IT management is presented in Figure 3.2. The combined pool of item statements derived from the three available instruments (see Table 3.2) was used as the basis for investigations at the initial stages of this research.

These instruments also provided insights for determining the structure of the new instrument. For example, the Guptha et al. (1997) instrument had twenty measures and the Sabherwal & Kris (1994) instrument employed five measures, presented in the form of simple Likert scale questions. Raymond and Pare's (1992) questionnaire was far more complex and longer than the other two. Also, it contained a mix of different types of questions. A shorter questionnaire with simpler format deemed appropriate for an investigation of this nature, taking into account the inherent features of the small business. Therefore, a set of Likert scale questions in the form of simple statements was proposed for inclusion in the instrument.

3.3 Relationship of IT Management Sophistication with IS Success

Research studies such as the IS success model (Delone & McLean, 1992; Delone & McLean, 2003), representation of contingency theory in MIS research (Weill & Olson, 1989; Sabherwal & Kris 1994) show that IS success have a direct impact on the improved organisational performance. The literature review pointed that IT management sophistication in small business is a likely factor that may act as the intermediary between the effect of IT on IS success. These assertions influenced the formulation of the third major objective of this research.

The third broader aim of this research is to examine how far IT management sophistication impact upon IS success. Such a model will help IS researchers and practitioners to understand the complex relationships between these concepts. Since this is an attempt to explore the influence of IT management sophistication and certain other related variables on IS performance in the context of small businesses, the objective in constructing this model is mainly theory building rather than theory testing.

The contingency model of MIS (Management Information Systems) research (Weill & Olson, 1989) proposed that MIS variables such as management, implementation, structure and development, influence MIS performance. The MIS performance variables identified in the contingency model were satisfaction, success, effectiveness and innovation. The literature review also revealed that IT sophistication, particularly the management aspects of IT, is a major factor that may influences the effective application of information technology systems in the organisation (Ross, Beath & Goodhue, 1996; Reich & Benbasat, 1997; DeLone, 1998; Bergeron et al., 2001; Sabherwal & Kris, 1994) (see also Section 2.4.3 of Chapter 2). In a broad sense, the dependent variable in the above scenarios can be identified as IS success. Considering the above, the relationship shown in figure 3.3 was hypothesised for investigation.

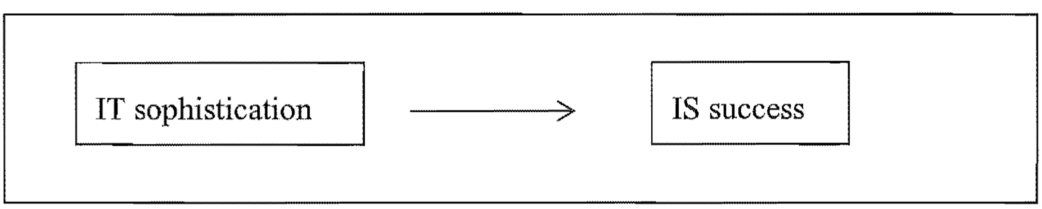

Figure 3.3. Impact of IT Sophistication on IS Success

The independent variable of the above relationship, IT sophistication, was characterised by Raymond & Pare (1992) as a multi-dimensional construct, suggesting that it could be examined under two broader sub-dimensions (IT management sophistication and IT usage sophistication. The IT usage sophistication dimension was further characterised under two sub-dimensions, namely, technological sophistication and informational sophistication (see Figure 3.1).

Accordingly, IT sophistication was hypothesised to be influenced by three constructs, namely, IT management sophistication, technological sophistication of IT and informational sophistication of IT.

As pointed out earlier, definition of the IT management sophistication construct was one of the major objectives of this research. Therefore, Raymond and Pare's (1992) characterisation of IT management was not adopted for hypothesising a research model for linking the respective variables to IS success. Instead, IT management sophistication was treated as a single independent variable. The outcomes of the investigations leading to characterisation of the IT management sophistication in small business construct, were to be incorporated into the proposed research model.

Accordingly, the relationship of three independent variables namely, IT management sophistication, technological sophistication and informational sophistication of IT, with IT effectiveness as the dependent variable were investigated under the third research objective of this study. The hypothesised tentative research model related to this objective is given in Figure 3.4.

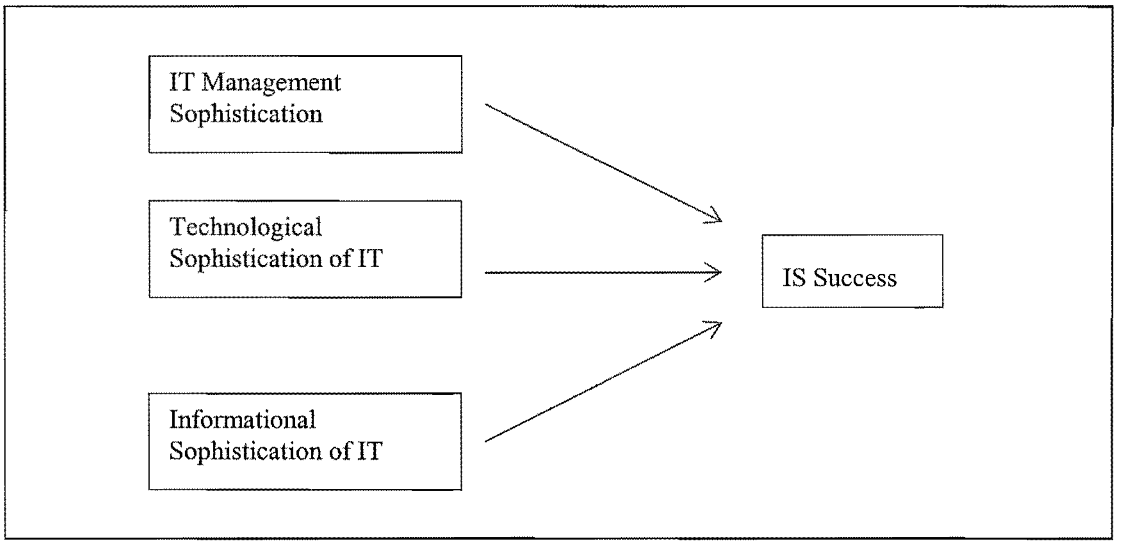

Figure 3. 4. Research Model Linking IT Management Sophistication and IS Success

3.3.1 Measurement of IS Success

The dependent variable in the proposed model, IS success, was described in terms of the impact of information systems towards improved organisational performance. That is the extent to which a given information system actually contributes to achieving organisational goals (Hamilton & Chervany, 1981; Yap et al., 1994)). It may be noted here that this broader concept has also been referred to by related terms such as *user computer success* (Igbaria, Zinatelli & Caveye, 1998) and *MIS success* (Weill & Olson, 1989).

DeLone and McLean (1992) assert that definition of IS success has not been an easy task and also that it is difficult to identify a single measure for this variable. They present six categories of measures, namely system quality, information quality, information use, user satisfaction, individual impact and organisation impact. There is not one single success measure but many. Each of these methods has its own difficulties. For example, user satisfaction is linked to personal expectations and actual benefits achieved; high system usage may not necessarily mean effectiveness or fulfilling the desired purpose; impact on organisation performance would amount to evaluating success in term of the needs of business (Ein-Dor & Segev, 1978; Hamilton & Chervany, 1981; Lucas 1975; Naylor & Williams, 1994). Therefore, it is advisable to use a combination of IS success measures depending on the context and the objectives of research (DeLone & McLean, 1992). However, certain surrogates have been used by past researchers to serve as reasonable indicators of Is success. For example user satisfaction has been used by Gatin (1994) and Gelderman (1998).

Since the primary aim of this part of the research was to examine the relative influence of the three independent variables on IS success in the context of small firms, this research did not attempt to derive an absolute measure of this dependent variable. Rather, the aim was to identify a suitable indicator for IS success, so that the influence of the three independent variables: IT management sophistication, technological sophistication and informational sophistication can be compared.

Thong et. al (1996) used IT impact as a surrogate for IS success and validated this in a number of studies of IT in small businesses. They used seven measures of a seven point Likert scale to assess IT impact. The scales were: pre-tax profit, sales revenue, staff productivity, competitive advantage, company operating cost, quality of decision making, and an overall measure rated by the practitioners (Thong et al. 1996; Thong et al. 1997; Yap et al. 1994). Thong et al.'s (1997) study that uses these measures reports their Cronbach's alpha coefficients in the range of 0.8, suggesting high reliability. Therefore, as an indicative measure of IS success, the organisational impact of IT, referred to as IT impact, was used in this research. Accordingly, the preliminary hypothesised research model given in Figure 3.5 was used for investigation in this part of the study.

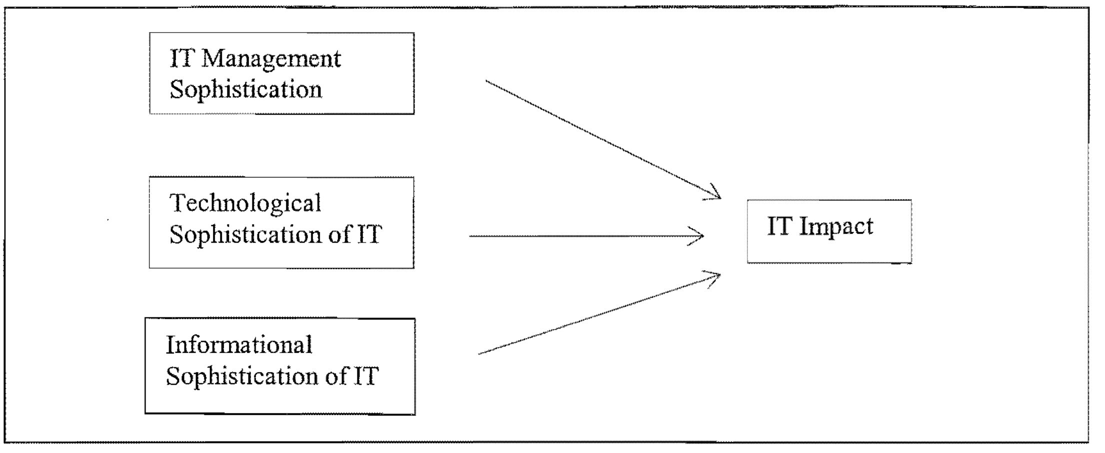

Figure 3.5. Hypothesised Research Model[2]

It may be noted that these relationships among study variables can also be presented as three research hypotheses.

3.4 Chapter Summary

Conceptualisation of the research problem, and the research objectives, are outlined in this chapter. The major emphasis of this research was characterising IT management sophistication in small business and developing a valid and reliable instrument to measure this construct. The other objective was to develop a model relating IT management sophistication, technological sophistication and informational sophistication, with IT impact.

In summary, the three major objectives of this research can be stated as follows:

- Definition of IT management sophistication in small business;
- Development and validation of an instrument to measure this construct, and
- Development of a model that relates IT management sophistication and IT impact.

[2] This particular model relates to the third objective of this research.

Chapter 4

Research Approach

4.1 Chapter Overview

The research approach employed in the current study with the relevant theoretical and conceptual background is presented in this chapter. A multi-method approach combining both qualitative and quantitative techniques, with major emphasis on quantitative techniques was adopted in this research. The case study method was used initially to explore the issues related to IT management to study firms in the natural setting. This was followed by a large scale mail survey to examine the applicability of the findings in a wider sample and to make statistical generalisations. The second generation multivariate analytical technique, namely partial least square (PLS) modelling was used for analysis of survey data.

Chapter Contents

4.2 Approach of This Study

Determining the research approach of this study was influenced particularly by the research objectives. Chapter 3 pointed towards three main objectives of the research:

- Definition of IT management sophistication in small business;
- Development and validation of an instrument to measure this construct, and
- Development of a preliminary model that relates IT management sophistication and IT impact.

These research objectives were quite diverse. Determining the most appropriate approach to this research undertaking that involves such a diverse set of objectives needed careful consideration. Each task (or combination of tasks) relating to the research objectives can be dealt with by a particular research method. A combination of data collection methods and analyses was appropriate for this study with its diverse objectives and multiple tasks. Hence, a multi-method approach for data collection and analysis was adopted for this research.

The following sections introduce the study population, detail the approaches adopted to address different tasks and the reasons behind selection of such methods. A brief background pertaining to certain methods, including the techniques of instrument development are also presented to establish the rationale behind selecting such approaches.

4.3 Study Population

The small chartered accounting practices (CA firms) in New Zealand were used as the study population in this research. The accounting profession in New Zealand is governed by the Institute of Chartered Accountants of New Zealand (ICANZ).

According to ICANZ regulations:

> Members of the Institute who offer accounting services (including accepting assignments), either on their own, in partnership, or as a director of a company, must be a CA and hold a Certificate of Public Practice (CPP) (www.icanz.co.nz)

Initially the New Zealand Society of Accountants was established with the 'New Zealand Society of Accountants Bill' presented in 1908. This, the only accounting body in New Zealand underwent a reform in its role, membership structure, and organisational structure in 1996, and was subsequently renamed the Institute of Chartered Accountants of New Zealand (Velayutham, 1998).

It is well known that IT has made a strong impact on most facets of businesses today. Accounting practices, including smaller firms, are not immune to this pressure. They are reported to be under stress as a result of the highly competitive environment and challenges presented by information technology and other factors (Lys & Watts, 1995; Pong & Turleys, 1997). Enhancement of the knowledge of the accounting practitioners in a number of fields, including information technology, is required to meet the current challenges (Von Brachel, 1996). The intensive use of IT and the wider distribution of small CA firms in New Zealand were major reasons behind selecting this industry as the study population. Further discussion on the rationale behind choosing the CA firms as the study population is given in Section 5.2.2 (page 77).

4.4 Approaches to Social Science Research

The research approach is the way of going about one's research. How does one decide on a particular research approach? The choice of the research approach for a particular study must not be influenced by more popular and regularly adopted scientific approaches. The researcher should consider relevance or usefulness when determining the most appropriate methodology. The methodology should fit the research question. The goals of the researcher and the nature of the research topic influence this decision to a great extent. The extent and control that the researcher has over actual behavioural events, and the degree of focus on contemporary as opposed to historical events, are two other important considerations in this respect (Benbasat et al., 1987; Romano, 1989; Yin, 1994).

A particular approach may contain a number of different methods and techniques (Galliers, 1992). The term *methods* refers to the type of research tools and techniques, which may be used to collect and analyse empirical evidence. Two basic types of data collection methods are used in social research. They are qualitative methods and quantitative methods (Cavaye, 1996).

Data are collected in the form of words or pictures in qualitative methods. These strategies emphasise an interpretative approach in which researchers develop categories and meanings from the data through an iterative process. The first step in this exploratory process is to reach an initial understanding of the perspectives of those being studied. This understanding is then tested and modified through cycles of additional data collection and analysis until coherent interpretation is reached. Case studies, reviews and action research are all examples of qualitative studies in IS research (Galliers, 1992).

Most quantitative methods are based on the positivist model of controlling (or at least measuring) variables and testing a pre-specified hypothesis (Kaplan, 1988). They involve collection and analysis of numerical data. Commonly used quantitative methods are surveys, laboratory and field experiments. Quantitative methods are applicable in studies involving the assessment of the validity and reliability of measurement scales and the development of models specifying the relationship of a number of variables.

Although these two methods (qualitative and quantitative) are dealt with separately in the research methods literature, they can be combined and used at the same time, or one after the other, in the same or different settings of a research study (Cavaye, 1996). Employment of different methods in a single study is referred to as a 'multi-method approach'.

Multi-method approaches provide a richer, contextual basis for interpreting and validating research results. Combining different methods introduces both testability and context into the research. Collecting different kinds of data by different methods from different sources provides a wider range of coverage that may result in a better understanding of the unit under study. Moreover, using multiple methods increases the robustness of results because the findings can be strengthened through triangulation (Benbasat et al., 1987; Kaplan, 1988; Yin, 1994).

All research methods have their own strengths and weaknesses. Thus no single strategy is more appropriate than all others for all research purposes (Benbasat et al., 1987). The goal of the researcher is not to find the single best method, since for most research problems several approaches will be better than one. One method can be used first, followed by another. Information developed at each stage guides selection of the next procedure. A multi-method approach is also useful in dealing with any unforeseen circumstances that arise in field research (Sommer & Sommer, 1986).

4.4.1 Nature of IS Research

IS is an emerging discipline. It has been conventionally seen as an applied discipline drawing upon more fundamental disciplines such as computer science, engineering, management science and behavioural studies (Baskerville & Myers, 2002). A shift from technological to managerial and organisational issues has been seen in IS research (Benbasat et al., 1987). This broad, multi-disciplinary and emerging nature of IS research demands a wider perspective of research approaches.

Analysis of 155 IS research articles by Orlikowski and Baroudi (1991) has revealed that surveys, laboratory experiments and case studies are the three primary research designs used during the period between 1983 and 1988. These three designs account for almost 90% of the studies conducted, surveys clearly being the dominant method (Orlikowski & Baroudi, 1991). A similar trend has been observed by Lee,Barua & Whinston (1997) in a review of IS field research from 1989 to 1995. Galliers (1991) asserted that case studies and surveys are appropriate for IS research dealing with theory building, theory testing and extension. Use of multi-method approaches has been encouraged in IS research. Mixing methods can also lead to new insights. Multi-method approaches introduce both testability and context into research (Kaplan, 1988). The appropriate use of a combination of approaches in dealing with a research strengthens the validity of study findings.

4.5 Instrument Development

A brief outline of the approaches used in instrument development is presented in this section. This review provides the background to explore the objective related to the development and validation of the measurement instrument. The methods used in instrument development by past researchers provide guidance in determining the approach for development and validation of the proposed instrument to measure IT management sophistication in small business.

An instrument is a device used to measure variables. The importance of developing better measures and valid instruments in social sciences research need no explanation, as Jacoby (1978) pointed out:

> What does it mean if a finding is significant or that the ultimate in statistical analytical technique have been applied, if the data collection instrument generated invalid data at the outset? (Jacoby, 1978 , p 90.) .

Measurement instruments with desirable *reliability* and *validity* properties are vital for research purposes and clear understanding of constructs (Ives et al., 1983). Straub and Carlson (1989) called for renewed methodological rigour suggesting that instrument validation has been inadequately addressed in most IS research. Hence, the development and assessment of scales with respect to unobservable (latent) variables (or constructs) continue to be of high interest among IS researchers (Segars, 1997; Straub & Carlson, 1989). Several measurement instruments[15] have been developed by researchers in the field of IS as well as in other social sciences. These studies not only highlight the

[15] Some examples of instrument development research:

(a) User Information Satisfaction /success of information systems (Bailey and Pearson, 1983; Doll et al. , 1995; Gatin, 1994; Ives et al. , 1983; Gelderman, 1998; Scott, 1995).
(b) Predicting user acceptance of computers (Davis, 1989).
(c) Information systems service quality (Kettinger and Lee, 1994)
(d) Organisation benefits of IS projects (Mirani and Leserer, 1998)
(e) Organisational impact of IT (Sethi and King, 1991)
(f) End-user computing support (Mirani and King, 1994)
(g)User competence (Munro et al. , 1997)
(h) Strategic Grid Framework (Raghunatha et al. , 1999)
(i) Service quality –SERVQUAL (Parasuraman, Berry & Zeithmal, 1991; Parasuraman & Berry Zeithmal, 1998)

importance of instrument development research, but also provide guidance to researchers on the process of instrument development.

According to Doll et al. (1994) the research cycle of developing a standardised instrument can be summarised into two phases as follows:

(a) Exploratory studies that develop hypothesised measurement model(s). This may be effected by analysing empirical data from a referent population.
(b) Confirmatory studies that test hypothesised measurement model(s) against new data gathered from same referent population.

Exploratory research is necessary when little is known about a phenomenon (Churchill, 1995). It is particularly important when there are no reliable and valid measures of a construct (Patton, 1980). This conceptualisation follows the scientific research cycle presented by Straub (1989), where the exploratory phase is devoted to theory building and the confirmatory phase for theory testing.

When an instrument is developed initially using exploratory studies, its applicability and generalisabilty can be established with confirmatory studies. New data for confirmation studies are generally gathered at different time intervals. This can also be achieved by gathering data in a single instance such as a survey, and splitting the sample into two equal sub-samples, provided that there are sufficient number of data points for statistical analyses. Such sub samples are referred to as split-samples and the first split-sample can be used for the exploratory phase and the second for confirmation purposes (DeVellis, 1991). For example, Barclay (1991) analysed split-samples in his research which aimed at formulating a model of the organisational characteristics that effect buying-related interdepartmental conflict.

The criteria and detailed processes for designing and validating instruments have been discussed in social science literature. Identification of variables, selection of the type of instrument, assessment of the validity and reliability of the instruments, pilot testing, redesigning the instrument incorporating test findings, and design of a procedure for administration and analysis are all vital steps in the instrument development process (Sproull, 1995).

A widely used and accepted eight step[16] procedure for developing better measures for marketing constructs is presented in Figure 4.1 (Churchill, 1979; Churchill, 1995). Churchill's (1979) procedure for developing better measures provides broad guidelines for arriving at a valid and reliable instrument. Many researchers who have dealt with instrument development have adopted Churchill's (1979) procedure, albeit with necessary modifications to fit the particular research setting. Sethi and King (1991) reviewed a number of research studies related to construct measurement in information systems and noted that it is useful to define a primary model of the dimensions underlying the construct. They found it enhances the ability to understand the empirical results, even when there is lack of previous measurement research (Sethi & King, 1991).

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[16] Churchill's (1979) procedural steps:

Step 1: Specify Domain of the Construct. In this first step the construct is defined constitutively and operationally. In the constitutive definition, the construct is defined in terms of other constructs. An operational definition is assigned to the construct by specifying the activities or operations necessary to measure it.

Step 2: Generate a Sample of Items. Past literature is reviewed in this step to derive the dimensions of the construct as well as a set of items for each dimension. When the past literature is not rich enough to conceptualise the construct the researcher may resort to other means such as case studies to explore the related activities and operations.

Step 3: Collect Data. Data may be collected using different methods such as laboratory experiments, field experiments, field studies or survey research. A particular method is selected on the basis of their strengths and weaknesses relevant to the research objectives and the context of the study. Survey research using questionnaires is a widely used method for collecting data.

Step 4: Purify Measure. In this step the reliability is examined empirically. There are a number of ways to assign reliability such as correlating alternative forms of measures against each other, split-half correlations and test retest.

Step 5 and 6: Collect New Data and Assess Reliability based on New Data. Additional data are collected to rule out the possibility that the findings of previous steps were due to chance. New data will be subjected to the same analysis and the results are compared. Alternative methods of assessing reliability, such as test-retest may be additionally employed at this stage.

Step 7: Assess Validity. In this step various statistical techniques will be used to assess construct validity, content validity and predictive validity etc.

Step 8: Develop Norms. In this last step the measures are aggrigated to compute an overall score and then develop a benchmark. This last step may not be common to all types of instruments (Sethi & King, 1991; Churchill, 1991; Churchill, 1979).

This conclusion is based primarily on the fact that most areas of IS research lack previous, rigorously defined construct measures.

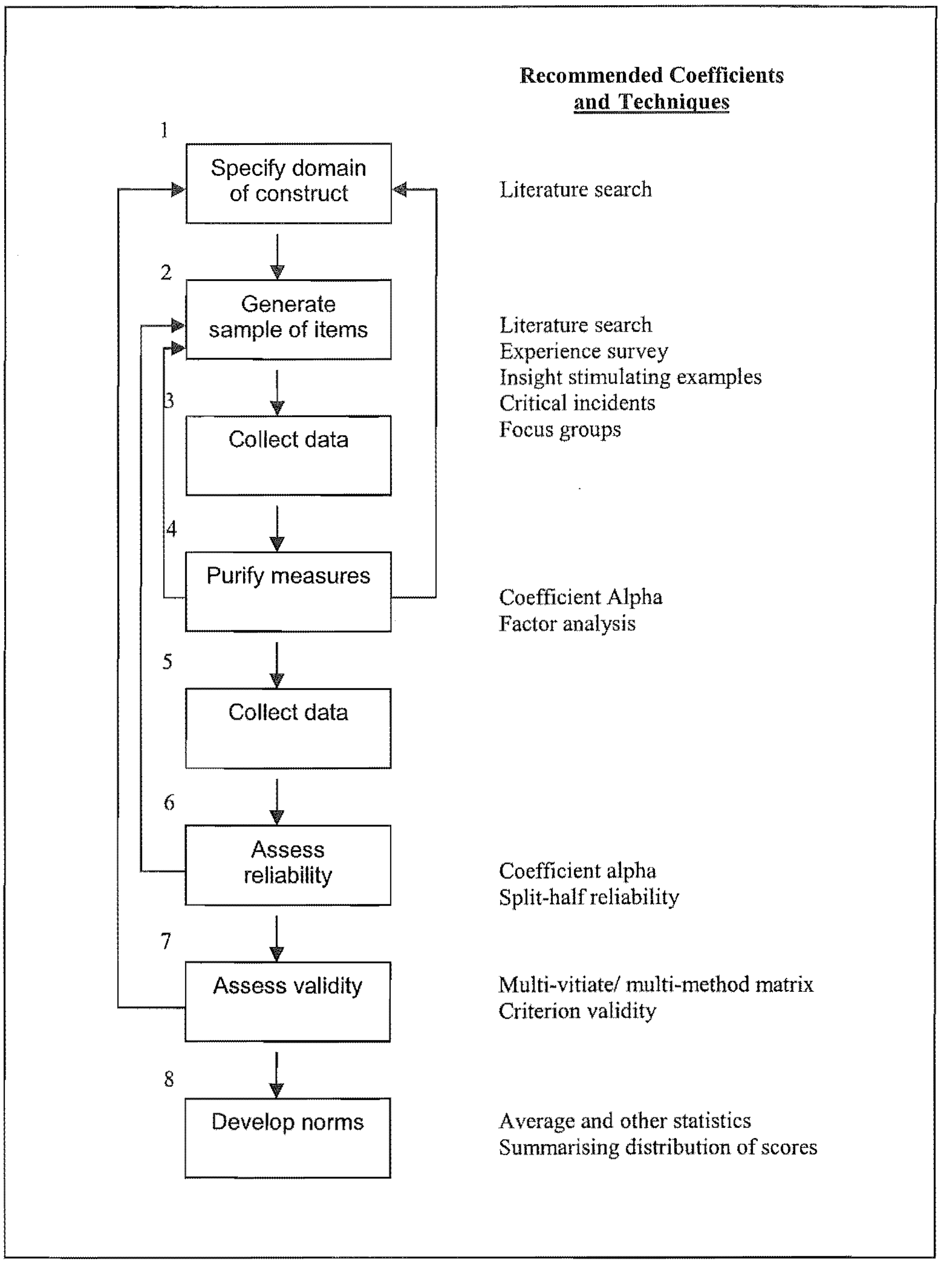

Figure 4.1 . The Procedure Suggested by Churchill (1979) for Developing Better Measures

Ishaman (1998) guided by Churchill (1976), and Straub and Carlson (1986) adopted a four step procedure for instrument validation with respect to IS success measures.

The four stages of Ishaman (1998) comprised of:

a. Pre-testing in the form of a review of the instrument by researchers in the field,
b. Pilot test (reliability and validity analysis using a small representative sample),
c. Reliability assessment and
d. Validity assessment.

Validity and reliability are the two main aspects oft the instrument development that a researcher should be concerned with (Jacoby, 1978; Churchill, 1979)

(a) Validity

A measure is valid when the differences in observed scores reflect true differences in the characteristics one is attempting to measure and nothing else (Churchill, 1979). Validity is defined as the extent to which the instrument measures what it is supposed to measure. Traditionally, three different categories of validity, namely, *content validity, predictive* or *external validity* and *construct validity* have been examined to evaluate an instrument.

Content validity implies that all aspects of the attribute being measured are incorporated in the instrument and thus the measurement is complete and sound. It answers the question: "are instrument measures drawn from all possible measures of the properties under investigation?" (Sturb & Carlson, 1989, p. 150). Therefore the content validity refers to the *representativeness* or *sampling adequacy* of the content.

Predictive or external validity refers to the fact that the instrument is consistent and agrees with other independent measures. Therefore, it can be used to measure or predict outside the boundaries of the research experiment. Predictive validity is demonstrated by correlating a measure against other measures of the same construct (Bailey & Pearson, 1983; Ives et al., 1983; Churchill, 1995). Assessing a construct's predictive validity is critical for understanding its scope, meaning and importance. Sethi and Carraher (1993) have emphasised the importance of paying greater attention and maintaining rigour in IS measurement research, considering the central role played by the measures in an evolving field of social sciences.

The property that the measurement instrument performs as expected relative to the construct of the attribute being measured is signified by construct validity. This answers the question: " Do measures show stability across methodologies? That is, does the data the reflect the true scores or artefacts of the kind of instrument chosen?" (Sturb & Carlson, 1989, p. 150) For example, in the context of user satisfaction, construct validity is established if those factors which are important to perceived satisfaction are important in the measurement questionnaire. Construct validity of a measure is demonstrated by validating the theory behind the instrument (Bailey & Pearson, 1983; Ives et al., 1983; Churchill, 1979).

(b) Reliability

A measure is reliable to the extent that independent but comparable measures of the same trait or construct of a given object agree (Churchill, 1979). Reliability is defined as the absence of measurement error. It answers the question: " Do measures show stability across the units of observation? That is, could measurement error can be so high as to discredit the findings?" (Sturb & Carlson, 1989, p. 150). A reliable instrument will measure the same object with error free results consistently (Bailey et al., 1983). This depends on the degree of variation in scores attributable to random or chance of errors. According to Ivis, Olson & Barodi (1983) generally there are two types of reliability: test-retest and amount of error in the measurement.

An approach similar to Ishaman's (1998) described above was adopted by Diamantopoulos and Souchon (1999) for scale development and validation with respect to *information used in export marketing*. Their procedure comprised of two broad phases; exploratory research and a mail survey. An item pool was developed in the exploratory research phase and incorporated in a questionnaire. The survey was conducted to collect a large data set for statistical analysis. Their measure development procedure comprised of four stages, namely, dimensionality assessment, reliability assessment, stability across acquisition modes and validation. The first two phases were devoted to scale derivation, and the third and the fourth were meant for scale replication and scale validation respectively.

The validation of an instrument calls for quantitative assessment and statistical analysis of a large number of observations of the phenomena. DeVellis (1991) recommend the useed split-samples for data analysis to reduce the likelihood of capitalising on chance during scale purification. Such an analysis will strengthen the reliability and useful for statistical generalisation, and to justify the value of newly constructed measures.

4.6 Characterising IT Management Sophistication

Definition of the IT management sophistication in small business construct and the development of related measures are two initial tasks with respect to the first two research objectives stated in section 4.2 above. This required a clear understanding of the operational issues with respect to managing IT systems within the context of small firms. It was also important to understand the behaviours of the players involved and reasons behind their actions. The practical measures that capture the latent variables under investigation were to be determined to operationalise the variables. Therefore, an exploratory search towards gaining a clear understanding of the specific issues pertinent to IT management in small firms and constructing the appropriate scales to capture such characteristics was deemed necessary.

Invariably the scales of a latent variable of this nature may be interpreted as either surrogates or characteristics of the phenomena but not as direct measurements of the events. Since this variable has not been previously examined in sufficient detail (see section 2.4.2 of Chapter 2), an exploratory approach with a view to learning the state of affairs in detail within the natural setting was necessary. The exploratory phase of this research was primarily based on a case study approach.

4.6.1 Case Study Approach

The case study method is particularly appropriate for situations where research and theory are in their early, formative stages and research phenomena are not supported by a strong theoretical base. This method is useful in addressing practical problems where the experience of those who are familiar with, and involved in the particular scenario, is important and the context of their actions is critical (Benbasat et al., 1987). Case studies are suitable for research objectives of an explanatory nature, which attempt to answer how and why questions that focus on contemporary events (Yin, 1994). A rich natural setting can be a fertile ground for generating theories using the case study approach. Furthermore, this approach is suitable only when the subjects or events need not be controlled or manipulated in the course of a research project (Benbasat et al., 1987; Yin, 1994).

Case research can be applied and used in many different ways. At one extreme it can be a highly structured, positivist, deductive investigation of multiple cases. On the other hand, case research can also be an unstructured, interpretative, inductive investigation of a single case. Furthermore, it can take any form between these two extremes (Cavaye, 1996). In this research the case studies were used for conducting an exploratory investigation into the IT management sophistication construct. This approach provided a means of obtaining the insights of practicing managers to understanding issues relating to IT management in small businesses.

The case study method[17] is suitable for the exploratory phase of this research as it required an in-depth understanding of IT management sophistication in small business. This phase also involved characterising and determining the major factors comprising the construct.

4.7 Development of the IT Management Sophistication Instrument

The process of developing an instrument to measure the IT management sophistication in small business construct should basically involve two stages:

a. exploratory studies leading to the development of measures and the hypothesised measurement model(s),

[17] A brief account of case study method is given in the Appendix 1.

b. testing the hypothesised measurement model(s) leading to validity and reliability assessments.

It was also noted that the objectives and the context of the current study are very similar to that of other studies leading to instrument development such as Diamantopoulos and Souchon (1999), and the procedure adopted by them could be used as a 'blue print' to guide the current research.

The exploratory phase leading to development of measures was similar to that of the characterisation of IT management sophistication in small business construct. The case study approach was found to be appropriate to address both these processes, namely, definition of the construct and development of the hypothesised measurement model. In affect the outcome of the construct definition stage was the basis on which the hypothesised measurement model was constructed. This was found to be a practical way of addressing the two related objectives using a single approach.

The next section deals with testing of the hypothesised measurement model.

4.7.1 Assessment of the Measurement Model

Testing of a hypothesised measurement model (of the IT management sophistication instrument) for validity and reliability can be achieved through collection of a large number of data points and statistical validations. Past research showed that similar approaches had been successfully employed in previous studies related to instrument development and validation (e.g. Sethi and King, 1991; Ishaman, 1998; Churchill, 1976; Straub, 1986; Diamantopoulos and Souchon, 1999). Therefore, a survey method was adopted for the purpose of data gathering employing a large sample.

Survey research involves gathering information for scientific purposes through a sample from a given population using standardised instruments or protocols. The snapshots of practices, situations or views at a particular point in time are obtained from which inferences may be made regarding the relationships that have existed in the past, exist in the present and will be in the future (Galliers, 1992). The questions like: who, what, where, how many and how much, focus on contemporary events and may be better addressed in surveys (Yin, 1994). The purpose of survey research is to generalise from a sample to the population about some substantive issue (Kraemer, 1991).

Survey research has the advantage of examining phenomena in a large number of natural settings. A greater number of variables can be studied than in the case study and experimental approaches. It is easier and more appropriate for generalisations (Galliers, 1992; Yin, 1994; Fowler, 1993). However, in survey research, it is likely that relatively few insights are obtained regarding the causes or processes behind the phenomena being studied. It is also possible that bias is present in the respondent, the researcher and in relation to the moment in time within which the research is undertaken (Galliers, 1992). This involves the application of questionnaires or interviews to a large sample (eg. a group of people, a number of organisations) to arrive at generalisations (Singleton, Straits & Straits, 1993). Therefore, survey research is not just a way of collecting data but it also involves analysis of results (Marsh, 1982).

The major components of survey research are the selection of the study population and sample, design of instruments, data collection and analysis. Details of these individual steps as applied to current research are given in the forthcoming chapters. However, it is important to determine the analytical techniques of survey data to address the diverse objectives of this research as previously mentioned.

4.7.2 Data Analysis Techniques

A range of statistical data analysis techniques can be applied in quantitative research. Multi-variate methods are applicable when analysing complex situations with multiple variables. Multi-variate methods generally refer to all statistical methods that simultaneously analyse multiple measurements on each individual or object under investigation. To be considered truly multi-variate, all the variables must be random and interrelated in such ways that their different effects can not meaningfully be interpreted separately (Hair et al., 1998). Some common multi-variate methods used in social and behavioural research are multiple regression, principal components and factor analysis and multi-variate analysis of variance and co-variance.

Another family of techniques successfully used in Social and IS research is collectively referred to as Structural Equation Modelling (SEM). SEM techniques have been used in the data analysis of a wide range of research studies (e.g. Barclay, Thompson & Higgins, 1995; Chin, 1998a; Chin & Gopal, 1995; Cohen & Cohen, 1990; Diamantopoulos & Souchon, 1999; Duxbury & Higgins, 1991; Floyd, 1998; Raghunathan et al., 1999; Thong et al., 1996). These techniques have resulted from an evolution of multi-equation modelling developed principally in econometrics and merged with the principles of measurement from psychology and sociology.

SEM, emerging from social sciences, is a way of dealing with issues related to theory development by simultaneously assessing and estimating the relationships among these constructs. This approach addresses such issues as recognition and handling of error in measurement, and recognition of error in theory, such as surplus meaning in constructs and unexplained variance (Barclay et al., 1995).

SEM procedures, referred to as second generation multivariate techniques, have advantages over their first generation counterparts such as principal components analysis, factor analysis, discriminant analysis and multiple regression, because of their greater flexibility for interplay between theory and data. In general, SEM based approaches provide the researcher with the flexibility to:

(a) Model the relationships among multiple predictor and criterion variables.

(b) Construct the unobservable latent variables.

(c) Model the errors in measurements for observed variables .

(d) Statistically test *a priori* substantive/theoretical and measurement assumptions against empirical data (Chin, 1998b).

The co-variance structure analysis as implemented in LISREL (Joreskog, 1979) or EQS (Byrne, 1994) and Partial Least Square modelling which uses least squares-estimation (Wold, 1985) are two primary approaches of structural equation modelling. Co-variance based techniques (e.g. LISREL) are best suited for theory testing and development while PLS is oriented more towards predictive applications. Under conditions of low theoretical knowledge, which is true for many technological-based studies, a more conservative estimate of a model's structural paths may be more appropriate. PLS techniques make no distributional assumptions regarding data. This approach is also superior on practical grounds since the computation of statistical parameters of large data sets is much faster (Chin, 1998b; Chin & Gopal, 1995).

4.7.3 Statistical Techniques Used in this Research

SEM was seen as a way of dealing with issues related to theory development by simultaneously assessing and estimating the relationships among variables. These procedures provide for greater flexibility for interplay between theory and data. The major task of instrument validation with respect to the measurement of IT management sophistication in small businesses involved modelling the errors in measurements for observed variables and statistically testing such hypothesised measurement assumptions against empirical data. This can be successfully achieved using SEM techniques of statistical data analysis as explained above. Therefore, SEM techniques were used as the main statistical tool in the process of instrument validation.

The nature of the objectives of the current research was considered in choosing the appropriate SEM technique of data analysis. As pointed out earlier, out of the two main SEM analytical tools namely, LISREL and PLS, The PLS techniques were found to fit well with the objectives this study which is oriented towards prediction and theory building rather than theory testing. These techniques make no distributional assumptions regarding data, and are also superior on practical grounds. Therefore PLS techniques were adopted for data analysis and modelling in this research. An account of the PLS analytical techniques is presented in Appendix 2.

4.8 Determining Relationships: Model Development and Testing

The third objective identified in this study was the development of a model that relates IT management sophistication and IT impact. This task also required theory development by simultaneously assessing and estimating the relationships among four constructs, namely, IT management sophistication, technological sophistication, informational sophistication and IT impact. This also involves the construction of models pertaining to the unobservable latent variables, assessing the validity and reliability of measurement models, and investigating the significance of relationships. Here the interactions between variables need to be identified with significant relationships being determined. In order to estimate the degree of association between different variables in the postulated model and to statistically analyse the variability, a larger data set was required.

It was observed that PLS data analysis techniques could be successfully applied to derive conceptual models that relate study variables, and to test the strength of structural relationships and their validity and reliability. Past researchers (e.g. Barclay, Thompson & Higgins, 1995; Chin, 1998a; Chin & Gopal, 1995; Cohen & Cohen, 1990; Diamantopoulos & Souchon, 1999; Duxbury & Higgins, 1991; Floyd, 1998; Raghunathan et al., 1999; Thong et al., 1996) have used these techniques successfully to achieve similar objectives. The applicability of PLS techniques was further evidenced in this study, where diverse research objectives could be achieved using the same survey data and the analytical methods.

Therefore, the data collection and the survey design related to this study were planned in such a way that all relevant data could be obtained to achieve the three diverse objectives indicated in section 4.3 above. In particular, survey research was devoted to fulfilling the needs of the second and third objectives. The survey was appropriate for examining the phenomena across a larger number of natural settings.

The PLS techniques of SEM data analysis approach were used for analysing survey data since this method was found to fit well with the objectives of this study. It may be noted here that although the methods of data collection and analysis were detailed in separate sections related to specific tasks of research objectives, these techniques were simultaneously carried out to address the related tasks.

Factor analysis may be another data analysis technique applicable in a study of this nature. However, this technique is used mainly for confirmatory purposes. Considering that the aim of this study was theory building rather than theory testing in an emerging area of IS research and that the PLS techniques are superior for the computation of statistical parameters of large data sets with no requirement of distributional assumptions, PLS techniques were found to be more applicable for analysing data obtained by this study.

4.9 Overview of the Research Approach

In summary, a multi-method approach comprising both case study and survey methods was adopted in this research. The process commenced with a comprehensive literature review to gain insights of the research area and to formulate the research objectives. The four key variables identified for investigation were IT management sophistication, technological sophistication and information sophistication of IT and the IT impact in the context of small business.

Next, the case studies were conducted in small and medium sized chartered accountancy firms in Christchurch. The information obtained from the case studies was substantiated with discussion with the IT consultants of small CA forums and a major software supplier to this industry. Further to the literature review findings, comprehensive discussions/reviews with IS and management academics, CA professionals and IT practitioners were used to analyse and supplement the case study and other findings. The principal outcome of these qualitative approaches was a pool of indicators which potentially represents the IT management sophistication in small business construct.

A large scale survey of small CA firms in New Zealand was conducted as the next stage of investigation. The outcomes of each stage of the research approach fashioned the foundation for the next stage. For example, the pool of indicators identified to be representative of the IT management sophistication in small business construct, was used to construct the survey questionnaire. Partial least square (PLS) modelling technique was used for survey data analysis and the associated model development. The detailed methodological steps are discussed in the forthcoming chapters.

4.10 Chapter Summary

The research methods employed in this study were outlined in this chapter. A multi-method approach comprising both case study and survey methods was deemed appropriate for this study. The chartered accountancy firms in New Zealand were selected as the study population. The outcomes of each stage of the research approach fashioned the foundation for the next stage. Partial least square (PLS) modelling technique was used for survey data analysis and the associated model development. Comprehensive discussions on these approaches are presented in chapters five through eight.

Chapter 5

Characterisation of the IT Management Sophistication Construct: Qualitative Phase

5.1 Chapter Overview

This chapter details the qualitative phase of the study leading to characterisation of the IT management sophistication in small business construct, being a key research objective identified in Chapter 3. The case study approach was the method used as identified in the previous chapter. Case studies conducted in four Chartered Accountancy (CA) firms were supplemented by three in-depth interviews with professionals in IT consultancy firms closely related to CA practice[18]. The findings of the case studies were reviewed with past literature to form a pool of item statements that portray the operational issues potentially representing IT management in small firms. These statements were then reviewed with a panel of academics and peer researchers in the IS and management fields, with the aim of ascertaining the potential indicators characterising the IT management sophistication construct.

Chapter Contents

5.2 Case Study Approach

As detailed in Section 4.3.1 of Chapter 4, the approach adopted in the initial exploratory phase of this study was the case study method. The main objective of these case studies

[18] Three supplementary in-depth interviews: two with managers of IT consultancies to CA firms and one with the general manager of a major software supplier to CA firms.

was to get an in-depth understanding of the IT management sophistication construct within the context of small firms. In this process, IT management practices of the firms investigated were compared and contrasted against perceived best practices. An attempt was made to identify the leaders and laggards of IT management and to learn how each of them manages their IT in day-to-day operations as well as in the long term. This information laid the foundation for understanding the key issues of IT management in small firms, which in turn was used to determine the major factors that characterise this construct.

The case studies were also aimed at constructing appropriate indicators that capture the major factors representing IT management sophistication. These indicators were to be incorporated as measures in the proposed instrument. As explained previously, these measures may not be direct measurements of the key factors, but characteristics of the phenomena (i.e. surrogates). Therefore, understanding the state of affairs of the construct under investigation within the natural setting and identifying and exploring the patterns of key characteristics to determine measures was necessary.

It was seen that not only were both these aims closely linked, but that they could be achieved simultaneously using the same case study investigations. The major steps in case study research were comprised of design, identification of suitable cases for investigation, preparation, collection and assessment of evidence, identification and explanation of patterns, theory development and report writing (Ryan, Scapens & Theobald, 1992). The forthcoming sections detail the methodological steps adopted in this case study research, and the applicability of such methods towards realising the stated objectives.

5.2.1 Case Study Design

The intent of this phase of study was exploration and theory building related to the construct that needed characterisation. Multiple-case design was selected, aimed at a more generalisable outcome. The single case design was useful in specific instances. Since the primary objective was theory development rather than theory testing, the research was designed to begin with an 'exploratory case.' This was followed up with multiple case studies. The remaining cases were identified on the basis of the findings of the previous cases and external information sources. The objective in seeking subsequent cases was to explore additional issues of IT management, or to confirm (or further develop) the issues already identified. Also, the firms were selected with the aim of covering a wide range of practices related to sophistication of IT management in the small chartered accountancy business sector.

The unit of analysis identified for the study was the individual 'firm'. The small and medium sized independently owned and operated CA firms were targeted for case studies. The IT management practices of subsidiaries (or branch units) of large organisations, possibly with international links, are influenced by the advanced practices of the parent organisations. Therefore, such subsidiary firms were eliminated from the study sample even though they fall within the criteria of "small businesses" on the basis of the number of employees. Their IT management practices may not represent the way small businesses operate.

5.2.2 Study Population

Small and medium sized CA firms in Christchurch were identified as the study population for case study investigations. There were several reasons for this selection.

a. Traditionally, accounting has been one industry that has used computers for information processing in their main business activity. The chartered accountancy industry is heavily involved with repetitive information processing due to the nature of the industry. IT is the principal tool used for performing day-to-day operations, as well as producing information for business and strategic purposes in CA firms today. This was also confirmed by the general manager of a major software supplier to CA firms :

> ..if you're doing that (accounting work) by pencil and paper or by spreadsheet or by something pretty simple, you will be so inefficient. You will hardly have a business, so I see every accounting firm has a reasonable investment in IT. They spend a reasonable amount of money on the hardware, the software and the ongoing maintenance.

> In fact sometimes [this is] how I've described it for accounting firms, their tool for their business is the computer software. [If] someone comes to you and say I am plumber and I am going to set up in business; you'll say to him; buy a good van; buy good quality tools and that sort of thing because that's what you need. You need good tools...In an accounting firm you need good hardware; you need good software...(CON3[19]).

Making investigations of an industry that use IT intensively (e.g. CA firms in this case) is important for a study dealing with managing IT resource. Such an industry is expected to adopt a wider range of management practices related to IT than one which users IT in a moderate sense.

b. It was also important to take steps to minimise distractions due to differences in technical sophistication since IT management sophistication is closely related to technological sophistication (Raymond & Pare, 1992). It is well known that the CA practices generally use similar IT systems. Therefore, small and medium sized CA practices were found to be quite suitable for this study.

c. Small scale CA practices are widespread in New Zealand. Availability of a substantial clientele comprising a very large number of small businesses may have attributed to this situation. There are over 1500 small and medium sized CA firms in the country. Hence, they were expected to generate a rich data set for the follow-up statistical analysis, through a survey in the next phase of the research.

d. The CA firms often offer advice to other small business on a number of aspects such as business management, use of information systems and IT management. Accordingly, the beliefs and actions of CA firms could impact on a lot of other small businesses. Therefore, the studies of IT management in small CA firms are of significance to small business sector in general.

e. A large number of small and medium sized CA firms are located in Christchurch (and suburbs) being the major city in the South Island, New Zealand. Relative ease of access and loyalty towards the University of Canterbury, geographically

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[19] CON3 denotes the case study based on the consultant 3. See page 85.

located in Christchurch, were also considered when restricting the prospective case study firms to the Christchurch region. This was an important practical aspect in this study. This was helpful for the researcher to make contacts with the interviewers easily and conduct all case study interviews and follow-up discussions with no additional travel costs. By this means the researcher was able to obtain first-hand information with respect to IT management and other relevant issues with direct exposure to the organisations investigated.

5.2.3 Case Study Preparation

The background information of the CA firms intended for study was obtained through external channels such as the yellow pages (a business telephone directory), computer vendors and business networks. The first firm for the case study was selected from CA firms in Christchurch listed in the yellow pages and represented an average level small CA firm.

Initially, appointments were made through telephone calls with the person-in-charge of IT systems in the firm. The highest possible person in the management hierarchy looking after the IT systems was sought in identifying the contacts.

At the preparation stage, broad areas for investigation were formulated first. Since the case study discussions were aimed at exploring the process of IT management in small firms, and not to test a predetermined hypothesis, a detailed questionnaire to tightly guide interviews was not prepared. The broad areas of IT management practices that were targeted for examination in the case studies were *planning, organising, controlling* and *leading*, as tentatively hypothesised when formulating the research problem (see page 51). The initial case study discussions were meant to be broad in content and scope with a view to understanding the nature of IT management in small firms, without leaning to a predefined structure. However, later case study discussions were more focused on IT management issues and were tailored on the basis of what has been learnt in previous cases.

5.2.4 Case Study Data Collection

The case studies were conducted in four small CA firms in Christchurch. These were identified as case study firm 1, 2, 3 and 4 and were abbreviated as CAF1, CAF2, CAF3 and CAF4 respectively. (The case study evidence quoted in this thesis is identified by these abbreviations given at the end of each quotation). All case study interviews were held during a four-month period commencing on 16 February 1999.

The primary data collection technique employed was interviewing. Documentation and other sources were used where available. This approach was found to be appropriate since information could be obtained direct from the source and was also verifiable then and there. Since the researcher conducted all interviews, a deeper understanding of the related issues could be obtained.

In all cases, the interviews were held with top management (chief executive officer, owner/manager, directors etc), and also with the executives and other staff working on the IT function. These discussions lasted about one hour each and were guided by open-ended questions. The sessions were audio recorded and the contents transcribed. Short notes were taken on important points. Second visits to case study firms were used to clarify matters arising from interviews and to fill gaps when required.

Case study interviews were initiated with a short introduction to the nature of the research. Some background information including the nature of the business, total number of employees, size and structure of the firm were gathered first. Then the discussions were directed to collecting information with respect to the issues of IT management including IT usage, IT infrastructure and day-to-day administration, IT organisation and control of IT systems. The ground situation with respect to IT planning, including acquisitions of computer systems, planning the implementation of IT systems and running day-to-day affairs, the maintaining and controlling of IT systems, organisation of the IT function and leadership characteristics were discussed with the aim of gaining a deeper understanding at the field level of IT management practices. Both IT management in general and managerial functions relating to specific IT projects were discussed. These discussions were aimed at addressing the potential IT management practices in small firms to explore the concept of IT management, bearing in mind the preliminary model of IT management hypothesised in Section 3.2.1 of Chapter 3.

The opening probe questions were centred on the firm's organisational arrangements, IT applications, new IT projects, external technical support, day-to-day management aspects of IT and IT management practices in general. As the case study interviews progressed the discussions were focused on specific IT management issues.

5.2.5 Supplementary Cases

The information gathered from the cases was supplemented with comprehensive discussions with two IT consultants, who were closely associated with CA firms (Consultant-1 and Consultant-2), and the general manager of a major software producer/supplier to the chartered accountancy industry in New Zealand and Australia (Software Producer). These investigations were identified as Consultant 1, Consultant 2 and Consultant 3, and were abbreviated as CON1, CON2 and CON3 respectively. These professionals were quite familiar with the IT management practices and other aspects such as use of technology and the issues and problems related to the IT area in chartered accountancy firms. Such supplementary information not only broadened the scope of overall findings, but also strengthened their validity and reliability.

These supplementary discussions were also conducted in the same manner as the four main case studies. The objective of the investigation was to obtain relevant information from more than one source which supports triangulation. For example, IT consultants were able to view certain IT management issues and problems, which may not be seen by people concerned within the firm. These IT consultancies and the software supplier were also selected from Christchurch area since they are familiar with IT systems in CA firms in general and the working of the case study CA firms in particular.

5.2.6 Characteristics of Study Firms

The background information of the CA firms investigated is given in Table 5.1. These four cases represented a broad range of issues relevant to CA firms. The total staff ranged from 3 to 50 and the number of partners ranged from 1 to 9. Two firms were using PC networks whereas the smallest one used standalone PCs. A variety of accounting software was used by these firms. Obtaining the services of a designated IT consultant was a feature in all three larger firms.

The general overall impression on the level of sophistication of IT management of the four CA firms could be formulated on the basis of case study discussions and the perception of other CA firms and IT consultants on the level of IT management sophistication in the respective firms. It was seen that the CAF4 employed better management practices than others. The CAF2 ranked the lowest for their level of IT management.

	CAF1 (CA Firm 1)	**CAF2** (CA Firm 2)	**CAF3** (CA Firm 3)	**CAF4** (CA Firm 4)
Date of first interview	16 Feb 1999	12 March 1999	28 April 1999	7 May 1999
Number of partners	3	1	6	9
Number of accounting staff	15	½ (part-time)	20	45
Total number of staff	~20	3 ½	~25	~50
Computer system	PC Network (14 pcs)	2 stand alone	IBM mini system with 14 computer terminals plus two PCs	PC Network (~50 Pcs)
Accounting software*	CA Systems (MYOB practice systems), Moving on to MS Widows base	Attache` Moving on to CA systems	Customised accounting package with IBM system APS for tax processing	APS
Principal Contact	Partner (in-charge IT)	Principal	Business Service Manager	Partner/Director (IT/strategy)
External IT Consultant	Yes	No	Yes	Yes

(* CA systems , MYOB, Attache`, APS are PC based software packages)

Table 5.1. Profile of Case Study Firms

5.3 Case Study Data Analysis

The case study data consisted mainly of transcribed interviews. As can be expected, this ran into many pages and the relevant excerpts of case study data with respect to CA firms and IT consultants are quoted in this chapter as required.

In order to make the findings more meaningful and applicable, the case study data were separately scrutinised firstly to identify the issues, concerns and important points that were supposed to characterise IT management practices in small firms. At this stage of investigation, the aim was to collect as many issues related to IT management as possible by further analysing the case study data, while trying to avoid any pre-conceived factorisation.

Therefore, a pool of potential issues that may be relevant to IT management in small firms was formulated on the basis of case study evidence and past research findings. Consideration was given in this review process to examining if a particular issue was actually IT management related. Emphasis was placed on those issues which were identified in more than one case and which have also been dealt with by past researchers. Also, a few statements were added to this pool to reflect certain critical IT management issues that were strongly supported by past researchers, although not highlighted in case studies. Finally, a draft pool of 30 item statements that were presumed to capture the IT management sophistication construct was developed (see Table 5.2). A discussion of the analysis process that led to the derivation of these 30 items is presented in the next section.

5.3.1 Data Security

Data security was a major concern regarding IT management in small CA firms. (see case study excerpts below). The IT consultants placed a strong emphasis on maintaining data security. They complained of poor standards of data security in most small CA firms.

The following case study evidence indicated various data security issues.

> I'm [i.e. partner in-charge of IT systems][20] the only one who does backups, in the office, we take those backups off the premises, we take one copy every night off the premises.. Just in case of a fire... we have five sets of backups. (CAF1)
>
> .. these backups obviously just as vital. (CAF1)
>
> We've got a C-gate tape unit.. every morning we back it up.. so Jennet [i.e. receptionist] comes and first thing in the morning she puts the tape and backs up that day... and then once a month we do a full back up of the whole of the C drive.(CAF2)
>
> Security, I mean to get on to the network you need to have a password to get logged in. The new system will have multilevel security in terms of data access.(CAF3)
>
> Data security? Yeah, pass worded; different levels; backups are done regularly; they are taken off-site. (CAF4)
>
> At the moment internally we don't really have much [internal] security. Our systems are open; Just about everyone in the office can actually look at anything in the system. (CAF4)
>
> Backups are done regularly…; backup on to tape…; but as far as I am aware I don't think backups are kept off-site. That's probably something to be addressed. (CAF3)
>
> We're trying to convince most people to take care of their data. The importance of security of data. (CON1)
>
> It's amazing how much faith you're putting in your staff in small businesses and how little security; you lock your doors; you put in alarm systems and monitor alarm system; but the most valuable part of the business; the data you have, the information that builds up over the years of running the business; and yet small businesses will have peer to peer networks; no security; very little limitation for the staff to see what the manager's writing; no security on the accounting files; its just amazing. (CON2)
>
> [A] lot of firms are not backing-up [their data]. Quite recently we had a major problem with our product. We released a new version of our invoicing product. [Due to some unforeseen problem] the data were corrupted [when the new system was up and running for the first time]. About twenty firms around the country got affected by it. Some of those were quite large firms; with 30 staff, and one of those firms

[20] The square brackets contain clarifications of terms/phrases used by the respondents involved in the case study discussions. These have been introduced by the researcher.

> haven't backed-up for months; I found it incredible; I am quite horrified and still believe that a lot of firms have very very poor security. (CON3)
>
> Some firms run the risk of not backing up regularly; not having a backup procedure; then other firms are saying that even if they do have a backup procedure, and the backup tape is sitting next to the computer; there is no off-site storage; no regular process of taking it off site, and its just incredibly poorly managed; ...the reality is [that] they run the risk of having their business destroyed; by a break-in, by a fire, or by say catastrophe. (CON3)
>
> ... they have absolutely no protection against virus attacks...; or any plan in place to what they are going to do if they get attacked by a virus... (CON2)

Confidentiality of information was also a major concern to CA firms.

> Oh, confidentiality is absolutely vital. It's totally vital. Our staff is briefed on confidentiality. (CAF1)
>
> Confidentiality of information is addressed in the employment contract...and it's specially important in any charted accountancy environment. (CAF3)
>
> So, we would not want firms to start being so sensitive they would not pass data on to us; they make it difficult to repair or fix them. (CON3)

All above were concerns related to different aspects of maintaining the security of information. Security and control was identified as an issue in IT management in New Zealand according to Davis et al. (1995). Raymond and Pare (1992) also identified the presence of IS security measures as a measure of IT management sophistication in small firms. It is a common practice in large firms to place a strong emphasis on maintaining high standards of security. Hence, this may not be seen as a significant management issue in larger IT installations. However, in a small firm context maintaining comprehensive IT security measures could be considered as a sign of greater sophistication of IT management.

On the basis of above evidence the following statement was generated as an indicator of IT management sophistication in small firms.

- **We have comprehensive procedures for maintaining the security of information stored on the computer.**

Here the term *'security of information'* was meant to broadly cover all relevant areas such as maintaining appropriate back-up procedures, having password access controls, having adequate security measures and maintaining confidentiality of computer based information.

5.3.2 Procedures for Managing IT Resources

The case studies revealed that there were several aspects to managing IT resources; the following quotations provide evidence for these issues. Indicators such as not looking after the computing resources properly, underutilisation of resources, not having proper procedures to control and utilise available resources may contribute towards inefficiency of business operations.

> Yes, nearly every body is [having a computer]; [for] some people, the work that they're doing would not warrant the expense of actually acquiring a PC. (CON3).
>
> No, there's no procedure written down; it's really just casual knowledge.(CAF3)
>
> ..no we don't write too much [about procedures] down… Because by the time you write it down, it would have changed… Personally I don't believing in writing things down too much. But we do have an abbreviated manual on how things work, but I don't think people ever look at them…(CAF4)
>
> There is no control over what software has been loaded on the PCs…; there is often different versions of all software on all the PCs depending on when they brought them…; they are just running what is available…; nobody has not put any thought into. (CON2)
>
> Lack of care of computers is there. Computers are left on the floor, on the carpet, sucking dust through the fan. That's where ninety-nine percent of the problems start in day-to-day use...;They do not care to look after the machines…; When using vacuum cleaners near computers…bang…they damage the hard drive..; (I have come across such instances] many times. (CON1)
>
> I honestly believe that in New Zealand some small businesses are holding on to this technology (IT) for too long and others are throwing it out too quick. (CON2)

> I would've restricted its [Internet] use...; you know what we've found, its here; I am sure you find in any firm; if you have unrestricted use; humans' being with their nature that they've got cannot help themselves; so they've just go and start using it; and they actually costing you money when they do that. (CON3)

Raymond and Pare (1992) have identified a related measure, namely presence of IS control measures, with respect to IT management sophistication. Although highlighted by case study evidence, the management of IT resources has not been identified in literature as a critical issue. Accordingly, the following item statement was formulated.

- **We have comprehensive procedures for managing the use of IT resources.**

5.3.3 Monitoring

Having regular meetings with IT consultants and users with a view to finding solutions to emerging problems was an example of monitoring the progress of IT systems in case study firms. Some firms had also turned to IT vendors and consultants for assistance in progress review of IT implementation and monitoring. For example:

> We [i.e. the partner in-charge of IT, external consultant and may be few other staff members] sit down from time to time and review where we want to be with respect to computer hardware... (CAF1)
>
> We've got meetings with all the staff every fortnight and computers is one of the issues that is discussed every time; Probably our monitoring is based on identifying how many problems we have...; if it is running smoothly. We are Ok. (CAF1)
>
> We monitor obviously the profitability of the firm and we could tell that really within six months [whether] we have actually recovered [the cost of a particular IT investment] (CAF1).
>
> Probably in three months down the track they [CA firms/software users] should ask for some consultation and review from the supplier. Get us to come back and actually say..; have we done this well? For very few firms we've done some consultation work. We've gone to review whether their IT [projects] have been implemented well, and we've given them back a report; and say; yes you've done this, this and this well; you need some further training on these areas and you should implement this...(CON3)

IS literature points to a number of aspects of monitoring IT systems in a firm. Post implementation evaluation (Raymond & Pare, 1992), the basis of IS performance evaluation (Sabherwal & Kris, 1994), IS project management (Boynton et al., 1994; Pollard & Hayne, 1998), contract monitoring (Feeny & Willlcocks, 1998) and monitoring of performance of IS function and having a clear performance criteria with respect to IT function (Guptha et al., 1997) are examples of such.

There was a relevant item statement in the Guptha et al. (1997) instrument which read as "*We constantly monitor the performance of IT function*". The emphasis here is on the regularity, frequency, and continual involvement in monitoring. However the case studies refer more towards intimacy, strong involvement and rigour of monitoring. Therefore the phrase 'closely monitor' was proposed to address these issues. Furthermore, there appear to be two aspects of monitoring (i.e. monitoring of IT projects and the monitoring of the functioning of IT systems) in small firms. Hence the following item statements were proposed.

- **We closely monitor the progress of our IT projects.**
- **We closely monitor the performance of the IT function.**

The more closely these aspects are monitored, the greater the IT management sophistication.

5.3.4 Determining Clear Responsibilities

The case studies revealed that a good practice of IT management was associated with determining clear responsibilities and allocating to the designated staff. In some cases the responsibility was given to the external consultant.

> OK., We have an outside consultant who is employed to look after all the computer systems. He is responsible for upgrading the hardware and software as required. He is also responsible for looking after the virus side of things. (CAF1)
>
> Basically how we do it .. [that is] left to me on day-to-day basis. I [i.e. partner in-charge of IT] am the only one who does backups.

> [when the partner in charge of IT is away from the office], there is procedure. The receptionist apart from me will do the backups. The receptionist is trained to do the backup, so that's not a problem. (CAF1)
>
> Currently my main task is review. Planning a new computer system for the firm. We review various options, software, hardware etc to develop a proposal for the new project. We have a three member review committee. The objectives of our committee have been clearly laid down. (CAF3)
>
> The organisation of IT, the responsibilities are clear; there is one senior accountant who is pretty much the person dealing with IT. Partners have recognised that there is a problem in IT. That's why they've formed the review committee and appointed three people to that. (CAF3)
>
> We have a small IT committee and we work with outside consultants; we have a blueprint; say for the coming year which we try and work towards, so we don't get diverted. (CAF4)
>
> [We have identified a] small little IT group in our firm which; we'd say ok, you are in-charge of training and installation, and set up with that software for instance..; If you've got a product, we have a person designated to look after it.(CAF4)
>
> Well, I put people in charge of responsibilities. I am referring more to myself, but I would say …; hey! make the people responsible for jobs and make the 'buck stop' with him, and that's what they should do. (CON3)

This aspect of IT management is discussed in the literature by several authors (e.g. (Raymond & Pare, 1992; Guptha et al., 1997; Feeny & Willcocks, 1998). Feeny and Willcocks (1998) have taken up this issue under leadership and indicated that responsibility and authority should be fixed in order to devise effective organisational arrangements. The following item statements borrowed from the Guptha et al. (1997) instrument captures these issues adequately, and these statements appear to be equally applicable to small firms.

- **In our organisation, the responsibility and authority for IT direction and development are clear.**

- **In our organisation, the responsibility and authority for IT operations are clear.**

5.3.5 Attitude and Involvement of Top Management

Attitude of the top management (owners, partners or directors) towards IT systems in the firm and their involvement with matters related to IT, appeared to play a major role in IT management in small firms. Small firm management in general is dependent on the attitude and the behaviour of the owner/manager (see section 2.2 of chapter 2), this aspect may be equally relevant to IT management. The Guptha et al. (1997) instrument had a measure reading as *'Extent to which the top management perceives the strategic importance of future exploitation of IT'* under the IT integration sub-dimension. The extent of top management involvement and their attitude towards IT were measures in Raymond and Pare's (1992) instrument. Shabharwel and Kris (1994) included two measures related to top management involvement.

Case study evidence showed that in the small firm context, top management perception may not be confined to certain specific issues such as strategy or planning, but may cover all aspects of business.

For example:

> That's right... [strong top management support contributes to success]. They [top management] have to be familiar with what we are trying to achieve, otherwise the whole system will stagnate. That's [top management support in our firm] great. (CAF1)
>
> It's really me [in-charge of IT]. I am the owner and only four of us work here. I own it, so, I basically look after that. I keep up-to-date; see what's available. (CAF2)
>
> [IT is the] last thing in a small business ever gets any financial backing; marketing gets financial backing; finance gets backing; company vehicles gets backing; but IT is way way down in the list, and it's very difficult to sell a manager of a company on the concept of putting thousands of dollars a year in to IT, which is what successful companies are putting, hundreds and millions of dollars a year in to IT (CON2)
>
> I think, certainly high priority [is given] to the [IT review] team. I'm not so confident about the priority given to IT by the partners and they don't seem to be. (CAF3)
>
> A lot of time and effort [has gone in to IT review]. It's a big investment in terms of the total cost; I mean not just the purchase

> price but also the opportunity cost; this firm's personnel time that's going to be taken up in training, and down time of doing that and what benefits are going to come back to us. (CAF3)
>
> Theirs [top management support of the CA firm supposed to be managing the IT extremely well-ie. CAF4 is] High. They are very keen. He [person in-charge] is very keen, very ' gung ho'; must have the latest and greatest ..
>
> [In that firm] there is a partner in-charge of IT. (CAF3)
>
> [Priority on IT in our firm is] Very high. ...Everyone in our firm has a computer on his/[her] desk. Can't do his job with out it, so it's just a basic necessity. ..That [fact that person in-charge of IT is a senior partner] has to be [an indication of priority] I think. I've seen specially in mid size and smaller firms unless a partner is involved, .. people get something set up, it works and then just stay there until they are forced to make a change. ..You have to have some one that can actually either has the autonomy or power to do basically what he likes or push it through, if it has to do it ...I suppose we are talking about rather a large dollar value spent on it. So.. again that's a priority as well. Apart from our wage cost, IT cost would probably be the next biggest item (CAF4)
>
> Yes, firms are better if they place high priority on IT because that will make them efficient. Firms who succeeded are [those] who budget an amount of money each year to spend on IT. (CON3)

Top management involvement in IT issues (Raymond & Pare, 1992; Benbasat et al., 1984; Doll, 1985; Falconer & Hodgett, 1997; Sabherwal & Kris, 1994), positioning of the IS function at a higher level in the management hierarchy (Philip & Booth, 1999), and making commitments to investments in IT (Philip et al., 1999) are certain ways of making a positive contribution to better IT management in the firm by the top management.

Therefore, the following statements were proposed.

- **Our top management perceives that IT is critical to our business success.**

- **In our firm, top management involvement in IT issues is high.**

The top management of a firm being perceived to view IT as critical to their business success is a sign of greater IT management sophistication. Furthermore, and the higher involvement of top management personnel in matters related to IT, the greater IT management sophistication.

5.3.6 Training and Skills

Significance of training and development as a major function of human resources management has been amply emphasised in literature. Due to the dynamic nature of organisations, changes take place in jobs and technology, new products are introduced and old ones phased out. Accordingly employees take on additional roles or need their skills upgraded. The new employees need to be oriented or socialised into 'the way things are done'. Training motivates employees (Macky and Johnson, 2003). Training improves individual performance and enhances employees' personal growth and potential. Better performance brings in greater job satisfaction and benefits the organisation in terms of better productivity, which contributes to the achievement of organisation's goals and objectives (Rudman, 1999).

One key factor in IT management recognized in prior research is that a firm should provide opportunities and support for staff to obtain appropriate training (Nelson, 1991; Pollard & Hayne, 1998). Educating the user through training and development in fundamental systems analysis and the continual training of IS personnel as a means of coping with the degree and rate of technology change are key issues in small firm IT management (Pollard et al., 1998). IT training is useful to develop users' understanding of the potential of IT (Feeny & Willcocks, 1998). IT related training is an important management issue (Philip & Booth, 1999).

Small CA firms do believe that staff training on IT is important for success. For example, certain case study CA firms had regular training programmes and placed a high priority on staff training.

> We run staff training on a regular basis. Every second Wednesday we have staff training for the whole office and that goes over a range of different topics. But once a year we do formal staff training on all sorts of issues and computers is one of those issues. (CAF1)

> ... it (success) comes from basically training. We are getting the best we can get our hands on as far as the management goes. We are training people. We are not slow in sending people to [training]. If we feel they are weak in a particular area. It's good practice within the firm being able to improve skills of everyone involved and then of course management. (CAF1)
>
> Yes, we do [value staff training on IT very much and spend a lot of money on training.] I think more time than money.(CAF4)
>
> As I mentioned, as far as financial resource is [concerned] we've actually spent what ever needed to... We've made available as far as human resources go. What ever training etc we have to do; we've done it.(CAF4)
>
> Firms who succeed actually don't stay at the bleeding edge: not always buying the latest, the hardware... and software.. and implementing.. new technology... If they've demonstrated to be a priority... that they would invest in training. So they will send their staff on training courses. If they are running our software and they send along to our training courses or have our staff go to them, and hopefully they are investing on just general training on computers... Who would succeed? Who would have actually made sure all their staff are trained (CON3)

However, in one case study where the level of IT management appears to be somewhat poor, investment on IT training was not viewed as a productive exercise.

> They see that way of getting you down for courses and get more money...I sent two women down there (for training) they are part-time people running the tax management side. They went for CA systems for the training in tax management software; that was all. (CAF2)
>
> [Do I promote staff training?]. Not really, I say to them, would you like to go on courses and that sort of thing. So generally it's not something really they are wanting to do; If there is a need I may. I am not saying that I am not sending for courses. (CAF2)

The level of IT knowledge and skills of the internal staff is related to training efforts of the organisation. In a small firm context a very high level of technical IT skills of staff may not be expected and a good functional skill would have been quite sufficient to handle their IT functions.

> I think, having one [IT specialist] inside is more than advantage, but you pay a premium obviously to have someone with that type of knowledge on board, and you can't afford firms not big enough to

> have one person here to look after computers. Now, if we were one of the six big firms and have branches and things like that, perhaps you could possibly warrant, but not as far as we are concerned. (CAF1)

Though the presence of separate, fully dedicated, IS personnel may not be applicable in the small firm context, IT knowledge and skills of all staff categories is an important factor for the development of IT systems (Davis et al., 1995).

The general manager of software suppler to CA firms said:

> I reckon it [i.e. advanced IT skills] is very important, because these days the business model for accounting firms it is going to change incredibly with e-commerce and the Internet. Unless they have some process for keeping up-to-date with the rapid changes that are going on, their business will become vulnerable or become unprofitable. So, it's very important that they keep up-to-date with the latest information. (CON3).

These findings suggest that the relevant managerial issue is of improving the skills of staff members by providing necessary training and other support. Since the standard of IT knowledge of staff in small firms is generally poor (Pollard & Hayne, 1998), providing suitable IT training was deemed to be a characteristic of greater IT management sophistication.

Considering the above, the following statement was formulated.

- **Our firm places a high priority on providing staff with appropriate IT training.**

5.3.7 Approach to IT Management

The case study involving the CA firm (CAF4) which showed a high standard of IT management suggested that the ability to maintain a flexible approach to managerial activities is recognised as an advantage in small firms. For example:

> You certainly have to know where you are trying to go to; but you have to be very flexible as well because, the ground rules change; like for instance...(CAF4)

> I think it's (flexibility) easier on a smaller firm. If we go in the wrong way, we just change…; Flexibility is a sort of readiness to change. That's an advantage of a small firm (CAF4)
>
> I think you've got to be pretty flexible; you have to some how to be aware and anticipate things. (CAF4)

The flexibility was meant to cover the ability to bring about quick changes in the implementation process, depending on emerging needs, but not to promote an ad-hoc approach to implementation. The emphasis in the case study findings was not on the formal approach to adoption and development processes or planning, but on informal arrangements and flexibility in approach to managerial functions. Flexibility in decision making has also been identified as strong point of small businesses (Bolton, 1971) Therefore, the following statement was proposed. The informal approach may be a sign of greater IT management sophistication.

- **Our firm has a flexible approach to organising IT operations and maintenance**

5.3.8 External IT Expertise

Case studies revealed that small firms use external IT consultants and this practice was preferred over employing internal IT specialists.

> We have an outside consultant who is employed to look after all the computer systems. He is responsible for upgrading the hardware and software as required. (CAF1)
>
> [We employ] one [IT] consultant. ... He has his own firm and he would deal with network problems, installation of new hardware [and] software. If there is anything wrong with the network [or] something like that then he would come in and attend to it. (CAF3)
>
> We have two ways of managing our firm I suppose. We've lot of staff training, external and internal. We have a small IT committee and we work with outside consultants. (CAF4)
>
> We use our external consultants to give us the technical knowledge on, say operating systems, and things like that. (CAF4)

> Consultants should be, definitely should be used. There is no two words about that, but it's very very difficult [to identify suitable IT consultants]. (CON1)
>
> I say the one [i.e. CA firm] with the [IT] consultant is better managing. (CON2)

Employing internal IT specialists may not be a viable option in small firms owing to reasons such as the inability to pay high salaries to attract highly skilled professionals. The other reason may be that there is not enough workload or intellectual challenge to match the aspirations of IT specialists. The prospects for their personal advancement in small firms are often poor compared to larger firms. According to case studies:

> As I said the (our) firm is too small. It doesn't warrant its own full time internal IT manager (CAF3) .
>
> ..suppose if I had one (internal IT specialist) he could have carried over the frustrations [and] I could have carried on doing accounting and running practice from that side of it. Yes, the larger firms do have them. Obviously the disadvantage is the huge overheads from that perspective of having specialist (CAF2).

Small CA firms also rely on software (and hardware) suppliers for technical support. For example:

> I'm thinking of our support centre where we have a 0800 [free phone] service to call us. It's a help desk. So if you've got bugs or problems with that [our software], so often they can call thorough to that. Generally the interesting thing that, at least half our calls [probably more] are *how to questions*. It demonstrates the lack of training or the lack of investment in training; that's a pity; sometimes you've been rung up to ask very very basic questions on how the product should work or how to use a function, day-to-day management, bugs; you know...(CON3)

Raymond and Pare (1992) identified the presence of IT consultants as a sign of sophistication of IT management in small firms. On the other hand, the reliance solely on outside IT consultants may be a poor management practice and can be avoided by educating the user (Pollard & Hayne, 1998). The use of external consultants to attend to technical issues that cannot be handled internally may be appropriate in small firms. The utilisation of external IT expertise is an important issue in organisations (Earl, 1996;

Fink, 1998; Gable, 1996; Igbaria et al., 1998; Igbaria et al,. 1997; Rockart & Flanney, 1996; Thong et al., 1996).

Accordingly, the following statement was proposed.

- **Our firm relies more on external IT expertise (e.g. IT vendors and consultants) rather than on employing specialised in-house IT staff**

[Note: This item statement appears to acknowledge that relying on external expertise for managing the information systems is an indication of greater sophistication of IT management. On the other hand, one might take the view that the firm's lack of IT management capability (in-house) may have caused its management to seek external assistance. This controversy may have influenced the survey respondents' ratings with respect to this particular questionnaire item. A farther discussion on this issue is given on page 167.]

5.3.9 Relationship with External Expertise

Another issue directly related to using external expertise is maintaining effective relationships with them. This involves maintaining the relationships with hardware and software suppliers and other IT experts which are external to the firm. According to the case study involving CAF3:

> We have some external relationships in terms of our external systems. For example the existing relationships with this particular external consultant and the relationships we already have with the suppliers of our existing software. We maintain a good relationship. (CAF3)

The case study CAF1 was pleased with the services of their software supplier and seemed to obtain required assistance.

> We are using CA systems [software provider]. It's pretty common, very popular package; not a bad package either; we found it very good. They have got online service or phone up service if there are any problems, it's very good. (CAF1)

The effective co-ordination of users and vendors is a core IS capability (Feeny & Willcocks, 1998). Maintaining a close relationship with the company's software providers is useful to manage IT systems efficiently (Philip & Booth, 1999). Having a good working relationship with external expertise is quite important for managing the IT systems considering that hiring high calibre internal IT specialists may not be a feasible option for small firms.

Hence the following statement was developed.

- **We have very effective working relationships with our IT vendors and /or external consultants.**

The stronger and more effective the relationships with external expertise is, the higher the IT management sophistication.

5.3.10 Sharing Information

Case studies revealed that small CA firms have a practice of gathering and sharing information related to IT within the industry. This may be affected through formal and informal meetings, workshops, annual conferences and involvement in user groups. User groups have been used as a successful vehicle for sharing better IT management practices among firms, for example; in identifying problems, conveying joint messages to vendors in a more forceful manner and for protecting the firms within the group against undue competition from other external forces.

> ..for example, in the last user group they were talking about converting (CA systems software from DOS environment) across on to windows. We spoke about the need for having to get the hardware right. That has been a major problem in the firms that have converted across. (CAF 1).

> ...we encourage user groups. ... (When) something is going wrong, they'll get together to discuss what's wrong with this supplier and what's wrong with this product and I encourage that. But when every thing is going ok then they fail to meet, and actually they should meet because sharing of information, about how to get the best out of the product and use the product well and the discussions about where the IT industry is heading and what they should do is invaluable. (CON3)

Obtaining information about others in the industry has been identified as an important factor, and has been incorporated in the instrument developed by Guptha et al. (1997)

The relevant statements were: *(a) We are adequately informed of the current use of IT by competitive forces (eg. buyers, suppliers and competitors) in the industry and (b) We are adequately informed of the potential use of IT by competitive forces (eg. buyers, suppliers and competitors) in the industry.*

It is noted that these statements emphasise the use of information for strategic management purposes. Involvement in user groups and IT forums have been identified as one of the competencies in IS management (Philip & Booth, 1999). However, the case studies did not provide evidence to show that gathering information from the others in the industry is used for gaining a competitive advantage. It is more for the benefit of all players in the industry, rather than competing against each other.

Sharing information with respect to IT systems has been seen as a good management practice. Hence, encouraging the staff to gather IT related information from others in the industry may be a characteristic of greater IT management sophistication.

- **Our firm encourages gathering IT information from others in the industry (eg. participating in IT forums, being involved in user groups)**

5.3.11 Staff Contribution towards IT

The common practice in large firms is to have a separate IT department with specialist IT staff. This is evident from the following statements:

> Our **IT specialist** understand our business and our firm (Guptha et al., 1997, p 410)
>
> Companies must build and sustain three key IT assets: a string of **IT staff**, a reusable technology base, and a partnership between IT and business management" (Feeny & Willcocks , 1998, p 9)

Case studies revealed that in most small firms the IT function was not managed under a separate department devoted to IT. Furthermore, specialised staff with IT skills and advanced training were not always available in small firms.

This feature was evident from the following:

> We have had (trained IT staff) once. Like in any accounting firms there is always staff turnover. In the past we had two very good people that were very knowledgeable about computers. I got it (i.e. management function of IT in the firm) by default when (they) left (CAF1).

In small firms, the staff members involved in disciplines other than IT share the activities of the IT function. Some of them may be more involved in managing IT systems than others. Though there may not be internal IT/IS specialists, there could be other professionals such as accountants with sufficient IT skills and knowledge to handle information systems.

For example: (a) in the case study CAF3;

> ...there is one senior accountant here who deals with IT. (CAF3)

(b) in the case study CAF4;

> I do not think there is any one who is specifically nominated as being person in-charge of (IT).There are couple of perhaps. Senior business manager would be probably recognised as the person who is the most knowledgeable about IT, and I probably be a close second (CAF4).

Since attracting qualified and experienced staff to manage a separate IT section may not be feasible in small firms, involving as many staff members as possible and devoting more time to IT functions may result in better IT management (see below).

> I think having one (i.e. IT specialist) inside is more an advantage, but you pay a premium obviously to have someone with that type of knowledge on board, and you can't afford firms not big enough to have one person to look after computers. Now, if we were one of the six big firms and have branches and things like that, perhaps you could possibly warrant. But not as far as we (i.e. our CA firm) are concerned. (CAF1)

The inability to attract IT specialists into internal staff cadres may be compensated to some extent by training available staff and obtaining the assistance of external experts. However, Raymond & Pare. (1992) considered that the presence of in-house specialised

IT personnel was a sign of IT management sophistication. Further, Pollard and Hayne (1998) identified IS human resource as a key issue in small firm IT management.

Hence, it is necessary to capture both aspects where (a) there are internal IT specialist staff who are mostly devoted to IT matters and (b) one or many of the non-IT professionals devote more time to IT matters. Therefore the following statement was introduced.

- **We have staff who spend most of their time managing our firm's IT resources.**

Greater IT management sophistication is characterised by having as many staff members devoted to the IT function, specialised in IT or otherwise.

5.3.12 Coping with Rapid Developments in IT

Coping with rapid technological change has been identified as a key management issue in small firm IT (Pollard & Hayne, 1998). The continual search for new technologies for use in business applications is a way of addressing this issue in small CA firms. The respondent of case study CAF3 talked about how a better managed firm (CAF4) went about this matter.

> They [CAF4] are using a PC based network, reasonably recent modern and highly specialised. They take advantage of modern technology. It's implied by the fact that every one is on e-mail; they encourage their clients to use computerised cash books; use programmes and facilities like bank link. [CAF3]

In large firms, the emphasis in the search for innovative opportunities is more to achieve competitive advantage (Guptha et al., 1997). In small firms the search for innovative opportunities may not be limited to gaining long term competitive advantage, but also to keep pace with the developments in industry to make improvements in day-to-day activities.

Continuous pro-active search for and, evaluation of, innovative opportunities of IT, may be a sign of high IT management sophistication whereas low sophistication may be characterised by stagnation with systems acquired in the early stages. The item statement formulated to address this issue was:

- **We are continuously searching for and evaluating new information technologies for their potential use in our firm.**

5.3.13 Staff Participation

Participation of staff with respect to matters related to IT has been identified as an important factor of IT management. References have been made to a IT planning committee (Raymond & Pare, 1992) and participation of users and line managers in decision making (Philip & Booth, 1999). Improving IS project management by way of improved communication skills inside IS and between IS and other functional areas (Pollard & Hayne, 1998) and end-user computing (Davis et al.,1995) are also related to this issue. Making decisions related to IT systems with the participation of relevant parties is an indication of greater IT management sophistication. A case study example is given below:

> We have two ways of managing our firm I suppose. We've lot of staff training- external and internal; we have a small IT committee, and we work with outside consultants. We have a blueprint, say for the coming year, which we try and work towards. So we don't get diverted. (CAF4)

Hence the following item statement was developed.

- **In our firm, staff participate in making major IT decisions.**

5.3.14 Selection of IT Vendors and External Consultants

Recruiting and developing IS human resources has been identified as a key IT issue in small firms (Pollard & Hayne, 1998). Although this reference is in respect of internal staff recruitment, the issue is equally valid for the selection of external consultants. Gable (1996) identified 15 criteria[21] for the selection of good consultants. In the small firm context, the selection of external consultants and vendors (external IT support) based on certain pre-defined criteria can be treated as a sign of higher IT management sophistication. These criteria may include features such as proven success of providing consultancy, advanced IT expertise and familiarity with the business. Following case study findings provided relevant insights:

> Probably is [consultant was identified on the basis of] a personal contacts. He looked after [a known small firm] prior to joining us. Mr X [consultant] was responsible for that practice. He is a client of our firm. But that's not the only reason he is being used. He's always been there; he has always done it; his reputation is known; his business is going fairly large; possibly he is not available as much as he used to be. It's a one man band. That's a little bit of a down side. (CAF1)

> Apart from having the technical knowledge they (external consultants) got to be realistic, and have a sort of business knowledge as well. They can't be dreamers, and they've also going to be around for a while, you know because it's nothing worse than trying to pickup someone else's mess. So, I presume if you've looked in the yellow pages... in two or three years it would be a totally new brand... I mean the good people are being head-hunted quite viciously. (CAF4)

The statement proposed was:

- **We select our IT vendors and consultants based on their proven success, IT expertise, and familiarity with our business**

5.3.15 IT Planning

From the literature review planning was identified as key factor of IT management in both small and large firms (eg. Earl, 1998; Nolan, 1973; Boynton et al., 1994; Feeny &

[21] Selection criteria external consultants (Gable, 1996)

1. The consulting company's stability
2. Personal relationship with the consultant/client
3. The proposed price
4. Consultant's understanding of client needs
5. Apparent trustworthiness of consultant
6. Proposal presentation quality
7. The consulting company's prior experience
8. Prior experience of individual consultants proposed
9. The consultant's methodology and related tools
10. How controllable the consultant appear to be
11. How independent the consultant appears to be
12. Availability of consulting staff to do the work quickly
13. High profile clients as references
14. The consultant's proposed approach to the project
15. The consultant is a friend, relative or acquaintance

Willcocks, 1998; Pollard & Hayne,1998; Raymond & Pare, 1992; Hann & Webber, 1996; Lederer & Sethi, 1988; Lederer & Sethi, 1991). Several issues relating to IT planning emerged as potential areas for consideration on the basis of case study findings and past research. The broader areas identified were:

a. Rigour of the planning process
b. Comprehensiveness of IT plans
c. Review of IT plans
d. Priority placed on IT planning
e. Alignment of IT planning and business objectives

Case study evidence:

> Yes, we are in that process [of planning the conversion to MS windows base system] right now. We sat down with our consultant a week or so ago and we found out what we need to achieve before we can convert across . (CAF 1)
>
> How did I plan about it [i.e. changing the accounting software from Attaché to CA systems, and this is a major change]? I think that in the last six months to two years. I've been sort of looking at what's available, and came to the conclusion that CA systems was the way I had to go. So then I decided. (CAF2)
>
> It [IT plan] is [varying] from a casual conversation of one end of the stage, to I think perhaps to put down sequential steps, and at each step consequences of taking or not taking it. But it's only very rare in small companies. Its only right at the extreme. (CON1)
>
> Most of the [small] businesses that we are related to, don't have any plan and IT is implemented by somebody outside. A plan to me is written; has time frame; has enough variables in it. If a another staff member joins, the plan is easily attainable and its reliable. (CON2)
>
> Currently my main task is review; planning a new computer system for the firm. We review various options, software, hardware etc to develop a proposal for the new project. We have a three member review committee on IT matters. Now we are running a system called PAC business systems. This system is very old and doesn't suit today's requirements. So we are planning for a new system. (CAF3)
>
> We have a small IT committee, we have a blueprint. Say for the coming year which we try and work towards. So we don't get diverted...

> We start off saying what we intend to do for next year or two…
>
> And then we specify exactly what we need technically, what gear we need what training we need, and we set up a time table and try and work for that. (CAF4)

These different aspects of IT planning in small firms were examined separately and seven statements were proposed as indicators to represent operational aspects of each such element.

a. Rigour of Planning Process

A number of previous researchers have taken up rigour of planning as an important management issue. *Formalisation of the IT adoption process and the formalisation of development process* (Raymond & Pare, 1992), *having an adequate picture of the coverage of the quality of our systems* (Guptha et al., 1997), *effective architecture planning* (Feeny & Willcocks, 1998) *more structured planning* and *integrated planning rather than ad-hoc approaches* (Philip & Booth, 1999) are such examples. Accordingly, embracing a rigorous planning process may be a sign of high IT management sophistication whereas informal, ad-hoc approaches to planning, or not going through adequate planning measures, are indications of lower IT management sophistication.

The statement suggested was:

- **We use a rigorous IT planning process within our firm.**

b. Comprehensiveness of IT Plans

The case studies revealed that the IT plan in a small firm may range from a simple reflection of the owner/manager, to a detailed written plan identifying requirements, time frame, cost structure, personnel requirements and possible constraints. Having a well documented plan is a sign of more structured planning (Philip & Booth, 1999).

In a large firm context, the final form of a plan may invariably be a written document. Since the availability of written plans is a common feature in large firms, this may not be seen as an issue that needs special reference. However, in a small firm context, this may be a relevant IT management issue. Raymond and Pare (1992) have observed the presence of IS documentation as an indication of greater sophistication in small firm IT management. CON2 indicated that:

> A plan to me it's written; it's documented; it has time frame; it has enough variables in it that if a another staff member joins, the [IT] plan is easily attainable and it's reliable. (CON2)

The desirable outcome of rigorous planning would be a comprehensive plan with reasonable details. Creating a coherent blueprint for a technical platform that responds to current and future business needs is a core IS capability (Feeny & Willcocks, 1998). Philip and Booth (1999) also emphasise the need for more structured planning. Development of more detailed plans compared to hazy, unclear and imprecise plans may be an indication of higher IT management sophistication.

Two characteristics of the final form of the plan have been highlighted here. That is they should be written and they should be comprehensive. Considering these characteristics, two statements were proposed:

- **Our firm prefers to have written IT plans.**
- **Our firm prefers to have comprehensive IT plans.**

[Note: These two statements were amended later, and the word "prefers" was eliminated. See table 5.3.]

c. Review of IT Plans

This refers to the frequency of review of IT plans to accommodate the changing needs of the firm, and the preparedness to make such changes as necessary. Business needs of small firms may change frequently due to the fact that they are more susceptible to environmental factors (Bergeron & Raymond, 1992). The rapid developments in the IT sector also contribute to this aspect.

Sophisticated IT management in small firms should therefore be able to identify and accommodate changing needs and be prepared to make necessary changes to adapt to new situations. Guptha et al. (1997) also value the importance of continuous search for innovative opportunities that IT can provide. If such opportunities are to be seized, plans need to be reviewed frequently. This aspect of IT management is addressed in the following statement.

- **Our IT plans are frequently reviewed to accommodate the changing needs of the firm.**

d. Priority Placed on IT Planning

Recognition and the placing of due importance of IT planning may be a criterion for assessing IT management sophistication in small firms.

> Oh, yes definitely [we place a high priority on IT planning]; because [in the] long term whatever solution you decide on is going to be cheaper, the better plan it is. (CAF3)

These case study findings were supported by past research. (Raymond & Pare, 1992; Sabherwal & Kris, 1994; Guptha et al., 1997; Feeny & Willcocks, 1998; Philip & Booth, 1999; Pollard & Hayne, 1998). The greater importance placed on IT planning and the recognition that IT planning is an important aspect of management are indications of greater IT management sophistication. The statement proposed was:

- **Our firm recognises IT planning as an important part of the overall process of IT management**

e. Alignment of the IT Function with Business Objectives

Incorporating the organisational objectives in the formulation of IT plans is an important issue of IT management in small firms (Raymond & Pare, 1992). The literature refers to a number of ways in which the IT function and business function could be aligned. The examples are: (a) the extent to which information systems planning takes into account an institution's future plans (Sabherwal et al., 1994), (b) support of IT towards achieving business objectives and strategies of the company (Guptha et al., 1997), (c) aligning IS organising enterprise – e.g. how far the IS is viewed as an integral part of their business strategy (Pollard & Hayne, 1998), (d) contribution of IT towards overall business perception (Feeny & Willcocks, 1998) and (e) closer alignment between business and IT goals (Philip & Booth, 1999).

This suggests that the stronger the alignment of IT planning with business objectives, the greater the sophistication of IT management. Therefore, the following item statement was proposed.

- **Our IT is closely aligned with the overall objectives of the firm.**

5.3.16 Leadership

The case studies suggested that the leadership qualities of managers have a strong impact on the effectiveness and efficiency of the IT systems of the firm. Reference was made to broader issues of leadership and the leadership qualities of managers with respect to IT matters. Relevant extracts of case study CAF4 were:

> We've been trying to cull the people [dealing with IT] that did not have the right attitude and just told a couple to go….
>
> We were quite lucky. When we changed our direction in a major way about two or three years ago that gave us the chance to clean all our [IT] systems. For instance we were two practices that were merged in 1985 or so. We had two cultures; we had two different ways of doing things which gradually diminished over the years as people left.
>
> But when we looked at putting our new system in we initially looked at converting our stuff. We said no. We won't do that (and) we'll start again. Which was pretty expensive; but it means that everyone's portable.
>
> In the last two or three years the whole awareness and the whole IT knowledge of every body have gone up dramatically [due to comprehensive training programmes]
>
> They (partners) have just said go with it (new IT proposals). So they've been very supportive.
>
> If some one does not push people in the [IT] team, they would just reach the comfort zone and stay at that level I think
>
> Sometimes that had to be bought back on track, say look, I don't care whose fault it is; I want it [i.e. the problems related to IT applications] fixed. (CAF4)

Effective leading, directing IT/IS activity, co-ordination and direction of IS personnel and liaison with top management; consultants and vendors are desirable qualities of good IT management. Getting the business constructively involved in IS/IT issues, commitment, support and encouragement from top management and involvement in IT related planning process (Feeny & Willcocks, 1998) are also related aspects of top management involvement.

Encouraging and promoting positive attitudes and ensuring staff satisfaction that will lead to the productive use of resources are characteristics of strong leadership. Case studies revealed that a firm which displayed a strong IT management focus has even gone to the extent of eliminating people whose attitude toward IT was not supportive.

The characteristics of the leadership function involve stimulating and guiding individuals (peers, supervisors, subordinates etc.) to achieve the organisational goals and objectives. It involves motivating individuals and departments, communicating the vision throughout the organisation and energises the employees into action. Leading involves building commitments and encouraging work efforts that support goal attainment (Daft, 1988, Schermerhorn, 1989, Bedian, 1989)

Certain other aspects of leadership have also been addressed in IS and management literature, such as envisioning the business process that technology makes possible, the ability to build and communicate a holistic view of the organisation and activity, readiness and the degree of including IS as an equal partner in every significant business development and securing commitment at all staff levels. (Feeny & Willcocks, 1998; Philip & Booth, 1999; Pollard & Hayne, 1998).

Hence the following statements were proposed:

- **IT management in our firm is characterised by strong leadership qualities**
- **Our managers have created a vision among the staff for achieving IT objectives**
- **Our managers have inspired commitment towards achieving IT objectives**
- **Our managers have directed efforts of staff towards achieving IT objectives**

5.3.17 IT for Competitive Advantage

The case studies did not provide strong evidence to show that small CA firms were using IT for competitive advantage. However, one respondent specifically indicated that IT was a competitive necessity.

> I do not consider that IT would give us competitive advantage. No, but if we do not go for it we will be at a competitive disadvantage. (CAF3)

The literature suggested that the increased use of IT for competitive advantage is a sign of greater IT management sophistication. According to Guptha et al. (1997), planning (and implementation of) IT projects to gain competitive advantage is a measure of IT management sophistication in large firms. In the small firms, the efforts towards gaining competitive advantage are focused not on predicting and controlling the operating environment but on adapting as quickly as possible to the changing demands (Jennings & Beaver, 1998). IT for competitive advantage has been identified as a key management issue in small firms (Pollard & Hayne, 1998). Floyd & Wooldridge (1990) have shown that IT is essential even where it provides no competitive advantage. Fuller (1996) asserted that IT has the potential to provide smaller firms with a competitive advantage.

Hence the following item statement was suggested. This would also provide an opportunity to verify the applicability of this issue (which has been mostly identified with large firms) in the small business context.

- **In our firm, IT is increasingly used for competitive advantage**

[Note: This statement was amended later, and the word "increasingly" was eliminated. See table 5.3.]

5.3.18 Systems and Software Acquisition

Improving the effectiveness of software development has been identified as a key issue in IT management in small firms (Pollard & Hayne, 1998). However, this aspect of software development was not brought up in the current case studies. It may be due to the fact that the case study CA firms in general did not develop their own software. The relevant management issues in the context of CA firms may be the selection and acquisition of appropriate software packages. The process of acquisition of new hardware and IT systems also result in a management issue in small firms. According to the case study of CAF1:

> We are using CA systems [software]. It's pretty common, very popular package, not a bad package either. We found it's very good. They have got online service, or phone up service if there is any problems, it's very good. Generally speaking, they provide manuals too. But they are not overly detailed, because software is changing, quite often they have been doing enhancements; quite a few enhancements obviously; also legislation changes. So, we have got to watch that we keep up to date with respect to the new software and adds on later. (CAF1)

The formality of IT adoption process has been identified as an indication of IT management sophistication in small business by Raymond & Pare (1992). In the case of small CA firms, acquisition and development of new IT systems is closely linked to IT adoption.

Therefore the following item statements were introduced to cover these aspects of acquisition and development of IT systems and in particular software for the firm's requirements.

- **We select the most suitable package based on proven success, when it comes to software acquisition.**

- **We have formal procedures for the acquisition and development of new IT systems.**

5.4 Review of Draft Statements

The 30 statements outlined above formed a draft pool of item statements for further examination at the next stage of analysis. This section reviews the draft statements with the aim of :

(a) ascertaining the relevance of the issues representing the derived statements;
(b) determining the potential factors (or sub-dimensions) of IT management sophistication represented by the derived statements.

This exercise was supplemented with an expert opinion review, in which the 30 statements derived from the case study findings were presented to nine individuals comprised of University staff in IS/IT and management disciplines and peer researchers. These experts were drawn from a broad range of related disciplines. Two senior professors (management and IS), two other academics/researchers (IS and management), two doctoral students (management and commerce) and a technical officer in the IT area were included in this panel. A similar approach was adopted by Chan (1992) to:

a. Assess content validity,
b. Determine the possible sub-dimensions of the IT management sophistication construct, and
c. Improve the presentation clarity of item statements,

with respect to the item statements derived with a view to characterising measures of IT strategy.

In this review process, each person involved was provided with a set of 30 cards in which one item statement each was printed. They were asked to sort the cards into a number of piles representing the potential dimensions of IT management. Going on the basis of sub-functions of management identified at the problem definition stage (see page 51), *planning, organising, controlling* and *leading* were suggested as a potential classification. However, the experts involved were encouraged to present their own views about the factors that may represent IT management sophistication. This sorting exercise was followed by discussions with the researcher to ascertain the views of the participants of the review process regarding content validity of the proposed items for investigation, and also to get a preliminary idea about potential indicators of IT management sophistication in small business. The outcome of this review was used as guidance for the next stage of statistical data analysis based on the survey data.

The results of the item sorting exercise are presented in Table 5.2.

Item No.	Item Statements Derived from Case Studies	Results of the Item Sorting Exercise								
		Individual Classifications								
		M1	M2	M3	M4	M5	M6	M7	M8	M9
1	Our firm recognises IT planning as an important part of the overall process of IT management.	P	P	P	P	D	P	P	P	P
2	Our firm prefers to have comprehensive IT plans.	P	P	P	L	O	O	U	P	P
3	Our firm prefers to have written IT plans.	P	P	P	O	O	O	U	P	P
4	We use a rigorous IT planning process within our firm.	P	P	P	O	C	P	P	P	P
5	Our IT is closely aligned with the overall objectives of the firm.	O	P	C	L	P	P	U	U	P
6	Our IT plans are frequently reviewed to accommodate the changing needs of the firm.	P	P	P	C	P	P	P	U	P
7	We are continuously searching for and evaluating new information technologies for their potential use in our firm.	P	P	O	L	L	P	C	P	P
8	Our firm IT is increasingly used for competitive advantage.	P	P	P	S	L	P	U	U	P
9	We have very effective working relationships with our IT vendors and /or external consultants.	O	O	O	D	U	U	C	U	U
10	Our firm encouragers to gather IT information from others in the industry (eg. to participate in IT forums, to be involved in user groups).	O	O	O	P	U	U	C	L	U
11	In our firm, staff participate in making major IT decisions.	L	O	O	C	O	O	U	O	O
12	Our firm has a flexible approach to organising IT operations and maintenance.	O	O	C	C	O	O	U	O	O
13	IT management in our firm is characterised by strong leadership qualities.	L	L	L	L	L	C	L	L	L
14	We closely monitor the progress of our IT projects.	C	C	C	C	C	C	C	C	C
15	We closely monitor the performance of IT function.	C	C	C	C	C	C	C	C	C

Key:
P= Planning O= Organising C= Controlling L= Leading D= Decision making U = Undecided

Table 5.2 (Part A) Item Statements Derived from Case Studies and Results of the Item Sorting Exercise

Item No.	Item Statements Derived from Case Studies	Results of the Item Sorting Exercise								
		Individual Classifications								
		M1	M2	M3	M4	M5	M6	M7	M8	M9
16	Our manages have created a vision among the staff for achieving IT objectives.	L	L	L	P	L	L	L	L	L
17	We have comprehensive procedures for managing the use of IT resources.	C	C	C	P	C	C	C	C	C
18	We have comprehensive procedures for maintaining the security of information stored on the computer.	C	C	C	C	C	C	C	C	C
19	In our organisation, the responsibility and authority for IT direction and development are clear.	C	C	C	O	C	C	U	O	C
20	We have staff who spend most of their time managing our firm's IT resources.	O	O	L	O	O	U	C	O	O
21	Our manages have inspired commitment towards achieving IT objectives.	L	L	L	L	L	L	L	L	L
22	Our manages have directed efforts of staff towards achieving IT objectives.	P	L	C	L	L	C	U	L	L
23	Our firm places a high priority on providing staff with appropriate IT training.	L	L	L	O	L	C	L	L	L
24	In our firm top management involvement in IT issues is high.	L	L	L	D	U	U	L	L	L
25	We select our IT vendors and consultants based on their proven success, IT expertise, and familiarity with our business.	C	O	O	D	P	O	O	U	O
26	Our firm relies more on external IT expertise (eg. IT vendors and consultants) rather than on employing specialised in-house IT staff.	U	U	C	O	U	U	U	U	U
27	In our organisation, the responsibility and authority for IT operations are clear.	C	C	C	P	C	C	U	C	C
28	We have formal procedures for the acquisition and development of new IT systems.	C	C	C	P	O	O	U	C	O
29	Our top management perceives as IT is critical to our business success.	L	L	O	P	U	1	L	L	P
30	We select the most suitable package based on proven success, when it comes to software acquisition.	O	O	P	C	P	P	U	U	U

Key:

P= Planning O= Organising C= Controlling L= Leading D= Decision making U = Undecided

Table 5.2 (Part B) Item Statements Derived from Case Studies and Results of the Item Sorting Exercise

In the review exercise all participants agreed that these statements, in general, would reflect the important issues of IT management in small firms. They also agreed that examination of these issues would provide a sufficient understanding of IT management in small firms, which in turn could be used to measure the level of IT management sophistication.

Participants generally agreed that the concepts underlining the statements presented can be categorised into the four broader factors of planning, controlling, organising and leading, and most statements were identified with the four factors accordingly. However, the participants were not unanimous in their decision with respect to certain statements. For example, the member M5 suggested introducing an additional category for decision making. It was also seen that certain statements, that represented the indicators of IT management sophistication, were identified under two or more key factors by different participants of the review. For example, item 4 was identified under planning by 7 participants; whereas two others placed this item under controlling and organising. There were five statements where most of the participants could not clearly identify with any of the four major factors planning, controlling, organising and leading.

In order to resolve such issues the statements that were not clearly identified with the four factors (eg. Items 9, 10, 26, 28 and 30) were reviewed in the light of the definitions of planning, organising, controlling and leading (Schermerhorn, 1989). Considering that decision making is closely associated planning and also that other members appear to be satisfied with a single category for planning, decision making was not introduced as a new category.

The decision to have formal procedures and writing them down may be regarded as planning to a greater degree. But, implementing these procedures is controlling. Item 28 referred to "having formal procedures for acquisition and development of new IT systems". Having formal procedures amounts to *taking corrective action*, which was considered as a controlling feature (e.g. Item 18 - Having comprehensive *procedures* in place for security of information which was clearly grouped under controlling by all participants. Hence, it was decided that item 28 was best categorised under "controlling".

Organising deals with allocating and arranging human and *material* resources. *Selection* of software packages (item 30) deals with this aspect of management. Therefore, item 30 was categorised under "organising" . This view was also supported by the fact that the statement referring to *selection* of IT vendors and consultants according to formal criteria (item 25) has been categorised under "organising" by a majority of participants.

The remaining three items (item numbers 9,10 and 26) did not appear to fit with the descriptions of the four factors identified above. All three items referred to obtaining support from external expertise and gathering information with respect to IT adoption and implementation. The item numbers 9 and 26 are associated with IT vendors and external IT consultants. Presence of consultants (Raymond& Pare, 1992) and external expertise (Thong et al., 1997) have been identified in small business IS literature as a significant indicators. Cragg and King (1993) identified the consultant's support as a factor that encourage IT growth. Referring back to case studies, it could be seen that the CA firms gather external information from other means such as involving in software user groups, mostly for purposes related to managing IT, and not for other operational activities of CA firms. SMEs (small and medium enterprises) value information about IT provided by external sources (e.g. vendors and consultants) for successful IT adoption (Fink 1998). Fann and Smeltzer (1989) have shown that suppliers/vendors and competitors are important sources of information for operational decision making in small firms. Therefore, a fifth factor, namely *external expertise,* was proposed for characterising IT management sophistication in small business.

Another major aspect of this exercise was to make suitable adjustments to the statements derived initially, to improve the readability and quality of presentation, without deviating from the original concepts upon which the operational statement was formulated. In this respect, certain minor adjustments to the statements were made on the basis of discussions with the experts. It may be noted that the participants of the review process were provided with the original quotations in case study transcripts when required.

These improved statements classified under potential sub-dimensions are given in Table 5.3. The item numbers of the original statements are also indicated for the purposes of comparing them with the improved version of respective statements.

Factor	Item Statements
Planning	1. Our firm recognises IT planning as an important part of the overall business planning process. 4. We use a rigorous IT planning process within our firm. 3. Mostly, our IT plans are written. 2. Our IT plans are very detailed. 5. Our IT system is designed to be closely aligned with the overall objectives of the firm. 6. Our IT plans are frequently reviewed to accommodate the changing needs of the firm. 7. Our firm is continuously searching for and evaluating new IT developments for their potential use in the firm. 8. In our firm IT is used to improve the firm's competitive position.
Organising	20. We have one or more staff members who spend most of their time managing our firm's IT resources. 25. We select our IT vendors and external consultants according to formal criteria *(e.g. based on a combination of their proven success, IT expertise, familiarity with our own line of business)*. 11. In our firm, staff participate in making major IT decisions. 12. Our firm has a flexible approach to organising IT operations and maintenance. 30. We select the most suitable package based on proven success, when it comes to software acquisition.
Controlling	15. We closely monitor the performance of our IT systems. 14. We closely monitor the progress of our IT projects. 18. We have comprehensive procedures in place for maintaining the security of information stored in our computers. 17. We have comprehensive procedures in place for controlling the use of IT resources *(e.g. who can use specific software, who has access to specific databases)*. 19. In our firm the roles and responsibilities for IT direction and development are clearly defined. 27. In our firm the roles and responsibilities for IT operations are clearly defined. 28. We have formal procedures for the acquisition and development of new IT systems.
Leading	13. IT management in our firm is characterised by strong leadership. 24. Our top management plays an active role in addressing the firm's IT issues. 29. Our top management perceives IT as critical to our business success. 16. Our managers have created a vision among the staff for achieving IT objectives. 21. Our managers have inspired staff commitment towards achieving IT objectives. 22. Our managers have directed the efforts of staff towards achieving IT objectives. 23. Our firm is committed to providing staff with appropriate IT training.
External Expertise	9. We have very effective working relationships with our IT vendors and/or external consultants. 10. We gather IT information from others in the industry. 26. Our firm relies heavily on external IT expertise.

Table 5.3. Factors/Indicators of IT Management Sophistication :Results of the Qualitative Analysis

Looking at the outcome of the case study research, the review process, and the past research findings, it was seen that the indicators related to planning, controlling and organising were commonly used to characterise IT management sophistication.

"Leading" emerged as a relevant factor of IT management sophistication according to the current study. Past research and the case study evidence also supported the inclusion of the indicators associated with a major factor related to *external expertise* for characterising IT management sophistication in small businesses.

5.5 Chapter Summary

This chapter presented the details of qualitative methods employed in this research and their results. The four case studies of CA firms supported by the detailed discussions with two IT consultants and a leading software supplier provided in-depth field level insights relating to the issues relevant to IT management in small firms. These issues were analysed and combined with the literature review findings to arrive at a pool of 30 item statements reflecting IT management sophistication in small firms. The item statements were then presented to a team of experts in order to get their opinion on the content validity and the dimensionality of the IT management sophistication construct. A consensus was reached about the potential dimensions of IT management sophistication in small firms and the item statements were grouped under the dimensions of planning, *organising, leading, controlling* and *external expertise* in relation to IT systems in the organisation.

Chapter 6

Survey Design and Data Preparation

6.1 Chapter Overview

As seen in Chapter 4, Research Approach, a large scale survey was planned to statistically validate the findings of the qualitative phase (comprised of case studies) of this research. This quantitative phase was primarily aimed at determining the main factors that characterise the IT management sophistication in small business construct, and their measures, and assessing the validity and reliability of the proposed instrument aimed at measuring this construct. This survey was also used to develop and statistically test a model concerning the interrelationships among the key constructs investigated[22] .

Details of the design and administration of the survey and data preparation are presented in this Chapter.

Chapter Contents

6.2 Survey Design

The survey design and administration were guided by past research and the procedures suggested by Dillman (1978), Dillman (2000) and, Cooper and Schindler (1998). This section presents particulars of the study population and the nature of the survey,

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[22] Four constructs: IT management sophistication, technological sophistication, informational sophistication, and IT impact

including promotional strategies adopted for obtaining a desirable response rate. The features relevant to the measures of respective variables, questionnaire pre-test, survey administration and data preparation are given in sections 6.3, 6.4, 6.5 and 6.6 respectively.

6.2.1 Study Population

As in the case study research, Chartered Accountancy firms in New Zealand were selected as the study population going by the same rationale. As detailed in section 5.2.2. the reasons for selecting the small CA firms were: intensive use of IT, similarity of technologies used across the CA firms, the fact that the small CA firms being a widespread industry in New Zealand, and relative ease of access (see pages 81-82). Since the scope of investigation covered IT management of the entire firm and not a particular section or a group of individuals within the business, the individual firm was identified as the unit of analysis.

Going by the practice of previous small business –I T researchers in New Zealand (Cragg, 1986; Cragg & King, 1988; Cragg & King, 1993; Zinatelli, 1994; Igbaria et al., 1997; Igbaria et al., 1998). CA firms comprised of a total staff of up to 50 were conceded to be *small* firms and were therefore targeted for study. Also, only individual firms functioning as independent entities were taken up for survey data analysis. The IT management practices of branches or subsidiaries of large firms may be influenced by the parent organisations, and hence were not expected to reflect small firm characteristics.

It was noted that almost all CA firms in New Zealand, except the branch operations/franchises of the *Big-Five*[23] accounting firms, fall into the *small* business category. The total number of CA firms in New Zealand was estimated to be around 1,500 (Sources: Institute of Chartered Accountants New Zealand, New Zealand

[23] Big five accounting firms were: Arthur Andersen, Deloitte & Touche, Ernst & Young , KPMG and PriceWaterhouseCoopers (http://www.cpateam.com/accounting-big6firms.htm). Later the number of major international accounting firms become four with mergers and other developments in the international business scene.

Telecom Yellow Pages Directory, New Zealand Business Directory). These firms were dispersed to all regions of the country, the major districts enjoying a higher concentration. Market demands may have caused the Auckland region to attract the highest number of CA firms, with Wellington and Christchurch standing at second and third positions respectively.

6.2.2 Nature of the Survey

Securing a reasonable number of responses for a comprehensive statistical analysis was important for generalising the findings of the survey. Therefore, it was decided to enumerate all CA firms in New Zealand, comprised of a population of about 1,500, in this survey, contrary to the common practice of surveying a smaller sub-sample of the entire population. Furthermore, a population of 1,500 was within the manageable limit in a study of this nature. Considering the scale of operation, geographical coverage, cost, time, and the higher level of literacy of the respondents, a mail survey approach was selected.

Dillman (1978) observed that obtaining an accurate and up-to-date mailing list of a study population was a common problem in mail survey administration. This was found to be equally true of CA firms in New Zealand. There were; three main sources which could be consulted for a mailing list. They were the Institute of Chartered Accountants of New Zealand (ICANZ), the Telecom New Zealand Yellow Pages Telephone Directory, and the New Zealand Business Directory. However, ICANZ being a professional organisation was reluctant to provide free access to membership information. Therefore, a comprehensive mailing list was compiled using the Telecom New Zealand Yellow Pages Telephone Directory-2000. The resultant listing was verified record-by-record and updated where necessary with the information in NZ Business Directory (2000). Thereby, a comprehensive mailing list comprising 1,516 CA firms was created.

The response rates of small firms were reported to be generally poor. Therefore, a number of strategies were adopted to encourage wider participation. The sponsorship of the University of Canterbury was highlighted in the survey questionnaire booklet. The comprehensive pre-test of the questionnaire was helpful in improving the presentation format. The questionnaire now had a look in-keeping with the thinking of prospective respondents. Pre-paid self-addressed envelopes were provided to mail back completed questionnaires. Anonymity of information that was to be provided was highlighted in the covering letter and all other documentation (see Appendix 3 and 4 for a copy of the covering letter and a questionnaire booklet respectively).

The survey was conducted in the months of September and October, considering that the day-to-day work load is generally lower during this period compared to other months of the year. As an incentive, a copy of a summary report of research findings was to be made available free of charge to responding firms. A pre-printed post card (see Appendix 5) was mailed to all recipients as a reminder, one week after the date of dispatch of questionnaires. A short introductory note about this research was published in the October 2000 issue of monthly journal of ICANZ (see Appendix 6). The survey was timed that this particular issue of the journal reached the CA practitioners two weeks after receiving the survey documentation.

6.3 Survey Instrument

The questionnaire booklet of the survey contained four parts with 48 questions in all:

Part One: IT Management

This section was meant to measure the IT management sophistication in small firms construct. This latent variable was labelled as *MangSo* in the PLS analysis.

Part Two: IT Use

This section was meant to examine the sophistication of IT use along the lines of Raymond & Pare's (1992) investigation. This was measured by Raymond & Pare (1992) under the two constructs; technological sophistication and informational sophistication.

Part Three: IT Impact

This section of the questionnaire was designed to assess IT impact as a measure of IT effectiveness.

Part Four : General Information

General information about the organisation for the purposes of statistical verification was included in this section.

Particulars of the instruments related to the above sections and their development process are detailed next.

6.3.1 Part One: IT Management

As stated in Chapter 3 (Research Problem) one of the key objectives of this study was to develop and validate an instrument to measure IT management sophistication in small firms. The qualitative methods detailed in Chapter 5 (Characterisation of the IT Management Sophistication Construct: Qualitative Phase) were aimed at addressing the preliminary step of characterising the construct that was to be measured. Thereby the potential factors (and the related operational variables in the form of item statements) deemed to characterise IT management sophistication in small business were derived. The next major step was to formulate the operational measures on the basis of item statements so derived, to create the IT management sophistication instrument that could be used in the survey.

Accordingly, the 30 statements derived as detailed in Chapter 5 were used to develop the measures of the IT management sophistication construct. Each statement was incorporated in the form of seven-point Likert scale questions. (The first three questions derived from the respective item statements are given in Box 6.1 as examples). With respect to the first 30 statements measuring IT management sophistication, the scale ranged from (1) – *Strongly Disagree* through (4) – *Neutral* to (7) – *Strongly Agree.*

PART ONE: IT MANAGEMENT

This section will be used to assess the current status of information technology (IT) management in your firm. For each statement, please **circle** the number that corresponds most closely to your desired response.

	Strongly Disagree			Neither Agree nor Disagree			Strongly Agree
	∨			∨			∨
1. Our firm recognises IT planning as an important part of the overall business planning process.....	1	2	3	4	5	6	7
2. Our IT plans are very detailed....................	1	2	3	4	5	6	7
3. Mostly, our IT plans are written..................	1	2	3	4	5	6	7

Box 6.1 IT management section of the questionnaire

It may be noted that the wording of certain item statements resulting from the qualitative analyses were marginally modified incorporating suggestions from the CA practitioners and IT professionals who were involved in pre-testing/review of the draft questionnaire. The main purpose of such minor changes was to improve the readability and clarity of the instrument in general.

An additional question was introduced to obtain the respondent's opinion on the overall level of IT management in the firm. In this question (Question 31 of Part one), the respondents were asked to rate the overall level of IT management in their respective firms, on a scale ranging from "1 – *Very Low Level of IT Management*" to "7 – *Very High Level of IT Management*" (see Box 6.2). This question was introduced to secure an overall measure of IT management sophistication, which facilitated construction of PLS models and related data analysis. Respondents were also requested to give reasons behind their rating as such qualitative statements could be used to strengthen the derived arguments. The CA practitioners and IT professionals involved in the review were in agreement with these improvements to the questionnaire.

31. Overall level of IT Management: Considering the managerial functions (such as planning, organising, controlling and leadership) how do you rate the overall level of IT management in your firm?...........	Very Low Level of IT Management 1	2	3	4	5	6	Very High Level of IT Management 7

Please explain or list the reasons for your rating of the overall level of IT management in your firm.

....

....

....

....

Box 6. 2 Question on the Overall IT management

As for the sequencing of questions, the item statements in the survey questionnaire were not presented separately under the major factors identified in the qualitative investigation. However, the questions were sequenced to maintain a logical flow of items representing the respective management issues. This sequencing of items were finalised on the basis of discussions of the draft questionnaire with CA practitioners and IT professionals at the review/pre-testing stages. The questions were arranged in this manner to avoid bias towards emerging patterns due to sequencing of statements.

Content validity of these measures was established during the qualitative investigation as detailed in Chapter 5. The other aspects of validity and reliability were examined in the PLS data analysis, as detailed in forthcoming chapters.

6.3.2 Part Two: IT Use

IT use was conceptualised under two dimensions namely, technological sophistication and informational sophistication, following Raymond and Pare's (1992) characterisation. Further, the concepts behind the indicators of the Raymond and Pare (1992) instrument were used as the basis for developing the measures of these two variables. It may be noted that this particular instrument was initially developed to enumerate small Canadian manufacturing firms over a decade ago. The invigorating rate of development in all sectors of IT/IS in the recent past, and innovations with respect to

IT applications in service industries, particularly in accounting applications, prompted certain major revisions to the measures.

In this respect the Raymond and Pare's (1992) instrument was first examined to capture the underlying concepts of the respective measures. Then the questions were modified with the ideas gathered from the case studies. In this process a number of discussions were held with several CA practitioners, IT practitioners and IS academics. The measures were thus modified to bring them in line with rapid developments in technology and to capture the nature of technology use in small CA firms. However, a rigorous approach of instrument development similar to the IT management sophistication construct was not adopted in developing these measures.

This approach was taken due to a number of reasons. Firstly, the development and validation of measurement instruments of these constructs was not a primary objective of this research. The aim of taking an assessment of these two constructs – technological sophistication and informational sophistication was to construct a model relating these variables with the IT impact. Hence an indicative assessment of these variables was deemed adequate to achieve the desired objectives of this research. Secondly, these measures were not newly created items, but has been adapted from the instruments used previously by Raymond and Pare (1992). As far as the validity and reliability of these instruments were concerned, Raymond and Pare (1992) indicated that:

> While the reliability coefficients for the technological and informational dimensions are relatively low, they are nonetheless at an acceptable level for exploratory work. (Raymond & Pare, 1992, p 10)

However, Raymond & Pare's (1992) instruments provided a good starting point in developing a suitable instrument for this research. Certain major improvements were made to these instruments for use in this research and the context of investigation was different. Furthermore, these measures have been subjected to a process of reliability and validity assessment along with the PLS model development.

6.3.2.1 Technological Sophistication

The measures of technological sophistication in Raymond's (1992) instrument had six scales to reflect the number or diversity of information technologies used, namely:.

1. Number of IT applications
2. Number of micros/workstations
3. Hardware decentralisation
4. Number of development tools used
5. Human machine interface quality
6. Percentage on line applications

The concepts such as the extent of information technology used and the extent of personal computers/workstations available were equally valid in the present context of small firms. Therefore questions were included to ascertain the number of technologies and the number of microcomputers used. This would provide an indication of the breath of technology use in small CA firms. However, the use of personal computers with networking and on-line applications being a common feature in the current context, the measures relating to hardware decentralisation and percentage of on-line applications were found to be not applicable. Also, the number of development tools used was not a proper indication of the technological sophistication of CA firm IT, because almost all small CA firms opt for readymade software packages rather than in-house systems development.

Customisation of standard software packages to suit specific needs of individual situations and data exchange between software applications were identified as a possible measure of technological sophistication. Therefore, questions were introduced to ascertain the extent of customisation of software packages in CA firms and the extent of electronically exchanging data between software packages. A question on the number of software applications (accounting and general purpose) was included to gather the level of software use.

In effect, emphasis was placed on the depth and breadth of the use of advanced technologies (hardware, software, networking and systems in general) to examine technical sophistication. The final form of this section of the questionnaire consisted of a combination of 6 multi-choice and 7-point Likert scale questions (see Box 6.3, Parts A and B).

PART TWO: IT USE

1. Which of the following technologies **are currently used** in your firm? *(Please tick (✓) **all** that apply.)*

- ☐ Internet/e-mail *(e.g., Web browsing, use of e-mail internally and externally)*
- ☐ Maintaining own Web page
- ☐ Direct downloading of bank data *(i.e. download clients' bank statements)*
- ☐ Local Area Network *(i.e. a communication system that interconnects computers and other peripherals **within** an organisation)*
- ☐ Remote access to the firm's computer system via Internet or dial up facility *(e.g., access from a staff member's residence)*
- ☐ Direct access to client's computer systems via Internet /dialup facility
- ☐ Use of programming languages/development tools for in-house systems development. *(e.g., Java, C++, Visual Basic, Jade)*
- ☐ Use of business development software *(e.g. forecasting packages, business evaluation software)* **other than** primary accounting packages and spreadsheets
- ☐ Other information technologies *(please specify)*

………………………………………………………………………………………………

………………………………………………………………………………………………

Box 6. 3 (Part A) Questions on Technological Sophistication

PART TWO: IT USE (Contd...)

2. Which of the following computer applications are **currently used** in your firm? *(Please tick (✓) **all** that apply.)*

- **Accounting applications**

  - ☐ Client database
  - ☐ General ledger/cashbook
  - ☐ Tax preparation and management
  - ☐ Electronic tax filing
  - ☐ Time and cost analysis
  - ☐ On-line time sheets
  - ☐ Productivity and workflow
  - ☐ *Other (please specify)*

  ....

- **Other applications**

  - ☐ Wordprocessing *(e.g., MS Word)*
  - ☐ Spreadsheets *(e.g., MS Excel)*
  - ☐ DBMS *(e.g., MS Access)*
  - ☐ *Other (Please specify)*

  ....

  ....

3. Please indicate the approximate **total number** of microcomputers or workstations **currently used** in your firm *(e.g., stand alone or networked PCs, dumb terminals of large computers)* :............

4. Which of the following accounting software packages are **currently used** in your firm? *(Please tick (✓) **all** that apply.)*

- ☐ APS
- ☐ MYOB Practice Systems (Formerly CA Systems)
- ☐ Solution 6
- ☐ Other *(please specify)*...

*(For Questions 5, 6 and 7, please **circle** the number that corresponds most closely to your desired response)*

	Not at all	To a very Little Extent						To a very great extent
	V	V						V
5. To what extent have you **customised** the standard software packages *(e.g. , primary accounting software, Ms excel)* to suit the specific needs of your firm?	0	1	2	3	4	5	6	7
6. To what extent do your computer systems **electronically export data from** primary accounting software *(eg, APS, Sol. 6, MYOB-CA systems)* **to**:								
a) **Spreadsheet** applications *(e.g., MS Excel)*?	0	1	2	3	4	5	6	7
b) **Any other** applications *(e.g., Databases such as MS Access)?*	0	1	2	3	4	5	6	7

Box 6. 3 (Part B) Questions on Technological Sophistication

6.3.2.2 Informational Sophistication

Raymond's (1992) instrument comprised of three measures in respect to informational sophistication:

1. Presence of local area networks
2. Percentage of administrative applications
3. Percentage of applications linked to a database

These measures were meant to capture the nature of the application portfolio and the degree of integration of the applications. Local area computer networks are quite common in the New Zealand accounting firms. Since most CA firms use integrated systems with specialised accounting software, the issue of applications linked to a database was also not applicable to these firms. In the context of small CA firms, the extent of use of computer systems to perform different tasks ranging from transactions to strategic applications (i.e. internal control, analysis, planning and forecasting) was examined to capture the scope of the application portfolio. According to practitioners, this was more applicable to CA firms than estimating the percentage of administrative applications. A question on data exchange between software packages grouped under technical sophistication also connected with the issue of integration, particularly with integration of applications between software packages. Since the integration of applications has been built into most accounting software, informational sophistication was examined mainly on the basis of diversity of the application portfolio (see Box 6.4).

PART TWO: IT USE (Contd...)

6. To what extent are your **computer systems used to perform** the following for your firm rather than for clients?

	Not at all ∨	To a very Little Extent ∨						To a very great extent ∨
(a) Controlling/Guiding *(e.g., job tracking, monitoring of workflow, monitoring of tax return filing progress)*	0	1	2	3	4	5	6	7
(b) Budgeting *(e.g., preparing annual budgets, project budgeting, resource allocation)*	0	1	2	3	4	5	6	7
(c) Analysing Problems *(e.g., reasons for write-offs, analysis of unproductive time)*	0	1	2	3	4	5	6	7
(d) Analysing Trends *(e.g., analysis of historical practice data such as clients gained vs. clients lost, market place trends)*	0	1	2	3	4	5	6	7
(e) Analysing Ratios *(e.g., analysing fee/wage ratio, fee/people ratio)*	0	1	2	3	4	5	6	7
(f) Planning/Forecasting *(e.g., budget variances, project planning and management)*	0	1	2	3	4	5	6	7

Box 6. 4 Questions on Informational Sophistication

6.3.3 Part Three: IT Impact

The instrument used by Thong et al. (1997) was adapted for IT impact measures. Their instrument contained eight questions (7-point Likert scale) to ascertain the impact of IT on certain specific aspects of firm performance, as a measure of IS success. The impact of IT on pre-tax profit, revenue, staff productivity, competitive advantage, and quality of decision making were the measures used. It also contained two overall measures, one for firm performance and the other for the effectiveness (see Box 6.5).

This was a well-tested instrument in recent small business IS research (Thong et al., 1996; Thong et al., 1997). It was reported that the reliability of the measures met the 0.80 level of Cronbach's alpha. These researchers were satisfied that the criteria for content validity and construct validity had been met. As far as the construct validity and construct validity is concerned, it may be pointed out that the draft questionnaire of this research passed through a rigorous process of instrument validation. The draft questionnaires were pre-tested with a number of CA firms and detailed discussions were held with the respondents thereafter. The respondents of the pre-testing and consultation process agreed that these IT impact measures were valid in the context of small CA firms. Therefore, only minor adjustments to the presentation format were effected in consultation with the CA practitioners.

PART THREE: IT EFFECTIVENESS

1. The impact of Information Technology for the last two years on:	Significant Negative Impact from IT ↓			No Impact from IT ↓			Significant Positive Impact from IT ↓
a) Increasing firm's pre-tax profit	1	2	3	4	5	6	7
b) Increasing firm's revenue	1	2	3	4	5	6	7
c) Improving staff productivity of the firm...	1	2	3	4	5	6	7
d) Strengthening competitive advantage of the firm....................................	1	2	3	4	5	6	7
e) Reducing firm's operating costs	1	2	3	4	5	6	7
f) Improving quality of decision making ...	1	2	3	4	5	6	7
g) Improving overall firm performance......	1	2	3	4	5	6	7

2. Overall effectiveness: Taking into consideration the cost, effort and resources spent, how do you rate the overall effectiveness of your IT system?	Very Ineffective IT System ↓						Very Effective IT System ↓
	1	2	3	4	5	6	7

Box 6.5 Questions on IT Impact

6.3.4 Part Four: General Information

The general information section was meant to collect certain basic data about the responding CA firms for statistical validation purposes. These questions were aimed at obtaining an understanding of the firm size, length of time of IT use, IT expenses and the status of the person in-charge of IT. A question was also introduced to check if the responding firm was a subsidiary of a larger practice. This information was used later to eliminate responses from large firms. These were direct, simple questions where the respondent was asked to choose from a set of suggested answers (see Box 6.6).

PART FOUR: GENERAL INFORMATION

(Please tick (☐) *one box only in questions* **1** *to* **5)**

1. Is your CA firm a **subsidiary** (or a branch office) of a larger practice?

☐ Yes ☐ No

2. How many **billing clients** are serviced by your firm?

☐ < 100	☐ 101-300	☐ 301- 500
☐ 501-1000	☐ 1001-1500	☐ > 1500

3. How long have computers been used in your firm on regular basis?

☐ < 1 year	☐ 1- 2 yrs	☐ 3 - 5 yrs
☐ 6-10 yrs	☐ 11 - 15 yrs	☐ > 15 yrs

4. What is your firm's annual **IT <u>maintenance</u> expenditure** (approximately)?

☐ < $ 25,000	☐ $ 25,000 –50,000
☐ $ 50,001- 100,000	☐ >$ 100,000

5. Where does the person who has the overall responsibility of your IT systems appear in your firm's management hierarchy?

☐ Top management *(e.g., partner/share holder/director/associate)*
☐ Middle management *(e.g., head of department/ section / unit)*
☐ Professional staff *(e.g., accountant)*
☐ Technical support staff *(e.g., computer technician)*
☐ Secretarial or clerical staff
☐ Other *(please specify)*..........................

6. Please indicate (approximately) the **total number** of full-time and part-time people/staff in your firm.
   - Full Time: .... • Part Time: ....

7. What is your job title *(optional)* ....

Box 6. 6 General Questions

6.4 Questionnaire Pre-test and Review

The survey questionnaire was developed placing together the series of questions derived for assessing the identified constructs and obtaining general information. Then the draft questionnaire was subjected to a pilot test and a review process. The draft questionnaire booklet and survey documentation including a pilot test evaluation form was posted to five CA firms (see Appendix 7 for the cover letter and the pilot test evaluation form). The questions in the pilot test evaluation form were directed to seek opinions on the time taken to complete the questionnaire, difficulties in providing answers, and the overall impression towards the layout, type of questions and complexity of the survey documentation.

Four CA firms returned the completed questionnaire and the pilot test evaluation form. The fifth firm did not respond due to the fact that the person in-charge of IT was not available. The draft questionnaire was also reviewed with an IT practitioner and the regional manager of a software supplier to CA firms. Discussions were also held with the respondents of CA firms to review the survey documentation to ascertain contact validity and the operational issues and implications related to survey administration.

Careful consideration was given to perfecting the presentation format and the wording of questions on the basis of suggestions made by the reviewers. Reviewers agreed that the questions did measure what was intended to be evaluated which provided evidence for content validity. They found no problems in administering the survey. The presentation formats of the cover page of the questionnaire booklet and the reminder postcard were modified along the lines suggested by the reviewers. No major modifications to the individual questions were made at this stage. Improvements were made to presentation and formatting only (see Appendix 5 and 6).

6.5 Survey Administration

The survey forms were dispatched on Monday 2 October, and the reminder postcards were posted on 9 October 2000. The ICANZ journal issued on 16 October contained a short introductory note on the research and a further reminder.

Out of the 1516 questionnaires initially mailed out, 421 completed questionnaires were received by 16 November 2000. Thirty six did not reach the intended recipient as either the addressee was unknown or the firm had relocated. It was noted that the bulk of completed responses were received during the first two weeks of the survey. Next, a database was created using the information collected from responses. Each question was assigned a variable name, the replies were coded and an Excel spreadsheet was created. (The variable names used in creating the spreadsheet are given in tables 7.2 on page

158, 8.2 on page 198, 8.3 and 8.4 on page 199). Having manually entered the data, a manual one-to-one check of the data items in the spreadsheet with the information contained in the original questionnaires was performed and corrections were made, where necessary to arrive at an error free data set.

6.5.1 Response Rate

The survey response rate was calculated on the basis of the number received and the effective number of contacts (Wiseman and Billington, 1984; Goodstadt et al., 1977). Accordingly, the overall response rate was computed as:

$$= \frac{421}{(1516-36)}$$

$$= 29\%.$$

Where 421 is the number of responses, 1516 is the number of survey questionnaires posted and 36 is the number of survey forms returned undelivered.

However, further examination revealed that there were 21 unusable responses and were eliminated from the data set (see Table 6.1 for a breakdown of unusable responses).

Reason for elimination	**No. of responses**
Most questions unanswered	9
Not handling accounting work	7
Practice closed	3
Duplicate responses	2
Total	**21**

Table: 6.1 Summary of Unusable Responses

Accordingly a data set of 400 responses were retained for further investigation (see Table 6.2 for summary of responses by date of receipt) and the effective response rate came down to 27% (= 400/1480). Although this survey response rate of 27% appeared to be some what low, 400 responses were found to be quite adequate for a rigorous statistical analysis. It may be noted that the response rates with respect to small firm research studies have been generally low (e.g. 173 responses amounting to 17.3% response rate in Raymond & Pare, 1992; 108 responses amounting to 8% response rate in Palvia, 1996).

Date	No. received	%	Cumulative %
05.10.2000	19	4.8	4.8
06.10.2000	43	10.8	15.5
09.10.2000	131	32.8	48.3
10.10.2000	17	4.3	52.5
11.10.2000	31	7.8	60.3
12.10.2000	29	7.3	67.5
13.10.2000	15	3.8	71.3
16.10.2000	42	10.5	81.8
17.10.2000	6	1.5	83.3
18.10.2000	9	2.3	85.5
19.10.2000	19	4.8	90.3
20.10.2000	9	2.3	92.5
25.10.2000	8	2.0	94.5
26.10.2000	3	0.8	95.3
27.10.2000	4	1.0	96.3
31.10.2000	3	0.8	97.0
01.11.2000	3	0.8	97.8
02.11.2000	1	0.3	98.0
06.11.2000	1	0.3	98.3
07.11.2000	2	0.5	98.8
10.11.2000	2	0.5	99.3
15.11.2000	1	0.3	99.5
16.11.2000	2	0.5	100
Total	**400**	**100**	

Table 6.2 Summary of Receipts of Questionnaires

6.6 Data Preparation

Preparation of survey data involved an examination for non-response bias and selection of a homogeneous data set suitable for PLS analysis, as shown by Wold, 1981. Such a data set, free from outliers, was selected from the 400 usable survey responses in this data preparation stage. The outliers represented extreme data values and the detailed description of selecting the research sample is given in section 6.6.2.

6.6.1 Non-response Bias

Before moving onto further analysis, the data set of the survey sample was examined for any distortions due to non-response. The non-response bias was examined comparing early and late responses with respect to certain characteristics of CA firms obtained from the part four of the survey questionnaire. This comparison assumed that that the persons responding later to be more similar to non-respondents. This could be combined with the concept of successive waves as described by Armstrong and Overton (1997). A wave referred to the response generated by a reminder. A similar approach has been used and recommended by previous researchers. (e.g. Chan, 1992).

The data set of 400 responses was grouped into three categories on the basis of the date of receipt. The three time periods selected were:

(a) 5 October 2000 to 11 October 2000
(b) 12 October 2000 to 18 October 2000
(c) 19 October 2000 to 16 November 2000

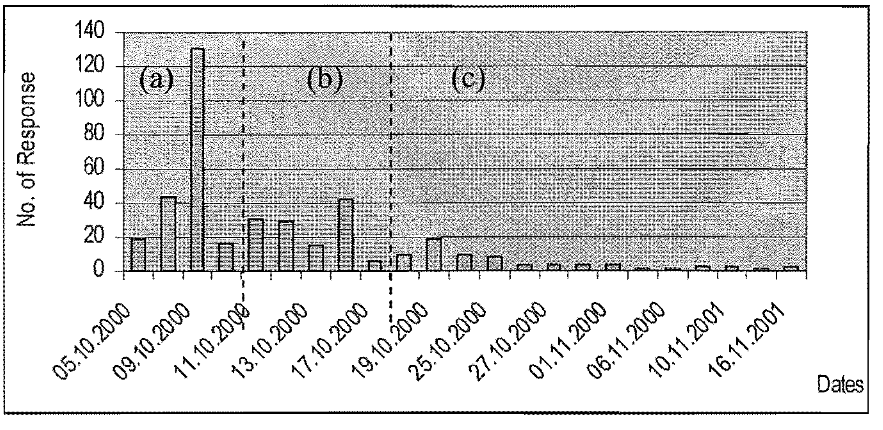


Figure 6.1 Distribution of Responses Over Time

The first period was the pre-reminder segment (i.e. [a] in figure 6.1) and most of the responses were received during this week. The next peak for receipt of responses was during the week following the reminder postcards (i.e. [b] in figure 6.1). The ICANZ journal carrying the note about this research appeared to be the next measure which impacted on responses. Thereafter, the receipt of responses gradually slowed down. These time periods reflected three distinct instances of receipt of survey responses resembling time dated waves. The number of responses in each group was large enough for statistical comparisons and contained 241, 101 and 58 responses in (a), (b) and (c) time periods respectively.

The following characteristics were used for statistical comparison of responses (Chi-square tests) of each time period:

(a) Number of billing clients [See Table 6.3(a)]
(b) Length of time of IT use [See Table 6.3(b)]
(c) Annual IT maintenance expenditure [See Table 6.3(c)]
(d) Status of person in-charge of IT [See Table 6.3(d)]
(e) Number of full time staff [See Table 6.3(e)]

Survey data of this nature (e.g. number of users, number of staff, budget, age, annual sales, computer experience) pertaining to the firms surveyed have been used by past researchers for reporting non-response bias analysis and other firm characteristics. (e.g. Mirani & King, 1994, Kettinger & Lee, 1994, Mirani & Lederer, 1998). These are independent of the main study variables investigated.

Comparing the number of returns of the three different time periods and the Chi-square[24] statistics, one can not conclude that there is a significant difference in the nature of firms between the three time periods. Therefore, firms that delayed returning questionnaires appeared to be typical of the firms surveyed. The analysis gave no indication that the sample suffered from non-response bias.

[24] Chi-square test is useful in statistical tests involving nominal data, and also can be used for higher scales. Using this technique the significant differences between the observed distribution of data among categories can be tested. Typically it is used in cases where persons, events, or objects are grouped in two or more nominal categories such as "yes-no", "favour-undecided-against", or "A, B, C, or D" (Emory & Cooper, 1991)

Time period	No of Billing Clients Up to 300	301 to 1000	1001 and over	Total
5 Oct. -11 Oct.	99	109	25	233
12 Oct. - 18 Oct.	39	45	13	97
19 Oct. - 16 Nov.	24	23	8	55
Total	162	177	46	385
Missing				15
Total No. of Responses				400
	Value	Df	Asymp. Sig. (2-sided)	
Pearson Chi-Square	1.137(a)	4	0.888	
Note (a): 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.57.				

Table 6.3 (a) Chi-Square Comparison – Number of Billing Clients

Time period	Length of IT use Up to 2 Yrs.	3 to-10 Yrs.	11yrs. and over	Total
5 Oct. -11 Oct.	9	101	126	236
12 Oct. - 18 Oct.	5	38	58	101
19 Oct. - 16 Nov.		24	34	58
Total	14	163	218	395
Missing				5
Total No. of Responses				400
	Value	df	Asymp. Sig. (2-sided)	
Pearson Chi-Square	3.480(a)	4	0.481	
Note (a): 2 cells (22.2%) have expected count less than 5. The minimum expected count is 2.06.				

Table 6.3 (b) Chi-Square Comparison – Length of Time of IT Use

Time period	IT Expenditure Up to $ 25,000/yr.	$25,001-50,000/Yr.	$100,000 and above	Total
5 Oct. -11 Oct.	194	31	13	238
12 Oct. - 18 Oct.	88	12	1	101
19 Oct. - 16 Nov.	45	9	2	56
Total	327	52	16	395
Missing				5
Total No. of Responses				400
	Value	df	Asymp. Sig. (2-sided)	
Pearson Chi-Square	4.344(a)	4	0.361	
Note (a): 2 cells (22.2%) have expected count less than 5. The minimum expected count is 2.27.				

Table 6.3 (c) Chi-Square Comparison – Annual IT Maintenance Expenditure

Time period	Status of IT in-charge: Top management level		Total
	Top management level	Other	
5 Oct. -11 Oct.	170	71	241
12 Oct. - 18 Oct.	71	30	101
19 Oct. - 16 Nov.	41	17	58
Total	282	118	400
Missing			0
Total No. of Responses			400
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.003(a)	2	0.998
Note(a): 0 cells (.0%) have expected count less than 5. The minimum expected count is 17.11.			

Table 6.3 (d) Chi-Square Comparison – Position of IT in-charge

Time period	No. of full-time staff			Total
	1-5	> 6		
5 Oct. -11 Oct.	120	121		241
12 Oct. - 18 Oct.	49	52		101
19 Oct. - 16 Nov.	27	28		58
Total	196	204		400
Missing				0
Total No. of Responses				400
	Value	df	Asymp. Sig. (2-sided)	
Pearson Chi-Square	0.209(a)	2	0.901	
Note(a): 0 cells (.0%) have expected count less than 5. The minimum expected count is 28.42.				

Table 6.3 (e) Chi-Square Comparison – Number of full-time staff

6.6.2 Selection of the Research Sample

Selection of a research sample to be used in PLS analyses was the next step of data preparation. The survey data was first imported to SPSS 11.0 statistical software package and analysed. The intention was to 'clean up' the sample data to arrive at a data set free of outliers and extreme values, suitable for PLS analysis. The data file was scrutinised closely (see Appendix 8 for the frequency plot of total full-time staff). Initially, 25 responses comprising of large firms employing over 50 employees and the subsidiaries of large firms were eliminated. The balance 375 records were examined further to arrive at a homogeneous data set.

The criterion for selection of the data set was based on the total number of employees as was done by previous researchers. Chau and Pedrsen (2000) used the definition of small business if the firms employ more than 5, and less than 20, in the Australian context. (Peursem et al. (1999) considered 30 as the upper limit as the number of employees for small Chartered Accountancy firms. However, it was noted that there is no previous research for guiding the determination of a usable data set that characterises small CA firms in the New Zealand context. Therefore the selection of a sample for statistical analyses was determined on the basis of number of full-time employees, comparing the scores of IT management related variables.

Since understanding of IT management sophistication was a key aspect of this research, determining a homogenous data set was also based on IT management related variables. Accordingly, the mean value of responses to the overall management level question, (Question 31- Part one of the survey questionnaire) and the total number of staff, were matched to examine whether a significant pattern could be observed (see appendix 9 for details). Accordingly, three distinct firm size categories were identified on the basis of the mean values of the overall level of IT management variable (see Table 6.4). This categorisation was also supported with four other IT management related variables computed as averages of scores of measures related to planning, leading, organising and controlling as determined by the qualitative investigation detailed in Chapter 5.

Category	**Mean Value Range (Overall IT management variable)**
Full-time staff below 3	Below 4.00
Full-time staff 3 or above and below 21	Between 4.00 and 5.00
Full-time staff 21 and above	Above 5.00

Table 6.4 Mean Value Ranges of Firm Size Categories

This categorisation postulated that the IT management of firms with one or two employees was expected to be different from the firms with more staff. The inter-personal communication and other managerial requirements may be minimal in very small firms as indicated in the literature review (see section 2.2.1). It could also be expected that there could be a significant difference in IT managerial practices as the firm size increases above a certain critical level. Accordingly, in this research, the lower cut off limit of full-time employees was determined as 3 and the upper limit of the number of staff was set at 20. Therefore, the survey data with respect to the firms employing more than 2 (excluding 2) and less than 21(excluding 21) full-time staff members were selected for further analysis in this research. This group of firms comprised of 254 records, and was adequate for a comprehensive statistical data analysis employing PLS techniques.

6.6.3 Characteristics of the Research Sample

Tables 6.5 (a) through 6.5 (d) provide the descriptive statistics of the research sample selected for data analyses.

It was seen that most of these firms (nearly 85%) provide accountancy services to a broad range of clientele numbering between 100 and 1000. It was interesting to note that IT has been used for over 15 years in over 30% of the firms. Firms that went into IT recently (during the last one to two years) were very few. Nearly 80 % of the firms have been using IT for over six years. Most firms in this sample spent less than $ 25,000 annually for IT maintenance. Only 12% of the sample firms were spending between $25,000 and $50,000 annually.

It is worth noting that in nearly 70% of the firms, IT systems were looked after by staff at the top management level (eg. partners, directors, associates and shareholders). The next major categories of staff managing IT systems were; professional accountants (12%) with the middle management comprising of heads of sections (11%). Since the personnel holding the top management and middle management positions of CA firms were also generally the chartered accountants, nearly all firms appeared to be dependent on accounting professionals with IT knowledge/background for the management of information systems.

Over 50 % of the sample firms employed 7 or less full-time staff members. On the other hand, less than 15% of the sample firms employed more than 13 full-time staff.

Number of Billing Clients (range)	No. of Responses	%
<100	9	3.5
101-300	70	27.6
301-500	75	29.5
501-1000	72	28.3
1001-1500	15	5.9
>1500	3	1.2
Missing	10	3.9
Total	**254**	**100**

Table 6.5 (a) Characteristics of the Research Sample – Number of Billing Clients

Length of IT Use (range)	No. of Responses	%
<1 Yr.	1	0.4
1-2 Yrs.	4	1.6
3-5 Yrs.	27	10.6
6-10 Yrs.	72	28.3
11-15 Yrs.	67	26.4
>15 Yrs.	80	31.5
Missing	3	1.2
Total	**254**	**100**

Table 6.5 (b) Characteristics of the Research Sample – Length of Time of IT Use

Annual IT Maintenance Expenditure (range)	No. of Responses	%
<$ 25,000	219	86.2
$25,000-50,000	32	12.6
$50,001-100,000	1	0
Missing	2	0.8
Total	**254**	**100**

Table 6.5 (c) Characteristics of the Research Sample – Annual IT Maintenance Expenditure

Position of Person-in-charge of IT	No. of Responses	Percent
Top management	174	68.5
Middle management	28	11
Professional Staff	32	12.6
Technical Support Staff	7	2.8
Secretarial/Clerical Staff	8	3.1
Other	1	0.4
Missing	4	1.6
Total	**254**	**100**

Table 6.5 (d) Characteristics of the Research Sample – Position of IT in-charge

No. of Full time staff	No. of Responses	Percent	Cumulative Percentage
3	35	14	14
4	33	13	27
5	34	13	40
6	23	9	49
7	19	8	57
8	17	7	64
9	20	8	71
10	6	2	74
11	9	4	77
12	14	6	83
13	2	1	84
14	9	4	87
15	6	2	90
16	7	3	92
17	2	1	93
18	11	4	97
19	3	1	99
20	4	2	100
Total	**254**		

Table 6.5 (e) Characteristics of the Research Sample – Number of Full-time Staff

6.6.4 Formation of Split-Samples

The importance of maintaining rigour in the instrument validation process has been emphasised by past researchers (e.g. Straub & Carlson, 1989; DeVellis, 1991). Cross-validation using split-samples is a procedure that can be adopted to reduce the likelihood of capitalising on chance during scale purification. In this procedure, the sample is divided randomly into two split-samples, and the first split-sample serves as the measure development sample and the holdout sample (second split-sample) is used to validate results. Instrument development researchers, Cadogan and Diamantopoulos (1999) and Diamantopoulos and Souchon (1999) have applied this procedure along with PLS techniques. Use of split-samples for data analysis was more applicable in PLS analyses because, not only can it accommodate smaller sample sizes, but also, the analytical procedures are relatively less time consuming (Chin, 1988). Replicating the findings this way by splitting samples provides valuable information about scale stability (see also DeVillis, 1991, and Hair et al., 1998).

Hence, two split-samples were created from the research sample containing 254 responses. In this process, random numbers were assigned to all records and the data set was sorted in ascending order. Next, every second record of the data set was extracted to form split-sample A. The balance 127 records formed split-sample B. Accordingly, the two split-samples were deemed to represent two randomly selected data sets of the overall sample. The resultant two split-half samples (referred to as *Split A* and *Split B* in the forthcoming PLS analyses) each contained 127 records.

These two split samples were then examined to determine whether they possessed similar characteristics. The number of full-time staff members (question 6 of Part Four: General Information in the survey questionnaire) and overall level of management (question 31 of Part One: IT management, in the survey questionnaire) were identified as suitable measures for comparison of the two split samples. These measures represented relevant aspects concerned with the research study. The number of employees is a common indicator used for classification of businesses and for examination of the firm size. The overall level of management was identified for comparison since this research was centred on investigating the managerial aspects of IT in small business.

Results of the statistical test for comparing means (independent samples) are given in Table 6.6.

Criterion Variable	**Mean**		**Standard deviation**		**Levene's Test for Equality of Variances**		**t-test for Equality of Means**	
	Sample A	Sample B	Sample A	Sample B	F	Sig.	t	**Sig. (2-tailed)**
Overall Mgt level	4.53	4.54	1.284	1.350	0.89	0.765	-0.095	0.924
No. of full-time staff	7.86	8.24	4.482	4.834	0.826	0.364	-0.646	0.519

Table 6.6. Comparison of Two Split-Samples A and B.

These results confirmed that there were no significant differences in mean values and variability in the two split-samples A and B.

6.7 Chapter Summary

This Chapter details the survey design including the measures, survey administration and data preparation. Particulars of respective measures of the study constructs and instruments were discussed. The non-response bias analysis provided no indication that the sample suffered from a non-response bias. A data set comprising of 254 valid responses representing the homogenous sample was identified, and two split-samples containing 127 items each were created for PLS analysis.

Forthcoming chapters deal with PLS model development and analysis. The next Chapter is devoted to development of the measurement and structural models of the IT management in small business construct.

Chapter 7

IT Management Sophistication in Small Business: Development and Assessment of the PLS model

7.1 Chapter Overview

PLS techniques were used for survey data analysis as outlined in chapter four and thereby two sets of PLS structural and measurement models were created. The first model was aimed at the development and validation of an instrument to measure IT management sophistication in small business, a major objective of this research.

This chapter deals with the first PLS model related to the IT management sophistication in small business construct, referred to as the *MangSo* model. The qualitative phase of this research identified five factors deemed to characterise the IT management sophistication construct. These findings provided the theoretical background for constructing the *MangSo* model.

Initially, the split-sample[A] of the survey data set was used to build and refine the PLS model, which was referred to as *MangSo-A* model. This *MangSo*-A model was analysed to ascertain the validity and reliability of the respective measures and the significance of structural relationships. Subsequently, the refined *MangSo* model was re-created using the data set of split-sample [B] (identified as *MangSo-B* model) for re-validation of previous findings.

This chapter begins with an outline of the data analysis plan adopted in the development and analyses of the *MangSo* model. The details of development and assessment of *MangSo*-A model and validation of findings using *MangSo*-B are presented next.

Chapter Contents

7.2 Approach to Data Analysis

An introduction to data analysis techniques used in this research has been outlined in chapter for (page ......). This section provides the specific details of the objectives of the analysis process and the data analysis plan.

7.2.1 Background

It is appropriate at this stage to outline the plan of data analysis aimed at PLS model development and testing. Barclay (1991) adopted a similar approach in his research on scale development.

The development of the measurement and PLS structural models, and their assessment were guided by the recommendations of and procedures adopted by Barclay, Thompson & Higgins (1995), Chin & Newsted (1999), Chin (1998-a), Chin (1998-b); Duxbury & Higgins (1991), Hair et al. (1998), Igbaria et al.(1998), World (1980), World (1981), World (1985) and, Yi and Davis (2003). A broad framework of structural equation modelling as outlined by Hair et al. (1998) is summarised in Figure 7.1. The other references provided specific guidelines with respect to PLS modelling and data analysis. (A detailed account of PLS analytical procedures is given in Appendix 2.)

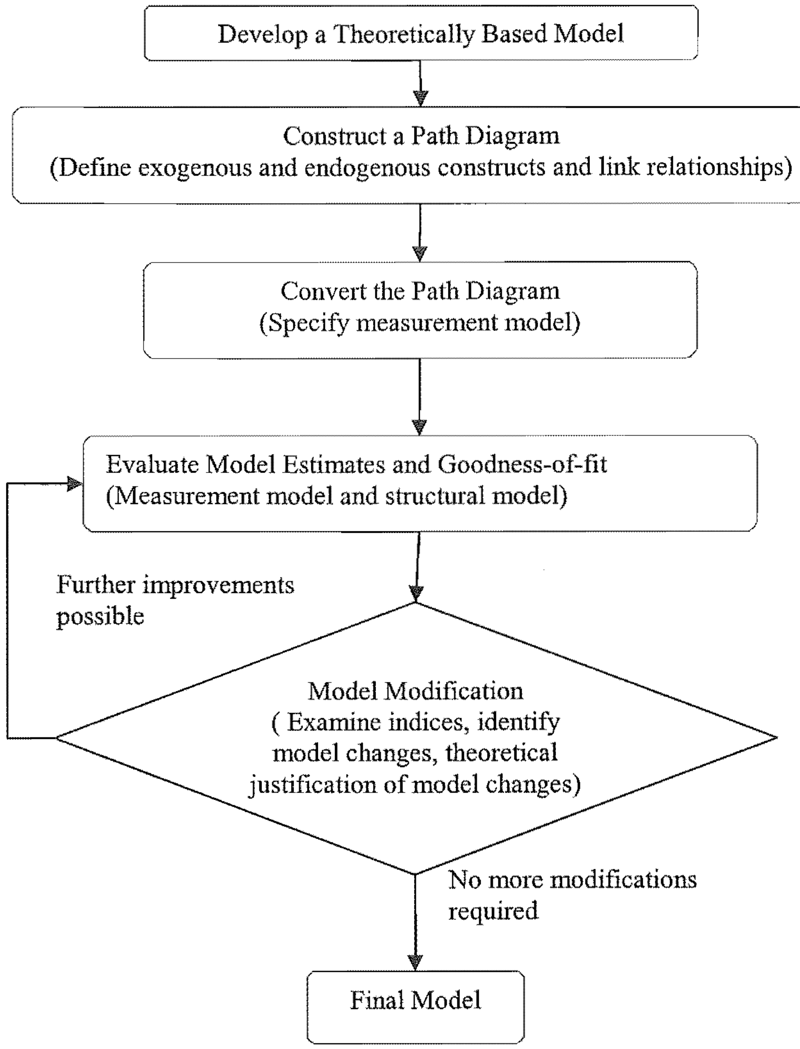


Figure 7.1 Stages in Structural Equation Modelling (adopted from Hair et al., 1998)

The following recommendations of Barclay et al. (1995) provided guidance at the initial model construction process:

> Start with a simple model, but try various facets of PLS. To begin, try modelling all constructs with reflective measures, then all with formative measures, then a mixture of the two. This will allow you to see how sensitive the results may be to different configurations of the measurement model.
>
> Next, try changing the structural model by adding and removing paths. This will allow you to observe the interplay between the structural and measurement model (by showing the change in item loading as the paths to corresponding constructs are changed), and will demonstrate the ease of changing the model specification within PLS. It should also demonstrate the importance of making changes based on theoretical reasoning rather than

> empirical evidence- it is too easy to become trapped into endless model revision otherwise (Barclay et al. 1995, p 305) .

The broad objectives of the data analysis process were to:

(a) further investigate *IT management sophistication in small business* with a view to arriving at a refined set of factors that determine IT management in small business;

(b) build, refine and validate an instrument to measure the *IT management sophistication in small business* construct;

(c) develop and validate an overall structural model relating the four constructs *IT management sophistication in small business, Technological sophistication, Informational sophistication* and *IT impact.*

As indicated earlier this chapter deals with the objectives (a) and (b) above.

7.2.2 Data Analysis Plan

Accordingly, two PLS models were to be constructed:

(a) *MangSo* model being the measurement and structural model of the IT management sophistication in small business construct.

(b) Overall model representing the relationships of the four study constructs, *IT management sophistication in small business, Technological sophistication, Informational sophistication* and *IT impact.*

The *MangSo* model was developed and analysed first so that it could subsequently be incorporated into the overall model. Similar approach of construction of sub-models and later incorporating them into an overall model has been used by Chin (1998-b) and Yi and Davis (2003). The construction of the *MangSo* model as a separate entity also fell in-line with the way the research objectives were formulated. It may be recalled that the development of an instrument to measure the IT management sophistication in small business construct was the major objective of this research. This approach was useful to gain a deeper understanding of the factors representing IT management sophistication first, and then use that construct to build the overall model.

The data analysis plan for development and testing of the *MangSo* model is outlined in Table 7.1.

Purpose	Method/Analysis
(a) Derive the *MangSo* model (Initially *MangSo*-A and later *MangSo*-B models)	• **Use split half sample [A] of the survey data.** • Construct PLS model linking respective measures and latent variables on the basis of background theory/case study findings. • Reflective/formative measures and exogenous/endogenous latent variables to be specified at this stage • Compute model parameters (e.g. Factor loadings, path coefficients) using PLS Graph software package. • Refine the PLS model to arrive at *MangSo*-A.
(b) Assess measurement model of (factors of) *MangSo*-A.	• Assess individual item reliability of measures (i.e. examine loadings). • Assess internal consistency (i.e. compute composite reliability coefficients). • Assess discriminant validity (i.e. compute average variance extracted [AVE[28]]; compare squared correlations between constructs and AVE).
(c) Assess structural relationships of *MangSo*-A.	• Examine path coefficients, and residuals in the structural model • Examine statistical significance of the loadings and the path coefficients, using bootstrap re-sampling technique
(d) Reconstruct and validate the measurement and structural models of *MangSo*-B.	• **Use split-sample [B]** • Reconstruct the refined *MangSo*-A model using split-sample [B] and repeat the statistical tests indicated in steps (b) and (c) above.

Table 7.1 Data Analysis Plan of *MangSo* Model Development and Assessment

[28] See page 177 for definition.

The first step of the plan (see purpose (a) of Table 7.1) was to construct and refine the *MangSo* model using the split-sample [A] data set. Next, this model (referred to as *MangSo*-A model) was to be investigated for validity and reliability (see purposes (b) and (c) of 7.1). The next step was to re-construct and validate the *MangSo*-A model using the data set of split-sample [B] (see (d) of Table 7.1). A similar process for construction of PLS models and assessment of reliability and validity has been recommend and used by past researchers (eg. Chin & Newsted, 1999; Rivard and Huff, 1988; Duxbury & Higgins, 1991; Barclay et al., 1995; Chin, 1995; Chin & Gopal, 1995; Chin, Marcolin & Newsted, 1996; Igbariai et al., 1997 Chin, 1998-a; Chin, 1998-b; Diamantopoulos and Souchon,1999; Raghunathan, Raghunathan & Tu, 1999)

The development and assessment of *MangSo* models are presented in the forthcoming sections of this chapter. The overall PLS model development is detailed in Chapter 8.

7.3 Background Theory: *MangSo* Model Construction

The *MangSo* model was derived on the basis of the hypothesised characterisation of the IT management sophistication in small business construct (see page 43 of Chapter 3) and the subsequent findings of the qualitative analyses (see page 111 of Chapter 5). Initially IT management sophistication in small business was hypothesised to be a multi-dimensional construct that mirrored the four sub-functions of management: planning, organising, controlling and leading related to information technology management in small firms. The qualitative investigation was aimed at verifying and broadening this hypothesised characterisation and identifying the likely measures associated with such potential factors (sub-dimensions). As discussed in chapter 5 the five factors of *planning, organising, controlling, leading and external expertise* related to IT systems in small business were identified as potential sub-dimensions of the construct (*see* Figure 7.2).

Accordingly, the initial PLS structural model was constructed with five factors linked to the *IT management sophistication in small business* variable. In this hypothesized *MangSo* model the four factors namely, *IT planning*, *IT organising*, *IT controlling*, *IT* *leading* and *external expertise*, were modelled as exogenous[29] latent variables while IT management sophistication was considered as the endogenous latent variable. An exogenous variable is shown as predicting or 'causing' an endogenous latent variable (Barclay et al., 1995). Eendogenous[30] latent variables assume the role of dependent variables.

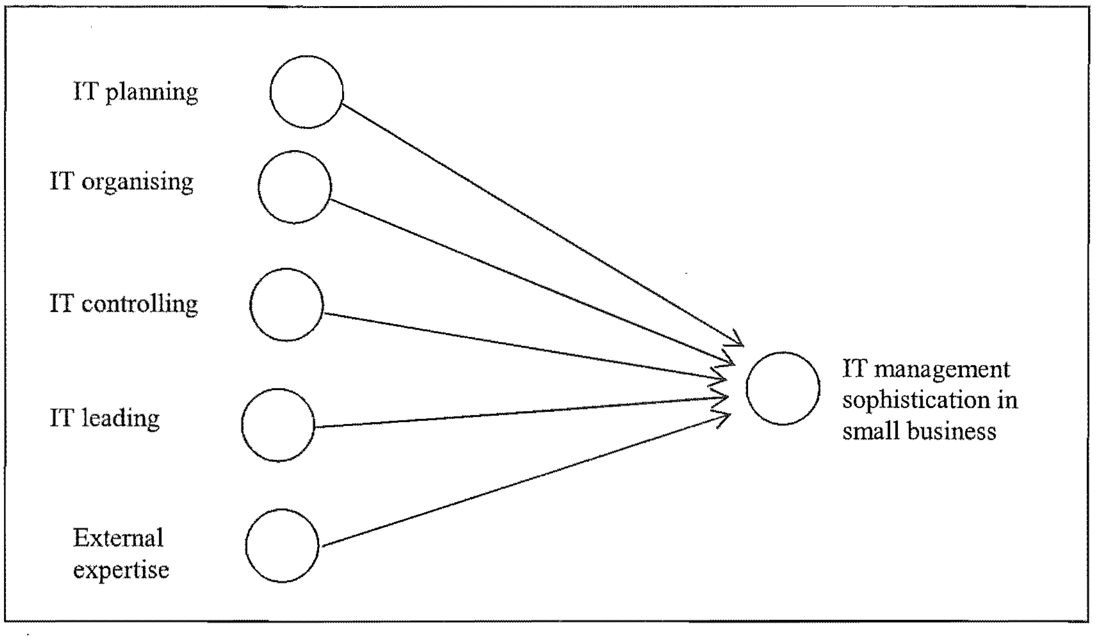


Figure 7.2 Hypothesised Structure of *MangSo* Model

7.3.1 Measures of Exogenous Latent Variables

The exogenous latent variables (as shown on the left side of figure 7.2) were measured using a group of Likert scale questions in section A of the survey questionnaire. The pool of measures were based on the indicators identified in Chapter 5 (see page 111). The measures used in this PLS model development were labelled as MGT01 through MGT30 and MGT99 as identified in Table 7.2. This table provides a complete list of item statements used as the measures with variable names, the item statements and the respective question number in the survey questionnaire.

---

[29] See Appendix 2 for details.

[30] See Appendix 2 for details

Variable Name	Item Statements (measures)	Question No.
MGT01	Our firm recognises IT planning as an important part of the overall business planning process	1
MGT02	Our IT plans are very detailed	2
MGT03	Mostly, our IT plans are written	3
MGT04	We use a rigorous IT planning process within our firm	4
MGT05	Our IT system is designed to be closely aligned with the overall objectives of the firm	5
MGT06	Our IT plans are frequently reviewed to accommodate the changing needs of the firm	6
MGT07	Our firm is continuously searching for and evaluating new IT developments for their potential use in the firm	7
MGT08	In our firm, IT is used to improve the firm's competitive position	8
MGT09	We have very effective working relationships with our IT vendors and /or external consultants	9
MGT10	We gather IT information from others who have IT knowledge and experience in our line of business. (e.g. we participate in IT forums and /or software user groups)	10
MGT11	In our firm, staff participate in making major IT decisions	11
MGT12	Our firm has a flexible approach to organising IT operations and maintenance	12
MGT13	IT management within our firm is characterised by strong leadership	13
MGT14	We closely monitor the progress of our IT projects	14
MGT15	We closely monitor the performance of our IT system(s)	15
MGT16	Our managers have created a vision among the staff for achieving IT objectives	16
MGT17	We have comprehensive procedures in place for controlling the use of IT resources (e.g. who can use specific software or access specific databases)	17
MGT18	We have comprehensive procedures in place for maintaining the security of information stored in our computers	18
MGT19	In our firm, the roles and responsibilities for IT direction and development are clearly defined	19
MGT20	We have one or more staff who spend most of their time managing our firm's IT resources	20
MGT21	Our managers have inspired staff commitment towards achieving IT objectives	21
MGT22	Our managers have directed the efforts of staff towards achieving IT objectives	22
MGT23	Our firm is committed to providing staff with appropriate IT training	23
MGT24	Our top management plays an active role in addressing the firm's IT issues	24
MGT25	We select our IT vendors and external consultants according to formal criteria. (e.g. based on a combination of their proven success, IT expertise, familiarity with our line of business)	25
MGT26	Our firm relies heavily on external IT expertise (eg , IT vendors and consultants)	26
MGT27	In our firm, the roles and responsibilities for IT operations are clearly defined	27
MGT28	Our firm has formal procedures for the acquisition and/or development of new IT systems	28
MGT29	Our top management believes that IT is critical to the success of our business	29
MGT30	When it comes to software acquisition, we select the most suitable system based on proven success	30
MGT99	Overall level of IT Management: Considering the managerial functions (such as planning, organising, controlling and leadership) how do you rate the overall level of IT management in your firm?	31

Table 7.2 Measures of IT Management Sophistication in Small Business

The measures associated with each factor (i.e. latent variable) as determined previously in the qualitative analysis phase and the respective indicator variable labels along with the latent variables are given in Table 7.3. In the initial PLS model construction all these indicators were linked to the respective latent variables.

Factor	Variable Labels
IT planning	MGT01, MGT02, MGT03, MGT04, MGT05, MGT06, MGT07, MGT08
IT organising	MGT11, MGT12, MGT20, MGT25, MGT30
IT Controlling	MGT14, MGT15, MGT17, MGT18, MGT27, MGT28,
IT leading	MGT13, MGT16, MGT21, MGT22, MGT23, MGT24, MGT29
External expertise	MGT09, MGT10, MGT26

Table 7.3 Measures Associated with Major Factors of IT Management Sophistication in Small Business

7.3.2 Overall Measure of IT Management Sophistication

The measure MGT99 was identified as the overall indicator of IT Management Sophistication, the endogenous latent variable of the model. MGT99 referred to question 31 of part 1 of the survey questionnaire which assessed the respondents' judgement towards the overall level of IT management, taking into account the managerial functions such as planning, organising, controlling and leading.

The second part of this question in which the respondents were asked to indicate the reasons behind their specified rating, was useful to examine if MGT99 could be accepted as a reasonable measure of the overall level of IT management in the firm (*see* Table 7.4. for examples of the Likert scale ratings of question 31 of part one of the survey questionnaire and corresponding responses).

It was observed that the ratings given by the respondents correspond with their respective reasoning. For example, respondents who rated overall level of IT management as high (eg. 5, 6 in Likert scale) have identified the characteristics such as greater commitment of senior management towards IT, employing skilled and experienced people, having programmes to upgrade knowledge and skills on IT. On the contrary poor ratings (e.g. 2 in Likert scale) correspond with situations such as not having proper planning in the IT function and IT being given low priority in the organisation. These conform to general management principles and therefore the measure MGT99 was accepted as a satisfactory indicator of overall IT management sophistication for the purpose of creating the PLS model.

Rating	Related Response
2	"Crisis management- need help when something goes wrong, stumble along when working well"
2	"IT rates fairly low in our priorities for providing exceptional service at a good price"
4	"Deal with IT when I have to but not plan IT functions, just use it."
4	"While we are very dependent on software for running our practice, we are a small firm and rely mostly on one software developer for our software and upgrades."
4	"Our IT management most time is reactive rather than proactive"
5	"Principal is responsible for all managerial functions of IT management, hence always short of time to update IT systems."
5	"Whilst we are very strong in some areas of IT management such as budgeting, purchasing and other spend oriented activities, we do not address all IT issues with full knowledge."
6	"We have a commitment to be at the forefront of our profession. We have senior staff with expertise and a programme to upgrade and improve our knowledge and expertise on IT."
6	"We have vast experience and employ skilled people."

Table 7.4 Examples of Responses to PART A: Question 31 of the Survey Questionnaire

7.3.3 Linking Measures to Latent Variables

In PLS model specification, the measures could be linked to the latent variables in two ways, namely, formative and reflective. A construct with formative measures implies that the construct is expressed as a function of the variables (i.e. the variables form, cause or precede the construct). All indicators do not measure the same underlying phenomena and are not correlated with each other. The latent variable is viewed as an effect of indicators.

In contrast, the observed variables are expressed as a function of the construct in the case of reflective indicators. These are 'effect' indicators which are assumed to measure the same underlying phenomena or the latent variable. Should the latent variable increase, all indicators also increase and vice versa (Cohen, Cohen & Velez, 1990; Barclay et al., 1995; Chin et al., 1996; Chin, 1998-a).

It may be noted that the determination of measures related to each factor as formative or reflective was not found to be a straightforward process. Therefore, a collective approach was adopted. The item statements were examined by three parties[31] separately, and the individual results were placed together, and discussed to agree upon the final decision. Accordingly, considering the above mentioned criteria and examining the measures in detail, they were incorporated into the PLS model as formative indicators.

7.4 *MangSo* Model Construction

The graphical representation of the initial *MangSo* structural and measurement model derived in *PLS GRAPH* software package, using the split-sample [A] data set (*MangSo*-A) is given in Figure 7.3 (see Appendix 10 the respective *PLS GRAPH* output) for In the graphical representation, the latent variables are represented by circles and the measurement variables (i.e. indicators) as squares. The structural relationships are indicated by arrows linking the respective latent variables. The arrow heads are pointed towards the endogenous latent variable. Accordingly, in this initial *MangSo*-A model the five factors (e.g. *IT planning* and *IT leading*) were identified as exogenous latent variables, and IT management sophistication was modelled as the endogenous latent variable. The respective path coefficients and the R^2 value are also shown in figure 7.3.

In the graphical representation of the measurement model (see figure 7.3), the associated indicators (symbolised as small squares) are linked with the respective latent variable (symbolised as a small circle) with arrow headed lines. The direction of the

[31] Three parties involved were the researcher, an associate professor and a senior lecturer in information systems, who were provided with the criteria for determining a set of indicators as formative or reflective.

arrow head signifies whether a particular indicator is reflective or formative. The arrows directing towards the squares represent the reflective measures, and in formative measurers the arrow heads are directed towards circles. For example, the factor *IT leading* is measured by the six indicators labelled MGT13, MGT16, MGT21, MGT22, MGT23, MGT24 and MGT29. Table 7.5 presents the factor loadings of individual indicators of each factor (e.g. 0.865 for MGT13 in *IT leading*) associated with the *MangSo* model.

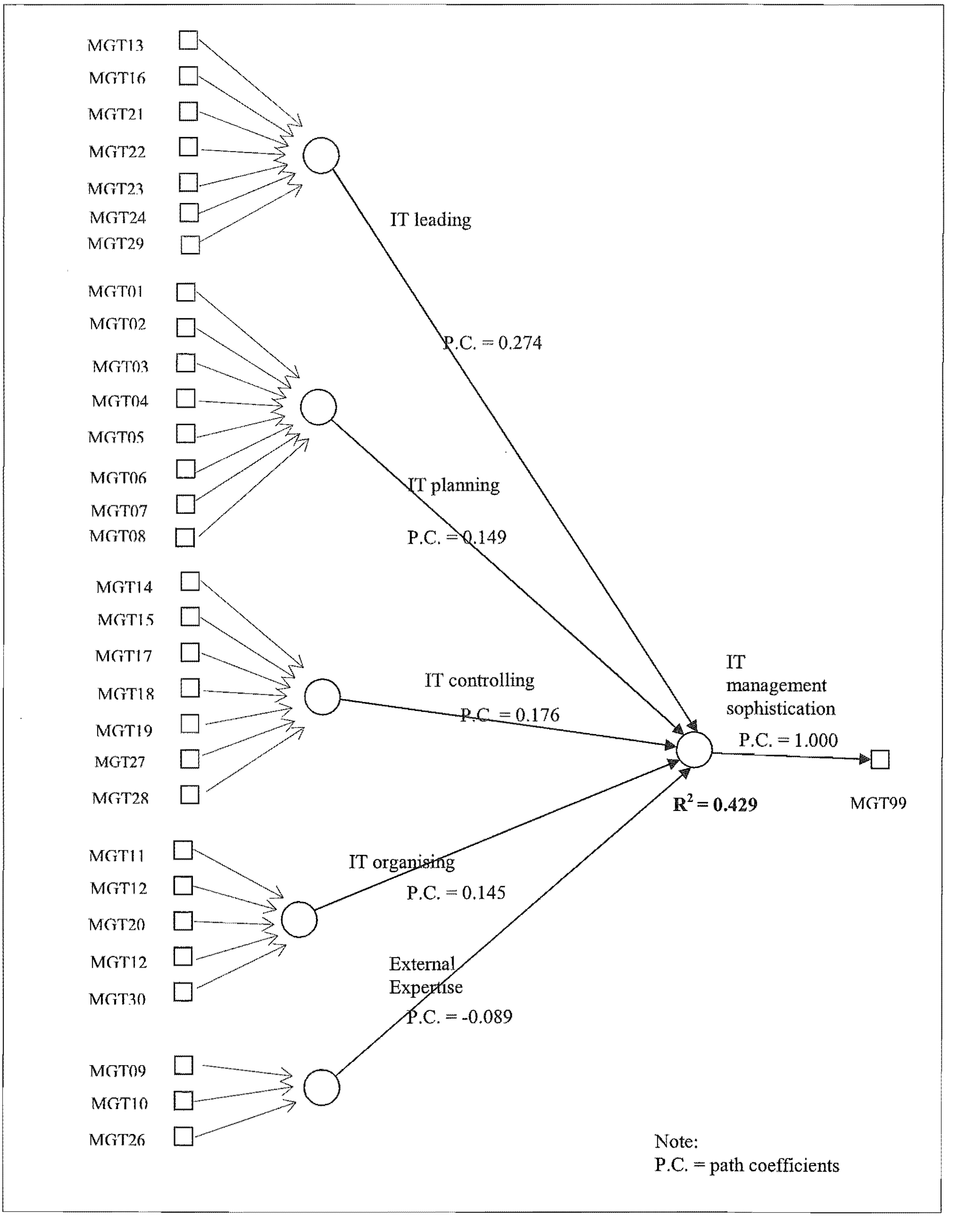


Figure 7.3 Graphical Representation of Initial *MangSo*-A Model

Factors	Measures	Loadings	Path Coefficients	R^2 of *MangSo* Latent variable
IT leading - Inward			0.274	**0.429**
	MGT13	0.865		
	MGT21	0.805		
	MGT22	0.770		
	MGT16	0.681		
	MGT23	0.633		
	MGT29	0.551		
	MGT24	0.492		
Planning-Inward			0.149	
	MGT04	0.885		
	MGT06	0.835		
	MGT08	0.730		
	MGT02	0.692		
	MGT07	0.665		
	MGT01	0.588		
	MGT05	0.574		
	MGT03	0.548		
IT organising- Inward			0.145	
	MGT20	0.683		
	MGT25	0.672		
	MGT11	0.492		
	MGT30	0.377		
	MGT12	-0.048		
IT controlling – Inward			0.176	
	MGT28	0.773		
	MGT14	0.738		
	MGT15	0.694		
	MGT17	0.608		
	MGT18	0.600		
	MGT19	0.564		
	MGT27	0.427		
External Expertise- Inward			-0.089	
	MGT26	0.405		
	MGT10	-0.633		
	MGT09	-0.705		

Table 7.5 PLS Estimates of Initial *MangSo*-A Model

These PLS analysis outputs provided sufficient evidence that the IT management sophistication latent variable was well explained by the five factors hypothesised as characterising this construct. The R^2 value of 0.429 indicated that nearly 43 % of the variance is explained by the factors. The path coefficients of 0.1 or greater between the first order constructs were substantive and such factors could be retained (Chin, 1995; Barclay et al., 1995). As for factor loadings, values of + or – 0.3 or above could be considered to meet the minimum level for acceptance; + or - 0.40 as more important and + or-0.5 or greater to be practically significant in representing the factor (Hair et al., 1998). Accordingly, all measures except MGT12 in *IT organising* factor pass the minimum level for acceptance of measures. It was also interesting to note that most of the factor loadings (i.e. 24 out of 30) had recorded figures over 0.5, which is considered practically significant. Therefore, this preliminary investigation revealed that the hypothesised factorisation and their respective measures were well within the acceptable limits for consideration as a suitable means of characterising the IT management sophistication in small business construct.

7.5 *MangSo*-A Model Refinement

The next step of model construction was to refine the initial *MangSo*-A model with suitable changes to its structure examining the PLS estimates, while maintaining the theoretical assertions. In this respect, the distribution of loadings of each factor was examined to see if the hypothesised factorisation could be further improved. Weaker measures could be eliminated considering the statistical significance, if such a change can be justified on the basis of practical significance (ie. on the basis of theoretical knowledge and experience). Therefore, each factor and related measures were re-examined taking into consideration the magnitude of loadings and the practical significance.

The factor related to *IT leading* consisted of seven measures of which six were above 0.5 and were practically significant. They appeared to be coherent, lying within a close range of values. Somewhat higher loadings were associated with measures MGT13 and MGT21 and MGT22. These measures seem to be directly addressing the leadership characteristics of managers towards achieving IT objectives of the firm. Although the factor loading of MGT24 was within the acceptable range (i.e. greater than 0.3), this did not appear to be coherent with other measures. The item statement of MGT24 referred to "top management playing an active role in addressing IT issues". In most CA firms, the senior accountants hold the top management positions. Their IT skills (both managerial and technical) may be perceived as somewhat poor by the staff working with computers and information systems. Therefore, the survey respondents may not have seen the top management playing an "active" role. Considering these factors, it was suggested that MGT24 be dropped to improve the model.

The factor dealing with *IT planning* was measured in terms of eight items. All measures were practically significant, and the loadings of most measures lie within a close range. The measure MGT03 fetched somewhat a lower loading figure of 0.548. Although this was within acceptable limits, considering the stronger values of other seven measures, a decision had to be taken on whether to drop or retain MGT03. The item MGT03 addressed the issue of "having written plans" while MGT02 was dealing with "having detailed plans". Since the notion of written plans may be incorporated in planning in detail (MGT02), the measure MGT03 was identified as potential candidate for elimination in the refined model. Going by the PLS models of past researchers, the number of measures in the 'planning' factor could be reduced without any distortion to the model.

The loading of measure MGT12 in *IT organising* was only -0.048 which is quite low. This lower loading could be attributed to possible ambiguity arising from the phrase 'flexible approach'. Flexibility built-in to the small firm environment was seen as strength in IT management at the time this item statement was formulated. This was meant to capture the strengths of small businesses such as ability to take decisions faster due to the 'freedom' enjoyed by the owner managers. However, this item statement appears to be not clear to the respondents. The tem 'flexibility' may be sometimes seen as weaknesses such as 'lack of control' or 'not adhering to procedures'. Therefore, this item did not appear to be a suitable indicator of *IT organising* and hence was a candidate for elimination.

The other three items in the factor *IT organising* were addressing managerial issues related to internal staff and process of selection of external staff support. The loading of MGT30 was also low (0.377) and was not in the range of factor loadings of other measures. It shows that the factor loadings of all measures relating to *IT organising* factor were not as strong as the other factors, and should be therefore taken into account in making improvements to the model. The impact of dropping MGT12 initially and MGT30 later was examined in the next stage of model construction.

As far as the loadings of the measures of the *IT controlling* factor were concerned, MGT27 appeared to record a lower value. This item was referred to defining the roles and responsibilities of IT operations. It was observed that in most CA firms, IT operations are generally handled by all employees. This situation may be interpreted as implying that this was not a clear definition of roles and responsibilities of operations. Considering this fact, MGT27 was identified as a candidate for elimination in the next stage of model improvement.

In the *external expertise* factor, the measure MGT26 appeared to be weak and did not match with the loadings of the other two measures. This inconsistency of MGT26 may have been caused due to poor wording of the item statement. MGT26 referred to reliance or dependence on *external expertise* in IT management in small firms. It read:

> 26. Our firm relies heavily on external expertise.

Although use of external expertise was an important managerial concern for small firms, the phrasing "relies heavily" may have created a negative impression on the respondents. The intended objective of this statement was to gain an understanding on how far the firm relies on external expertise. Improved presentation of this statement may have resulted in a different rating. Considering the above, MGT26 was also identified as a candidate for elimination at the next stage of model development.

Accordingly, the *MangSo* model was refined and the respective PLS estimates were obtained using *PLS GRAPH.* Figure 7.4 presents the graphical representation of the refined model – *MangSo*-A (see Appendix 11 for the respective *PLS GRAPH* output) and Table 7.6 for the PLS estimates

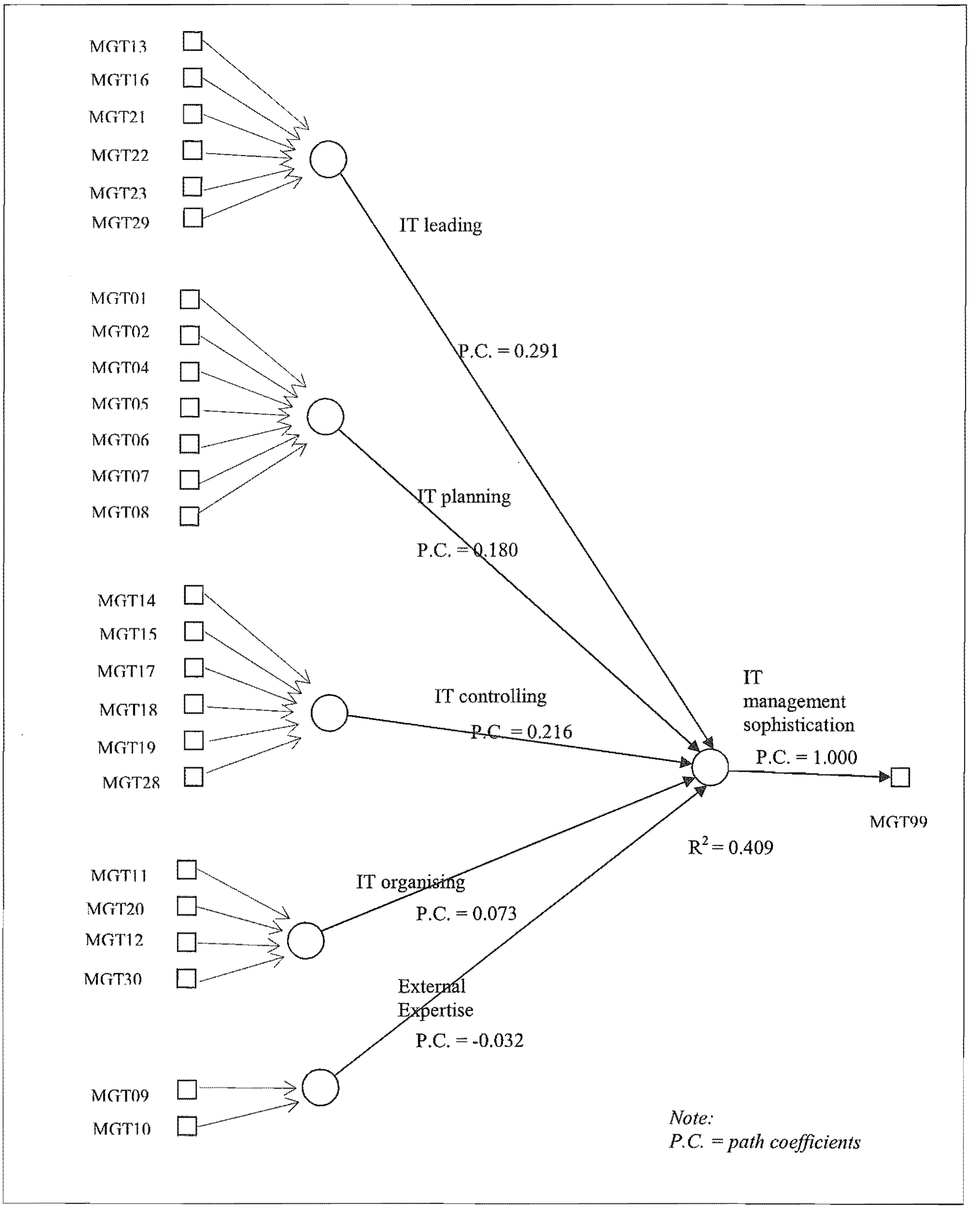


Figure 7.4 Graphical Representation of Refined *MangSo*-A Model

Factors	Measures	Loadings	Path Coefficients	R^2 of *MangSo* Latent variable
IT leading - Inward			0.291	0.409
	MGT13	0.870		
	MGT21	0.809		
	MGT22	0.774		
	MGT16	0.684		
	MGT23	0.635		
	MGT29	0.554		
Planning-Inward			0.180	
	MGT04	0.885		
	MGT06	0.836		
	MGT08	0.731		
	MGT02	0.692		
	MGT07	0.665		
	MGT01	0.588		
	MGT05	0.575		
IT organising- Inward			0.073	
	MGT20	0.742		
	MGT25	0.730		
	MGT11	0.535		
	MGT30	0.410		
IT controlling – Inward			0.216	
	MGT28	0.773		
	MGT14	0.738		
	MGT15	0.694		
	MGT17	0.608		
	MGT18	0.600		
	MGT19	0.564		
External Expertise- Inward			-0.032	
	MGT10	0.768		
	MGT09	0.855		

Table 7.6 PLS Estimates of Refined *MangSo*-A Model

Examination of this improved *MangSo*-A model revealed that the path coefficients of three factors, namely *IT leading*, *IT planning* and *IT controlling*, were significantly high and respective R^2 value of 0.409 was also accepted as substantial. The factor loadings of these latent variables were high and found to be coherent.

The path coefficients of the *IT organising* and *external expertise* factors in the improved model fetched below 0.1, the acceptable level. This indicates that the influence of *IT organising* and *external expertise* in shaping IT management sophistication in small business is rather low. In the case of *IT organising* factor, it can be seen that the loadings of two factors MGT20 and MGT25 are reasonably high, but the other two are low and not consistent with the highly loaded measures. This may be an indication that the lower path coefficient (0.073) of *IT organising* can be attributed to poor design of measures rather than the effect of the factor it self. However, since the results of the survey do not support that the *IT organising* factor has substantial influence on shaping the IT management sophistication, this factor may be a candidate for elimination.

The path coefficient of the *external expertise* factor records insignificant negative number (-0.032) where as the two factor loadings of the associated measures are substantial and positive (i.e. 0.768 and 0.855). This result appears to be mathematically incorrect. Although there is no clear explanation for this result at this stage, this may be due to several reasons (e.g. The effect of other factors may have influenced this result. The measures of the *external expertise* factor may not be complete. The factor it self may not fit in with this model and may be linked to the variables in a totally different manner). However, at this stage of model refinement the *external expertise* factor may be eliminated considering that the path coefficient is very low.

A firm decision of the elimination of *IT organising* and *external expertise* factors from the IT management sophistication model could be taken after the second phase of the model construction using the split-sample [B] data set. However, further research need to be carried out to examine the significance of these factors with respect to explaining the variability of the study construct, develop improved measures and examine their validity and reliability.

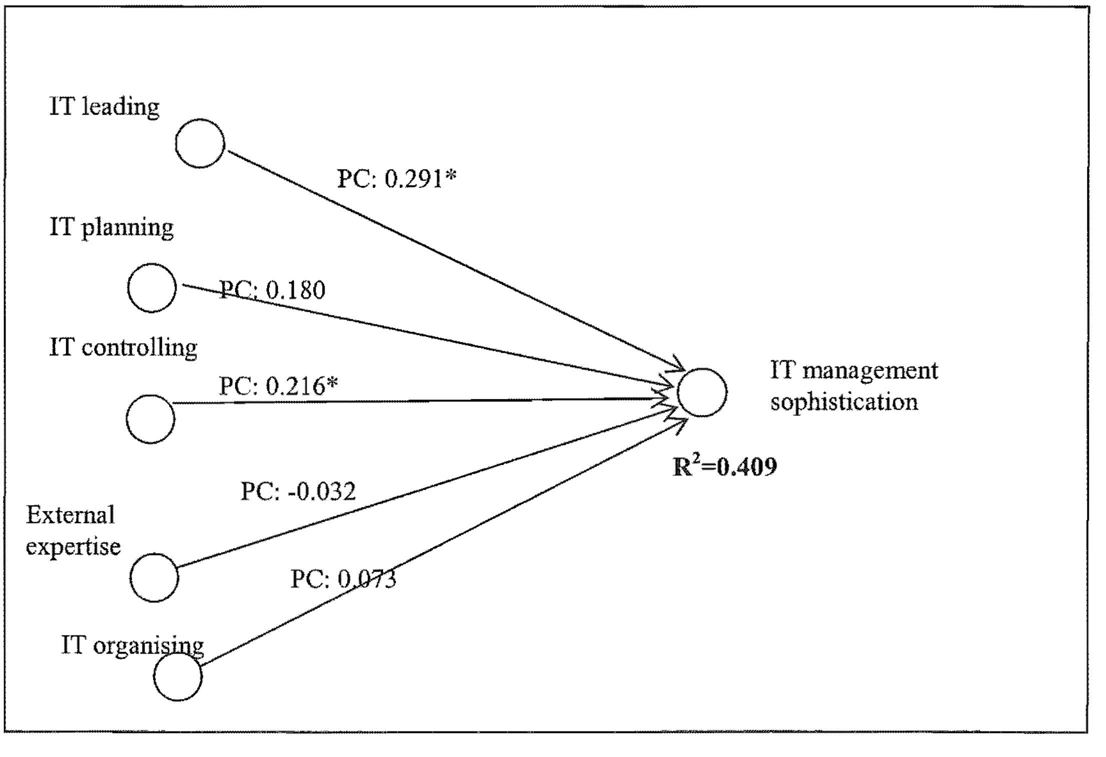
Accordingly, the improved model (*MangSo-A* refined) comprised of three substantially valid factors (i.e. *IT leading, IT planning* and *IT controlling*), and the two weaker factors (*IT organising* and *external expertise*) was accepted for testing the validity and reliability of measures and assessing the predictive power of the model. The validity and reliability of the measures and the predictive power of the model were re-examined further with the reconstruction of this improved model using the dataset of the split-sample B.

7.6 *MangSo*-A Model Assessment

As indicated in the data analysis plan, *MangSo*-A model was subjected to a rigorous assessment process for validity and reliability of measures and significance of the structural relationships. The structural models were examined on the basis of path coefficients and R^2 values, whereas the individual item reliability, internal consistency and discriminant validity were examined to assess the measurement models. The results of the assessment process of *MangSo*-A model are presented next.

7.7 Assessment of the Structural Model (*MangSo*-A)

The graphical representation of structural relationships of *MangSo*-A model is given in Figure 7.5. The path coefficients of *IT leading*, *IT planning*, *IT controlling*, *external expertise* and *IT organising* factors are 0.291, 0.180, 0.216, -0.032 and 0.730 respectively. The R^2 of IT management sophistication is 0. 409.



Notes: (a) ***p < 0.001, **p < 0.01, *p <0.05 (*see* Table 7.8 for probability values)
(b) PC : Path coefficient

Figure 7.5 Structural Relationships: *MangSo*-A Model

7.7.1 Predictive Power

Predictive power is a major factor that determines the validity of a particular model. This indicates whether the model sufficiently explains the variability of the latent variable. The R^2 values of the latent variables are indicative of the strength of the relationship between the variables, and can be interpreted in the same manner as those obtained from multiple regression analysis[32] .

The R^2 value that explains the IT management sophistication in small business latent variable in the *MangSo*-A model was high and indicated that over 40% of the variance has been explained by the factors identified in the model. R^2 values of similar range have been accepted by past researchers to explain similar endogenous latent variables (Barclay et al., 1995; Chin et al., 1996; Chin, 1998).

7.7.2 Path Coefficients

Statistical significance of loadings and path coefficients were estimated using the bootstrap re-sampling method[33] and the probability values for the student *t*-distribution were computed for each path coefficient of the model (see Table 7.7). Higher, more statistically significant path coefficients signify a stronger relationship between latent variables than lower less significant path coefficients[34]. Accordingly, the three factors – *IT planning*, *IT leading* and *IT controlling* – emerged as key latent variables with a substantial effect on explaining the IT management sophistication in small business construct. Path coefficients of these three factors passed the acceptable level of 0.1 as having a substantial effect and also, two of them (*IT leading* and *IT controlling*) were statistically significant. The other two factors, *external expertise* and *IT organising*,

[32] See Appendix 5 for details

[33] See Appendix 2 for details.

[34] See Appendix 2 for details.

were not statistically significant in *MangSo*-A model and their path coefficients were less than the minimum acceptable level of 0.1.

Factor	**Path Coefficient**	**Probability for t-distribution**
Planning	0.180	0.112
IT leading	0.291	0.018
Controlling	0.216	0.044
IT organising	0.073	0.497
External expertise	-0.032	0.653

Table 7.7. Significance of Exogenous Latent Variables (*MangSo*-A)

7.8 Assessment of the Measurement Model (*MangSo*-A)

The loadings of individual measures and their significance with respect to the measures of latent variables that characterise IT management sophistication in the *MangSo*-A model are given in Table 7.8. These indicators are useful to examine the validity and reliability of respective measure of the model.

7.8.1 Individual Item Reliability

Individual item reliability indicates whether or not an item should be included in the construct measure[35]. In examining the loadings of measures and their statistical significance, one could be satisfied that the respective measures satisfactorily capture the individual factors. It was observed that in the case of *MangSo*-A model, the estimates of loadings of all measures reached the acceptable level (ie. of 0.3)[36] of magnitude and were statistically significant. The probability level of the loadings of all measures except two (i.e. MGT11 and MGT30) were less than 0.001. The significance

[35] See Appendix 2 for details

of MGT11 and MGT30 in the *IT organising* factor were also $p < 0.05$ and $p < 0.02$ respectively. This was a clear indication that the measures fall within acceptable limits and significantly capture the variability of latent variables.

Latent variable	Measure	Loading	Significance (Probability for t-distribution)
IT leading	MGT13	0.870	p <0.001
	MGT16	0.684	p <0.001
	MGT21	0.809	p <0.001
	MGT22	0.774	p <0.001
	MGT29	0.554	p <0.001
	MGT23	0.636	p <0.001
IT Planning	MGT01	0.588	p <0.001
	MGT02	0.692	p <0.001
	MGT04	0.886	p <0.001
	MGT05	0.575	p <0.001
	MGT06	0.836	p <0.001
	MGT07	0.665	p <0.001
	MGT08	0.731	p <0.001
IT controlling	MGT14	0.738	p <0.001
	MGT15	0.695	p <0.001
	MGT17	0.609	p <0.001
	MGT18	0.600	p <0.001
	MGT19	0.564	p <0.001
	MGT28	0.773	p <0.001
IT organising	MGT11	0.535	p <0.05
	MGT20	0.742	p <0.001
	MGT25	0.731	p <0.001
	MGT30	0.410	p <0.2
External expertise	MGT09	0.855	p <0.001
	MGT10	0.768	p <0.001

p = Probability for t-distribution.

Table 7.8 Factor Loadings of Measures and their Significance (*MangSo*-A)

[36] A particular measure may be regarded as unimportant if the loading does not reach a minimum level of 0.3 (Hair et al., 1998).

7.8.2 Internal Consistency

Internal consistency is concerned with the homogeneity or single-factoredness of the observations and is assessed in PLS using composite reliability[37]. The composite reliability values of each latent variable of the *MangSo*-A model are given in Table 7.9 (see Appendix 11 for detailed calculations of internal consistency relating to refined *MangSo*-A model).

All factors demonstrated internal consistency with the composite reliability exceeding 0.7. The guideline was that, in order to demonstrate internal consistency, the calculated value of internal consistency should be equal to or greater than 0.70 (Nunnally, 1978; Fornell & Larcker, 1981; Chin, 1998-b; Hair et al.1998).

Factor	Composite Reliability[38]
IT leading	0.8693
IT planning	0.8795
IT controlling	0.8262
IT organising	0.7037
External expertise	0.7945

Table 7.9 Composite Reliability: *MangSo*-A Model

[37] See Appendix 2 for details

[38]

$$\text{Composite Reliability} = \frac{(\Sigma\lambda_{yi})^2}{(\Sigma\lambda_{yi})^2 + \Sigma \mathrm{Var}(\epsilon_j)}$$

Where $\mathrm{Var}(\epsilon_j) = 1 - \lambda_{yi}^2$ and λ_{yi} are respective loadings

7.8.3 Discriminant Validity

Discriminant validity indicates the extent to which a given construct is different from other constructs. Discriminant validity is assessed in PLS using three approaches:

i. Magnitude of Average Variance Extracted (AVE)[39] :

   For a particular latent variable to be accepted as having sufficient discriminant validity, it is recommended that the AVE should be greater than 0.5. This means that 50% or more of the variance of indicators should be accounted for by the

ii. Comparison of loadings of each indicator within and between factors:

   According to this criterion, each indicator had to load more heavily on its associated construct than on to any other construct, to accept that the factor demonstrates discriminant validity (Barclay et al., 1995; Chin, 1998a).

iii. Comparison of AVE with the variance shared between the construct and the other constructs in the model (Fornell & Larcker, 1981):

   For this test, the correlations between two constructs are compared with the square root of AVE. These coefficients are presented in the form of a 'correlation matrix' with the square root of AVE of the factors in diagonal elements. For adequate discriminant validity, the diagonal elements should be greater than the off diagonal elements (Barclay et al., 1995; Yi & Davis, 2003; Igbaria et al., 1997).

While all these three approaches can be used to assess the discriminant validity certain past researchers have applied a single criterion (e.g. Igbaria et al., 1997) and others have used a particular criteria first and then other criterion for confirmation of the previous result (e.g. Barclay et al., 1995, Chin, 1998; Yi & Davis, 2003). The following section

[39] See Appendix 5 for details

presents the results of these three approaches of ascertaining discriminant validity of the key factors of *MangSo*-A model.

7.8.3.1 Magnitude of Average Variance Extracted

Table 7.10 presents the AVE of each factor of the *MangSo*-A Model (see Appendix 11 for detailed calculations). It was observed that *IT leading*, *IT planning* and *external expertise* had clearly demonstrated discriminant validity according to this criterion. As for controlling, the AVE was somewhat lower, but it was closer to 0.5 and marginally acceptable. However, in the case of IT organising, the AVE is well below the acceptable level of 0.5. This supported the claim that *IT organising* may be eliminated from the final model.

Factor	AVE[40]
IT leading	0.5312
IT planning	0.5162
IT controlling	0.4453
IT organising	0.3847
External expertise	0.6598

Table 7.10 Average Variance Extracted: *MangSo*-A Model

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$$\text{AVE} = \frac{\Sigma\lambda_{yi}^{2}}{\Sigma\lambda_{yi}^{2} + \Sigma \text{Var}(\epsilon_j)}$$

Where $\text{Var}(\epsilon_j) = 1-\lambda_{yi}^{2}$ and λ_{yi} are respective loadings

7.8.3.2 Comparison of Loadings

The component structure matrix of *MangSo*-A model showing the loadings of each measure against five latent variables is given in Table 7.11. Examination of the matrix (Table 7.11) reveals that all measures pass this test of discriminant validity. For example, the latent variable *IT leading* is represented by six measures MGT13, MGT16, MGT21, MGT22, MGT29 and MGT23. Loadings of these measures (given in bold) on the *IT leading* factor is given in the first six rows of the column labelled *IT leading* . The loadings of these six measures with respect to other factors such as *IT planning*, IT organising, *IT controlling* and *external expertise* are given under respective columns. Going row by row, it can be seen that each measure loads more heavily on its associated factor than on other factors, with the singular exception of measure MGT19 under the *IT controlling* factor. Considering that five other measures (MGT14, MGT15,.MGT17, MGT18, MGT28) of *IT controlling* pass this test, measures of this factor also can be accepted as having adequate discriminant validity. Therefore, according to this criteria, it could be concluded that in general, the instrument held discriminant validity.

7.8.3.3 Comparison of AVE with the variance shared between the construct and the other constructs

The 'correlation matrix' of the five significant factors related to the *MangSo* Model derived using the split-sample [A], with square root of AVE as diagonal elements are shown in Table 7.12. It was observed that the diagonal elements were greater than the off-diagonal elements in the corresponding rows and columns, which confirms the discriminant validity of the respective measures pertaining to the major factors representing IT management sophistication in the *MangSo*-A model.

Factors/ Measures	IT leading	IT planning	IT Organising	External Expertise	IT Controlling
IT leading					
MGT13	**0.876**	0.589	0.349	0.279	0.615
MGT16	**0.684**	0.556	0.300	0.311	0.543
MGT21	**0.812**	0.459	0.500	0.317	0.543
MGT22	**0.774**	0.529	0.464	0.345	0.583
MGT29	**0.554**	0.460	0.230	0.304	0.471
MGT23	**0.635**	0.426	0.459	0.380	0.525
IT planning					
MGT01	0.467	**0.588**	0.186	0.327	0.503
MGT02	0.366	**0.692**	0.151	0.237	0.468
MGT04	0.431	**0.885**	0.339	0.334	0.608
MGT05	0.439	**0.565**	0.283	0.368	0.380
MGT06	0.617	**0.836**	0.379	0.357	0.635
MGT07	0.530	**0.665**	0.199	0.302	0.542
MGT08	0.581	**0.731**	0.254	0.417	0.587
IT organising					
MGT11	0.319	0.231	**0.538**	0.212	0.312
MGT20	0.309	0.212	**0.742**	0.155	0.226
MGT25	0.426	0.340	**0.730**	0.355	0.427
MGT30	0.358	0.298	**0.410**	0.354	0.354
External Expertise					
MGT09	0.240	0.327	0.350	**0.854**	0.296
MGT10	0.380	0.377	0.223	**0.768**	0.360
IT controlling					
MGT14	0.628	0.640	0.264	0.306	**0.739**
MGT15	0.578	0.584	0.466	0.400	**0.695**
MGT17	0.385	0.433	0.452	0.292	**0.608**
MGT18	0.450	0.344	0.332	0.273	**0.600**
MGT19	0.561	0.566	0.458	0.233	**0.564**
MGT28	0.510	0.585	0.376	0.226	**0.773**

Table 7.11 Component Structure Matrix of *MangSo*-A model

	IT leading	IT planning	IT controlling	IT organising	External Expertise
IT leading	**0.729**				
IT planning	0.385	**0.718**			
IT controlling	0.487	0.528	**0.667**		
IT organising	0.271	0.151	0.222	**0.620**	
External expertise	0.137	0.184	0.158	0.129	**0.812**

(Note: The diagonal elements are the square root of AVE)

Table 7.12 Correlation of Constructs of *MangSo*-A Model

7.9 Validation of *MangSo* Model Estimates

As identified in the data analysis plan, the estimates of *MangSo*-A model derived using the data set of split-sample [A] was revalidated using the data set of the split-sample [B]. This was a significant step of the instrument development process, where the validity and reliability of the factors that characterised the construct and their respective measures could be established (or refuted) using two separate samples. This could also be seen as a point of strength with respect to using PLS analytical techniques. PLS techniques provided for a rigorous analysis and was within the means of the researcher. Not only does the *PLS GRAPHICS* software supports faster analysis, but also relatively small sample sizes were sufficient for producing reliable results in PLS analytical techniques (Chin et al., 1996).

In this re-validation process the *MangSo*-A model derived previously with the split-sample [A] data set was reconstructed using the split-sample [B] to arrive at *MangSo*-B model. In the process of reconstruction no changes were made to the structure of the refined *MangSo*-A model (as given in Figure 7.4 on page 164) and the same latent variables and the respective measures[41] were retained in arriving at the *MangSo*-B model. However, instead of using the dataset of split-sample [A] for deriving PLS estimates of *MangSo*-A model (this was considered to be the potential model that represent the IT management sophistication in small business) the dataset of split-sample [B] was used to derive the *MangSo*-B model. In effect the only difference between *MangSo*-A and B models was the use of two distinct datasets (split-samples [A] and [B]) for derivation of the PLS model. As detailed in chapter 6, the datasets of the two split-samples [A] and [B] were derived by a random process to obtain two similar samples from the full data set of the survey (see page 145).

Subsequently, the assessment process adopted in examining the validity and reliability were repeated with the *MangSo*-B model. The aim of this re-validation process was to examine the similarities and differences in the characteristics of potential model derived using the spilt-sample [A] and the split-sample [B]. The extent to which the PLS estimates of both models were similar, was an indication the strength of the potential model for explaining the IT management sophistication in small business construct.

This section presents the results of the analysis of the structural model and the measurement model of the reconstructed *MangSo*-B model. It may be noted that further improvements to the *MangSo* model were not attempted in the process, since the objective was to examine as to whether the validity and reliability estimates derived by *MangSo*-B model confirms the *MangSo*-A estimates.

7.10 *MangSo*-B Model: Graphical Representation

The graphical representation of *MangSo*-B model is given in Figure 7.6 (see Appendix 13 for the respective *PLS-GRAPH* output). Comparison of the two models *MangSo*-A and *MangSo*-B revealed that the distribution of factor loadings of measures, path

[41] The latent variables and the respective measures were:
(a) IT planning measured by MGT01, MGT02, MGT04,MGT05, MGT06,MGT07 and MGT08,
(b) IT leading measured by MGT13, MGT16, MGT21, MGT22, MGT23 and MGT29
(c) IT controlling measured by MGT14, MGT15, MGT17, MGT18, MGT19 and MGT28
(d) IT organising measured by MGT11, MGT20, MGT25 and MGT30

coefficients and R^2 values were quite similar and the second model strengthened the findings of the previous model assessment.

Results of the detailed analyses of *MangSo*-B model are given next. Since the statistical tests and the results reported in this section were quite similar to the *MangSo*-A model assessment, only the outputs and salient features are briefly discussed.

(e) External expertise measured by MGT09 and MGT10 .

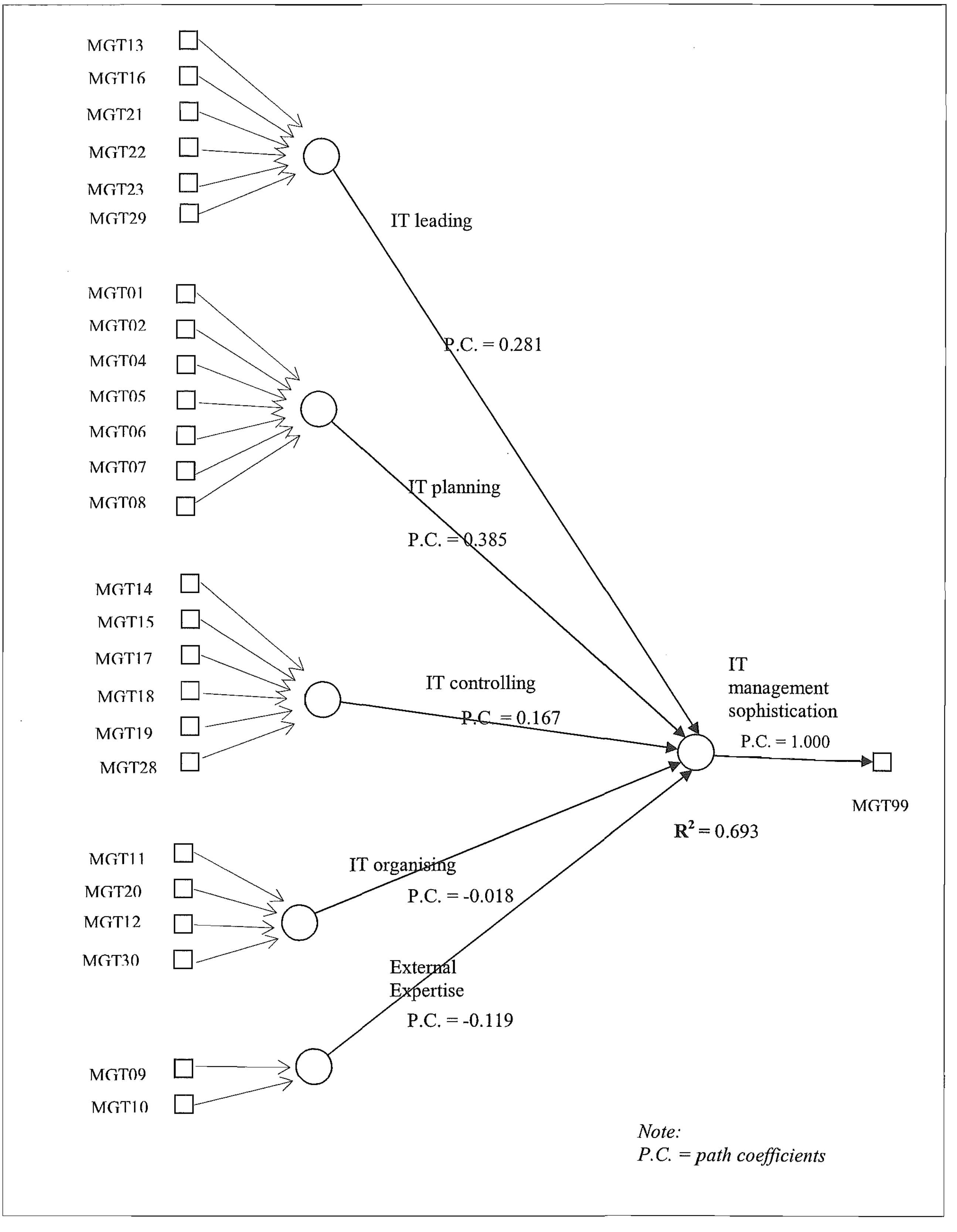


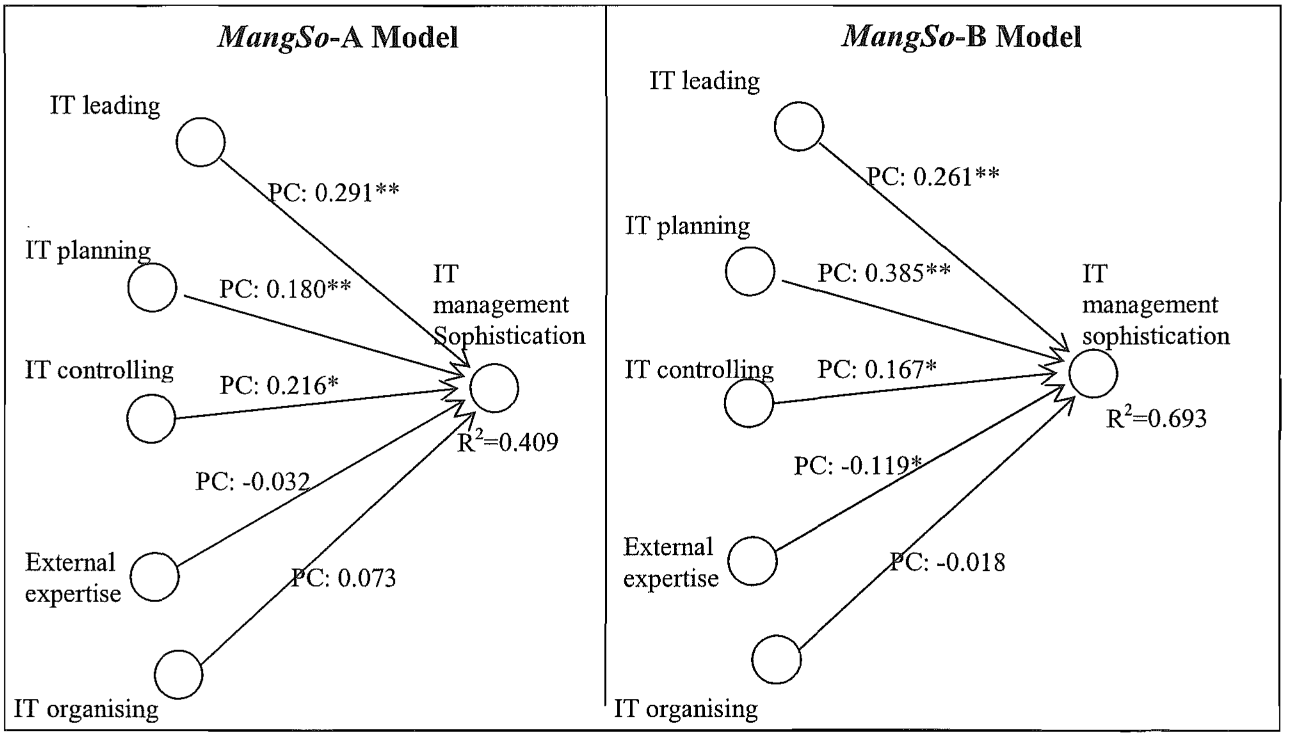
Figure 7.6 Graphical Representation of *MangSo*-B Model

7.11 *MangSo*-B Structural Model – Predictive Power

The R^2 value of the IT management sophistication latent variable of *MangSo*-B model was 0.693. This was a significantly high value which indicated over 69% of the variance has been explained by the underlying factors. The comparative R^2 of *MangSo*-A was 0.409 and this re-assessment thoroughly confirmed the previous finding with respect to predictive power of the model.

7.11.1 Path Coefficients

The path coefficients of *MangSo*-B model are compared with *MangSo*-A model estimates in Figure 7.7 and Table 7.13.



***p < 0.001, **p < 0.01, *p <0.05 (see Tables 7.13 for probability values).

PC: path Coefficient

Figure 7.7 Path Coefficients of *MangSo*-A and *MangSo*-B models

Results of the verification exercise of *MangSo*-B model confirmed the previous finding that *IT planning*, *IT leading* and *IT controlling* were factors that substantially explain the IT management sophistication in small business construct. In the *MangSo*-B, not only did the path coefficients of these three latent variables exceeded the minimum acceptable level (i.e. 0.1) but also, all three were found to be statistically significant. The *external expertise* factor emerged as statistically significant in the *MangSo*-B model. The factor related to *IT organising* was not statistically significant in both samples.

Factor	Split-Sample [A]		Split-Sample [B]	
	Path Coefficient	Probability for t-distribution	Path Coefficient	Probability for t-distribution
IT planning	0.180	0.112	0.385	0.001
IT leading	0.291	0.018	0.281	0.008
IT controlling	0.216	0.044	0.167	0.026
	0.073	0.497	-0.018	0.822
External expertise	-0.032	0.653	-0.119	0.044

Table 7.13. Path Coefficients and their Significance (*MangSo*-A and *MangSo*-B)

The inconsistency with respect to the positive factor loadings the negative path coefficient of the *external expertise* factor has been cleared with the results of the split-sample [B] analysis. However, a similar problem can be seen with respect to the IT organising factor in the split-sample [B] analysis (path coefficient being -0.018 and but the factor loadings were positive). As indicated earlier, although a clear explanation of this behaviour is not possible at this stage, this result also emphasises the fact that further research is needed to be able to make firm decisions on these two factors and the associated measures.

7.12 *MangSo*-B: Measurement Model

The factor loadings of individual measures and their significance of *MangSo*-B measurement model are given in Table 7.14.

Latent variable	Measure	Loading	Significance
IT leading	MGT13	0.8937	p <0.001
	MGT16	0.6806	p <0.001
	MGT21	0.7417	p <0.001
	MGT22	0.7325	p <0.001
	MGT29	0.6599	p <0.001
	MGT23	0.6231	p <0.001
IT planning	MGT01	0.7025	p <0.001
	MGT02	0.7859	p <0.001
	MGT04	0.7377	p <0.001
	MGT05	0.7957	p <0.001
	MGT06	0.8032	p <0.001
	MGT07	0.4779	p <0.001
	MGT08	0.6517	p <0.001
IT Controlling	MGT14	0.7936	p <0.001
	MGT15	0.8114	p <0.001
	MGT17	0.4215	p <0.001
	MGT18	0.3478	p <0.001
	MGT19	0.8251	p <0.001
	MGT28	0.7952	p <0.001
IT organising	MGT11	0.5244	p <0.001
	MGT20	0.5037	p <0.001
	MGT25	0.6913	p <0.001
	MGT30	0.8079	p <0.001
External expertise	MGT09	-0.8079	p <0.001
	MGT10	-0.8152	p <0.001

p = Probability for t-distribution.

Table 7.14 Factor Loadings and their Significance (*MangSo*-B)

The comparison of magnitude of loading and the respective probability values in tables 7.8 (*MangSo*-A model) and 7.14 (*MangSo*-B model) indicated that both models derived using the split-samples [A] and [B] behave in a quite similar manner. All loading were in the acceptable range (i.e. greater than 0.3) and were significant at 0.001 probability level. In the case of *IT leading* factor, all measures had loadings greater than 0.6 and were even stronger than the *MangSo*- model estimates. The loadings of measures of *IT planning* factor were also generally higher in the *MangSo*-B model with the exception of MGT07 (Loadings of 0. 0.665 in *MangSo*-A and 0.478 in *MangSo*-B). The loadings of MGT 17 and MGT18 related to the *IT controlling* factor were somewhat weaker in the *MangSo*-B model (ie. *MangSo*-A: MGT17 = 0.609 and MGT18 = 0.600; *MangSo*-B: MGT17 = 0.422 and MGT18 = 0.348). The loadings of measures of the two factors - *IT organising* and *external expertise* - were generally higher in the *MangSo*-B in comparison to *MangSo*-A. Overall, these PLS estimates of *MangSo*-B model reconfirmed the validity of the potential model representing IT management sophistication in small business, and thereby its reliability was established.

7.12.1 Individual Item Reliability

The factor loadings of all measures in the *MangSo*-B measurement model were statistically significant at the 0.001 probability level. These results reconfirmed the findings based on the *MangSo*-A model with respect to individual item reliability. In effect, a higher level of significance was observed with respect to the two variables MGT11 and MGT30 in this model validation exercise. This was a clear indication that the measures fall within the acceptable limits and they substantially capture the variability of latent variables.

7.12.2 Internal Consistency

Composite reliability of the five factors investigated in *MangSo*-A model were computed with *MangSo*-B Model in order to examine their internal consistency. (See Table 7.15 to compare the composite reliability of the respective factors of the two models. The computation details are given in Appendices 12 and 14). These results confirmed the previous finding that the five factors – *IT leading, IT planning, IT controlling, IT organising* and *external expertise* - demonstrated internal consistency. The composite reliability of all factors exceeded acceptable level of 0.7.

Factor	Composite Reliability[42]	
	MangSo-A	*MangSo*-B
IT leading	0.8693	0.8690
IT planning	0.8795	0.8779
IT controlling	0.8262	0.8373
IT organising	0.7037	0.7318
External expertise	0.7945	0.7942

Table 7.15 Composite Reliability of Significant Factors (*MangSo*-A and *MangSo*-B)

7.12.3 Discriminant Validity

The discriminant validity of the measures of the *MangSo*-B model was examined using the three approaches[43], as was done in the previous assessment.

7.12.3.1 Magnitude of Average Variance Extracted

Table 7.16 compares the AVE of each factor represented the *MangSo*-A with the re-analysis of the same model with split-sample [B] data set (The computation details are given in Appendices 12 and 14).

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$$\text{Composite Reliability} = \frac{(\Sigma\lambda_{yi})^2}{(\Sigma\lambda_{yi})^2 + \Sigma \mathrm{Var}(\epsilon_j)}$$

Where $\mathrm{Var}(\epsilon_j) = 1-\lambda_{yi}^2$ and λ_{yi} are respective loadings

43 See section 7.8.3 on page 176 for details.

These results confirmed the previous findings which clearly demonstrated the discriminant validity of three factors – *IT leading*, *IT planning* and *external expertise.* As far as the *IT controlling* factor was concerned, the AVE in the split-B model (i.e. 0.4833) was observed to be higher than that of the *MangSo*-A, and was closer to the acceptable level of 0.5. The discriminent validity of *IT organising* shown to be poor in both analyses (i.e. split-sample [A] and split-sample [B]).

Factor	AVE[44]	
	MangSo-A	*MangSo*-B
IT leading	0.5312	0.5287
IT planning	0.5162	0.5124
IT controlling	0.4453	0.4833
IT organising	0.3847	0.4148
External expertise	0.6598	0.6586

Table 7.16 Comparison of AVE of Significant Factors (*MangSo*-A and *MangSo*-B)

7.12.3.2 Comparison of Loadings

The component structure matrix of the *MangSo*-B model is given in Table 7.17. It was observed that all measures passed the third test of discriminant validity and reconfirmed the findings based on *MangSo*-A model. Considering the above criteria, it could be concluded that the instrument held discriminant validity.

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$$\text{AVE} = \frac{\Sigma\lambda_{yi}^{2}}{\Sigma\lambda_{yi}^{2} + \Sigma \mathrm{Var}(\epsilon_j)}$$

Where $\mathrm{Var}(\epsilon_j) = 1-\lambda_{yi}^{2}$ and λ_{yi} are respective loadings

Factors/ Measures	IT leading	IT planning	IT Controlling	IT organising	External Expertise
IT leading					
MGT13	**0.894**	0.690	0.641	0.589	-0.503
MGT16	**0.681**	0.650	0.616	0.466	-0.340
MGT21	**0.747**	0.662	0.528	0.487	-0.391
MGT22	**0.741**	0.657	0.538	0.482	-0.399
MGT29	**0.660**	0.609	0.456	0.544	-0.410
MGT23	**0.623**	0.607	0.489	0.508	-0.359
IT planning					
MGT01	0.634	**0.703**	0.441	0.408	-0.394
MGT02	0.592	**0.786**	0.590	0.491	-0.339
MGT04	0.614	**0.738**	0.589	0.472	-0.322
MGT05	0.649	**0.796**	0.538	0.503	-0.390
MGT06	0.683	**0.803**	0.665	0.529	-0.364
MGT07	0.563	**0.478**	0.272	0.342	-0.380
MGT08	0.640	**0.652**	0.460	0.465	-0.517
Controlling					
MGT14	0.639	0.582	**0.794**	0.393	-0.305
MGT15	0.613	0.600	**0.811**	0.493	-0.390
MGT17	0.357	0.387	**0.422**	0.342	-0.214
MGT18	0.240	0.253	**0.348**	0.186	-0.266
MGT19	0.577	0.601	**0.825**	0.481	-0.400
MGT28	0.563	0.599	**0.795**	0.580	-0.339
IT Organising					
MGT11	0.408	0.401	0.291	**0.524**	-0.437
MGT20	0.350	0.386	0.315	**0.508**	-0.236
MGT25	0.458	0.434	0.498	**0.631**	-0.421
MGT30	0.533	0.479	0.457	**0.808**	-0.376
External Expertise					
MGT09	0.487	0.405	0.344	0.482	**-0.808**
MGT10	0.418	0.426	0.373	0.404	**-0.815**

Table 7.17 Component Structure Matrix of *MangSo*-B Model

7.12.3.3 Comparison of AVE with the variance shared between the construct and the other constructs

The 'correlation matrix' of the five factors (used to create the *MangSo*-A refined model) related to the *MangSo* Model derived using the split-sample [B], with square root of AVE as diagonal elements are shown in Table 7.18. It was observed that average variance shared between a construct and its measures (i.e. diagonal elements) were greater than the variance shared between the construct and its measures (i.e. off diagonal elements). These results confirm that the measures of the major factors of IT management sophistication in *MangSo*-B demonstrate discriminant validity.

	IT leading	IT planning	IT Organising	IT Controlling	External expertise
IT leading	**0.727**				
IT planning	0.697	**0.716**			
IT organising	0.460	0.419	**0.644**		
IT controlling	0.534	0.540	0.375	**0.695**	
External expertise	0.310	0.262	0.297	0.195	**0.812**

(Note: The diagonal elements are the square root of AVE)

Table 7.18 Correlations of Constructs of *MangSo*-B Model

7.13 Confirmed Sub-dimensions of the IT Management Sophistication in Small Business Construct

Although the case study analysis suggested five factors as potential sub-dimensions of the IT management sophistication in small business construct, (see page .....), the survey data analysis confirmed the relevance and validity of only three of those factors, *IT leading, IT planning* and *IT controlling*. As discussed in section 7.5, the applicability of *IT organising* and *external expertise* was not strongly supported by the results of the survey data analysis. The issues raised by the data analysis using the split-sample [A] data set was not resolved with the subsequent analysis using the split-sample [B] data set. The path coefficients of these two factors remained substantially weak. Further investigation on these factors and the associated measures may be required, if these two factors are to be included in the model that characterises IT management sophistication in small business[45].

On the other hand the path coefficients of the three factors *IT leading, IT planning* and *IT controlling* were confirmed to be substantially high and statistically significant (see figure 7.7 on page 184). The R^2 values derived using both split-sample data sets remained substantially high (i.e. 0.409 and 0.693). This result confirmed that the three significant factors explain the variability of the IT management sophistication in small business construct to a very large extent. Accordingly, the three factors observed to be having a substantial influence in explaining the IT management sophistication in small business construct (i.e. *IT leading, IT planning* and *IT controlling*) were selected for the next stage of data analysis leading to construction of the overall model, and further investigation of validity and reliability of the associated measures.

7.14 Chapter Summary

This chapter presented the details of development and refinement of the *MangSo* model, the analysis of the *MangSo*-A model for its structural significance and, validity and reliability of associated measures, and their validation exercise using *MangSo*-B model. According to this investigation, the three latent variables *–IT leading, IT planning* and *IT controlling* of information systems - emerged as key factors that explain the IT management sophistication in small business. The contribution of the two factors, IT organisation and *external expertise*, towards explaining IT management sophistication in small business seems weak and therefore these factors may be excluded from the measurement model of the instrument measuring the construct. Further investigation into these factors is needed for arriving at firm conclusions.

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[45] A further discussion on applicability of these two factors (*IT organising* and *external expertise) is given on pages 192 and 221.*

The validity and reliability assessments of the measurement model and their reconfirmation demonstrated encouraging results. These matters will be further examined in the next chapter incorporating the *MangSo* model with the overall model which relates the four major variables investigated in this research namely, IT management sophistication, technological sophistication, informational sophistication and IT impact in the context of small business.

Chapter 8

Development and Assessment of the Overall Model

8.1 Chapter Overview

The previous chapter outlined the process of development and assessment of the *MangSo* model, being the first PLS model examined in this research. Subsequently, a comprehensive overall model aimed at understanding the effect of IT management sophistication, technical sophistication and informational sophistication towards IT impact in small business was developed. This chapter details the process of development of the overall model. As indicated in chapter 7, the previously derived *MangSo* model was incorporated into this overall model, along with the other three constructs.

Chapter Contents

8.2 Data Analysis Plan

The process of development and assessment of the overall model was guided by a predetermined plan, quite similar to the *MangSo* model development. In general, this data analysis plan which was aimed at the development (see Table 8.1) and assessment of the overall model mirrored the PLS development assessment plan used in the *MangSo* model given in Table 7.1 on page 155. Here too, the literature review and case study findings were used as the basis for theoretical background. The *MangSo* model (with its related measures) which represented the IT management sophistication construct derived previously was incorporated into the overall model. The measurement models related to the other three constructs were derived afresh using the respective measures in the survey instrument.

One major difference in this process is that the full data set of the survey responses is used for PLS analysis, instead of using the split-samples as in the case of previous analyses. The primary reason behind the use of two split-samples of the survey data set in two stages for the assessment and verification of the *MangSo* model is to maintain rigour in the validity and reliability assessment. Such an approach has been used by past researchers in the development and validation of a measurement instruments (Barclay 1991; DeVillis 1991; Cardigan, Dimantopoulos & Montanges, 1999). However, since the aim of development and investigation of this overall model is to understand the relationships of four identified constructs, such a rigorous approach is not required (e.g. Barclay et al., 1995; Chin, 1998-b have used a single step process for model development). On the other hand, it was observed that the results of the *MangSo* model analysis with two split- samples did converge and gave rise to a conclusive outcome.

Therefore, the full original data set which was used to derive the two split-samples was used to create and assess this overall model. This approach also provided for analysing the PLS models with a third perspective. The first and second using split-samples [A] and [B], and the third with the total sample. This method was seen as an extension of the use of split-samples to first develop PLS models and then to verify them. Since the overall model has been incorporated in the *MangSo* model, which was derived (and tested) previously, the final outcome of the analysis was expected to be well-founded. Accordingly, the full data set comprising of 254 records (i.e. split-samples [A] and [B] combined) was used in the development and assessment of the overall model.

Purpose	Method/Analysis
(a) Derive and refine the overall model representing the relationship of the four constructs investigated : • IT management sophistication • Technical sophistication • Informational sophistication • IT impact	• **Use the full data set comprising of 254 survey data records.** • Construct PLS model linking respective measures and latent variables on the basis of background theory/case study findings. As for the IT management sophistication construct, the *MangSo* model derived previously was to be incorporated. • Reflective/formative measures and exogenous/endogenous latent variables to be specified at this stage. • Compute model parameters (e.g. Factor loadings, path coefficients) using the PLS Graph software package. • Refine the PLS model
(b) Assess measurement model(s) of (factors of) four constructs.	• Assess individual item reliability of measures (i.e. examine loadings). • Assess internal consistency (i.e. compute composite reliability coefficients). • Assess discriminant validity (i.e. compute average variance extracted (AVE); compare squared correlations between constructs and AVE.
(c) Assess structural relationships of the overall model.	• Examine path coefficients, and residuals in the structural model • Examine statistical significance of the loadings and the path coefficients, using bootstrap re-sampling technique

Table 8.1 Data Analysis Plan: Overall Model

8.3 Background Theory: Overall Model

The background theory to identify and link the four constructs was presented in section 3.3 of Chapter 3 (pp. 51-55). The hypothesized overall model relating the four constructs is given in Figure 8.1.

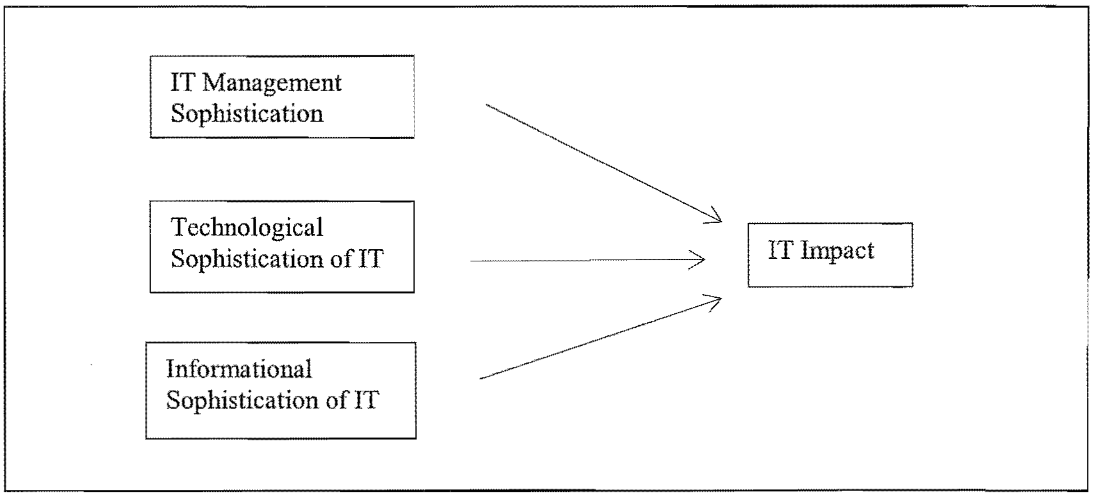


Figure 8.1. Hypothesised Research Model Linking IT Management Sophistication and IT Impact

The four constructs were derived using the respective measures in the survey instrument. As discussed in chapter 7 the *MangSo* model represented the IT *management sophistication* in small business construct. Similarly, the other three constructs – technological sophistication, informational sophistication and IT impact – were also derived using survey data (these three constructs: technological sophistication, informational sophistication and IT Impact were labelled as **TechSo, InfoSo** and **IMpact** respectively, for the purpose of PLS model development).

The process of developing the respective measurement models of these three variables is quite similar to that of *MangSo* model development. Therefore, only the final outcome of the PLS model development process is presented here, without detailing every step as was done in the previous chapter.

The measures used to derive each construct need to be identified before detailing the process of construction and analysis of the overall model. Since the measures of IT management sophistication construct were derived after a rigorous verification process as discussed in chapter 7, its confirmed sub-dimensions (i.e. *IT planning, IT leading and IT controlling*) and the associated measures were retained without amendments. The measures of IT impact, technical sophistication and informational sophistication are presented next.

8.4 Measures of IT Impact

The measures of the IT impact were derived from questions 1 and 2 in part three of the survey questionnaire. As detailed in section 6.3.3 of chapter 6, these measures were based on the previously tested instruments of Thong et al. (1996) and Thong et al. (1997). (See page 135). The variable names used in PLS analysis, the item statements and the reference to the survey questionnaire are given in Table 8.2.

Variable Name	Item statements	Question No. (Part Three)
PROFT	The impact of IT on increasing firm's pre-tax profit	1(a)
REVNU	The impact of IT on increasing firm's revenue	1(b)
STAPR	The impact of IT on improving staff productivity of the firm	1(c)
COMAD	The impact of IT on strengthening competitive advantage of the firm	1(d)
OPCST	The impact of IT on reducing firm's operating costs	1(e)
DECMK	The impact of IT on improving quality of decision making	1(f)
OVALL	The impact of IT on improving overall firm performance	1(g)
OEFTV	Overall effectiveness of the IT system	2

Table 8.2 Measures of IT Impact

Two out of these eight measures referred to "the impact of IT on improving overall firm performance" (OVALL) and "overall effectiveness of the IT system" (OEFTV) were aimed at capturing the overall impact of the IT system. Since the aim of the PLS model construction at this stage of analysis was not to derive a separate model for explaining the IT impact construct as in the case of IT management sophistication, these two overall measures (i.e. OVALL or OEFTV) were not used at this stage of analysis.

8.5 Measures of Technological Sophistication and Informational Sophistication

As detailed in chapter 6, the sophistication of IT use was conceptualised under two latent variables namely technological sophistication and informational sophistication. This conceptualisation was based on the IT sophistication model proposed by Raymond et al. (1992) and the respective measures were developed accordingly (see pages 131 and 134 for details).

The variable names, that were used in PLS model development, related to the measures of these two latent variables and the associated indicators with the respective question numbers in the survey questionnaire are given in tables 8.3 and 8.4 respectively.

Variable Name	**Item Statement**	**Question No.** (Part two)
TECNO	Number of technologies used	1
ACCNO	Number of accounting applications used	2 section a
OTTNO	Number of other applications used	2 Section b
WKSNO	Number of workstations	3
CUSTM	Extent of customisation of the standard software packages	5
EXPSP	The extent of exporting data electronically from primary accounting software to spreadsheet applications	7(a)
EXPOT	The extent of exporting data electronically from primary accounting software to any other applications	7(b)

Table 8.3 Measures of Technological Sophistication

Variable Name	**Item Statement**	**Question No.** (Part two)
CNTRL	Extent of use of computer systems for controlling/guiding	6(a)
BUDGT	Extent of use of computer systems for budgeting	6(b)
ANLYS	Extent of use of computer systems for analysing problems	6(c)
TREND	Extent of use of computer systems for analysing trends	6(d)
RATIO	Extent of use of computer systems for analysing ratios	6(e)
PLANG	Extent of use of computer systems for planning /forecasting	6(f)

Table 8.4 Measures of Informational Sophistication

8.6 Development of the Overall Model

The overall model comprised of four key constructs, namely, IT management sophistication, technological sophistication, informational sophistication and IT impact. Of the above four latent variables, IT impact was modelled as an endogenous variable going by the hypothesized model as shown in Figure 8.1. An iterative process was followed in the construction of overall model, similar to the *MangSo* model development. The graphical representation of the final version of the overall model is presented in Figure 8.2 (see Appendix 15 for the *PLS-GRAPH* output) and the salient aspects of model development are outlined next.

8.6.1 IT Management Sophistication Latent Variable

As for IT management sophistication, the structure of *MangSo* model derived previously was adopted. Since only the three factors of *IT leading*, *IT planning* and *IT controlling* were found to have a substantial role in explaining the IT management sophistication construct, only they were retained in the final model (see page 204). Furthermore, the measurement models of these three factors were also retained without further modifications, since they had been subjected to rigorous analysis. The only difference in construction of the *MangSo* model component of this overall model compared to the previous analysis was the use of the full data set (with 254 records) instead of two split-samples containing 127 records each.

8.6.2 Informational Sophistication Latent Variable

Initially, all six measures identified by the qualitative analysis (as seen in Table 8.4) which are supposed to be representing the informational sophistication latent variable were incorporated in the model as formative variables. However, examination of the loadings of the PLS model (see Table 8. 5) indicated that all measures are not quite coherent. The factor loading of the measure CNTRL was observed to be much lower (i.e. 0.399) when compared to all others and this measure was not consistent with others. The rest of the measures were found to be reasonably consistent and were within a closer range, with the two measures, ANLYS and BUDGT, showing higher factor loadings.

The measure CNTRL deals with the extent of use of computer systems for controlling/guiding the accounting practices and procedures in the CA firms. CA firms being traditionally strong in controlling of its procedures and resources it may be that the impact associated with using IT for this aspect in these firms may be not very significant. Furthermore, the factor loadings of five other measures were quite strong and were coherent. Therefore, it was decided to eliminate the measure CNTRL from the model considering that the other five variables were sufficient to measure the informational sophistication latent variable.

Measure	Factor loading
CNTRL	0.399
BUDGT	0.836
ANLYS	0.892
TREND	0.661
RATIO	0.731
PLANG	0.658

Table 8.5 PLS Estimates of the Measures of Informational Sophistication

8.6.3 Technological Sophistication Latent Variable

The technological sophistication latent variable was modelled initially with all seven formative measures as shown in Table 8.3. (Factor loadings of these measures in the PLS model are given in Table 8.6.) It was observed that the loadings of all seven measures were not consistent, indicating that either some of these measures did not represent the technological sophistication latent variable or there may be flaws in defining the latent variable with these measures.

Measure	Factor loading
TECNO	0.795
ACCNO	0.467
OTTNO	0.547
WKSNO	-0.047
CUSTM	0.392
EXPSP	0.291
EXPOT	0.510

Table 8.6 PLS Estimates of the Measures of Technological Sophistication

The poor loading of -0.047 of the measure WKSNO (number of workstations) could be an indication that the number of workstations was not a suitable measure of technological sophistication in small firms in today's context, although this would have been a reasonable measure when Raymond and Pare (1992) initially identified designed these measures. Networking was not common in small firms at that time. With the introduction of network technology and the other later developments of computer technology such as portable computers, the number of workstations may not be regarded as an indication of technological sophistication. The CA firms investigated in this survey may therefore not provide the required variability for this measure to show a significant factor loading. Therefore, the measure WKSNO was dropped from the model.

The factor loading of the measure EXPSP was also quite low (i.e. 0.291) compared to other measures. Since both measures EXPOT and EXPSP were representing the same underlying concept (i.e. data exchange between software packages) the latter was dropped in the process of refining the model. Although the measure CUSTM also demonstrated a somewhat lower factor loading (0.401), this was retained since no other measure in the model represented this notion of customisation of software.

The five respective measures retained in the improved model (i.e. TECNO, ACCNO, OTTNO, CUSTM and EXPOT) were deemed to be representing the technological sophistication latent variable. However, it was observed that the factor loadings of measures representing technological sophistication (see Table 8.6.) were not quite consistent compared to the measures of other latent variables in this study. For example, the range between the highest and the lowest factor loadings of the measures of technological sophistication latent variable (i.e. TECNO with 0.832 and CUSTOM with 0.410) was considerably higher compared to similar evaluation of the IT impact latent variable (i.e. factor loadings of REVNU : 0.823 and OPCST : 0.696). This indicated that the measures representing technological sophistication may need further refinement. However, as observed earlier, precise measurement of technological sophistication was not the major objective of this research. Furthermore, taking into account that the model so derived was adequate for the purpose of this research, no further refinement of these measures and the overall model was attempted at this stage.

8.6.4 IT Impact Latent Variable

The IT impact latent variable was modelled with six indicators as given in Table 8.2. These were identified as reflective variables. The presumption was that a change of the IT impact latent variable in a particular direction gives rise to variability towards the same direction of all six measures of business performance. For example, all six measures would positively reflect if the level of *IT impact* improves. On the other hand if lower level of IT impact is observed, all measures would reflect negatively. The factor loadings of these six measures were quite high and fall within a close range, lying between 0.699 and 0.822.

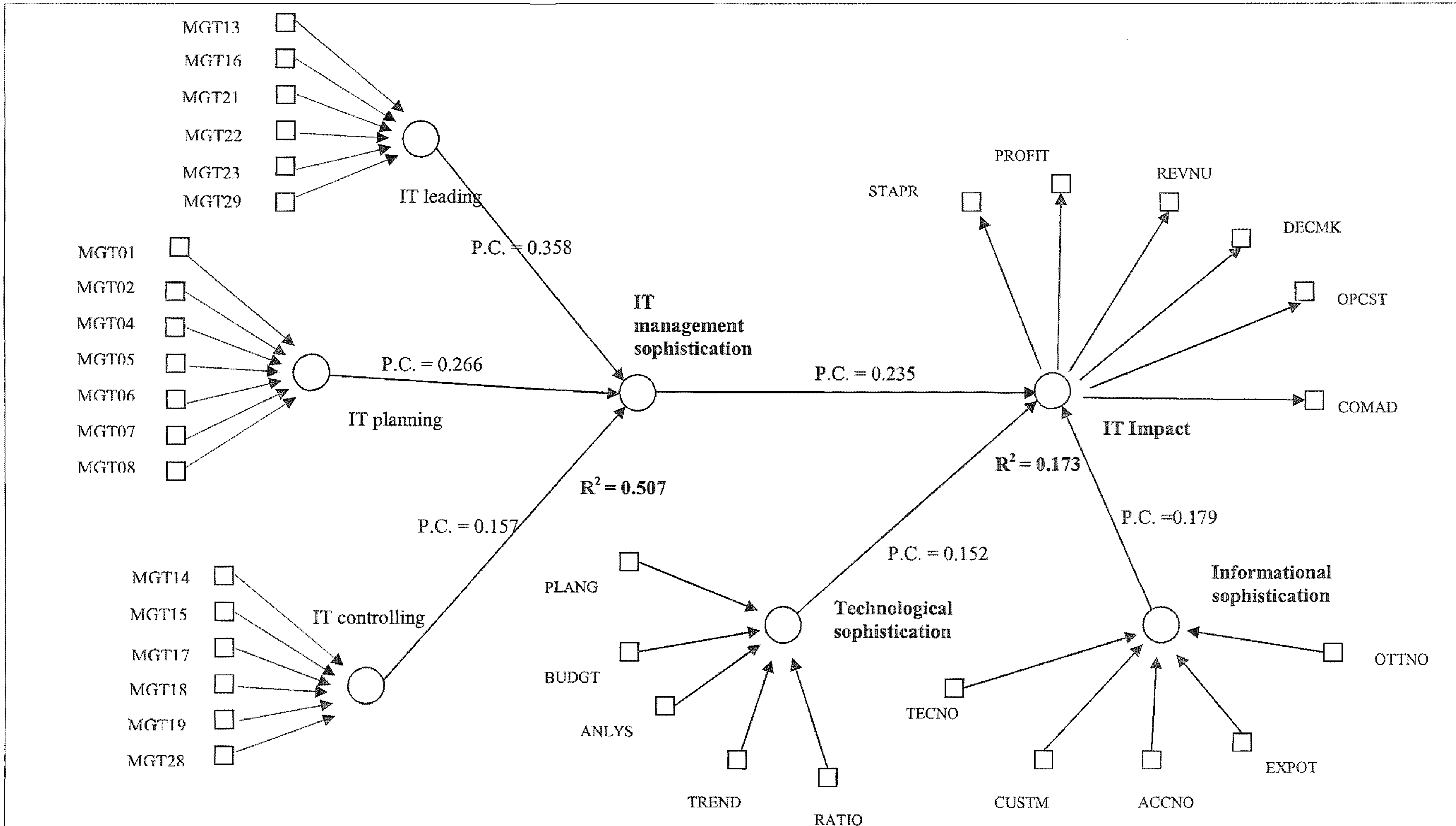


Figure 8.2 Graphical Representation of the Overall Model

8.7 Assessment of Overall Model: Structural Relationships

As identified in the data analysis plan, the overall model was analysed for validity and reliability of measures and the significance of the structure. This analytical process was quite similar to the *MangSo* model assessment. Therefore, the results of the data analysis are presented without elaborating on the techniques used.

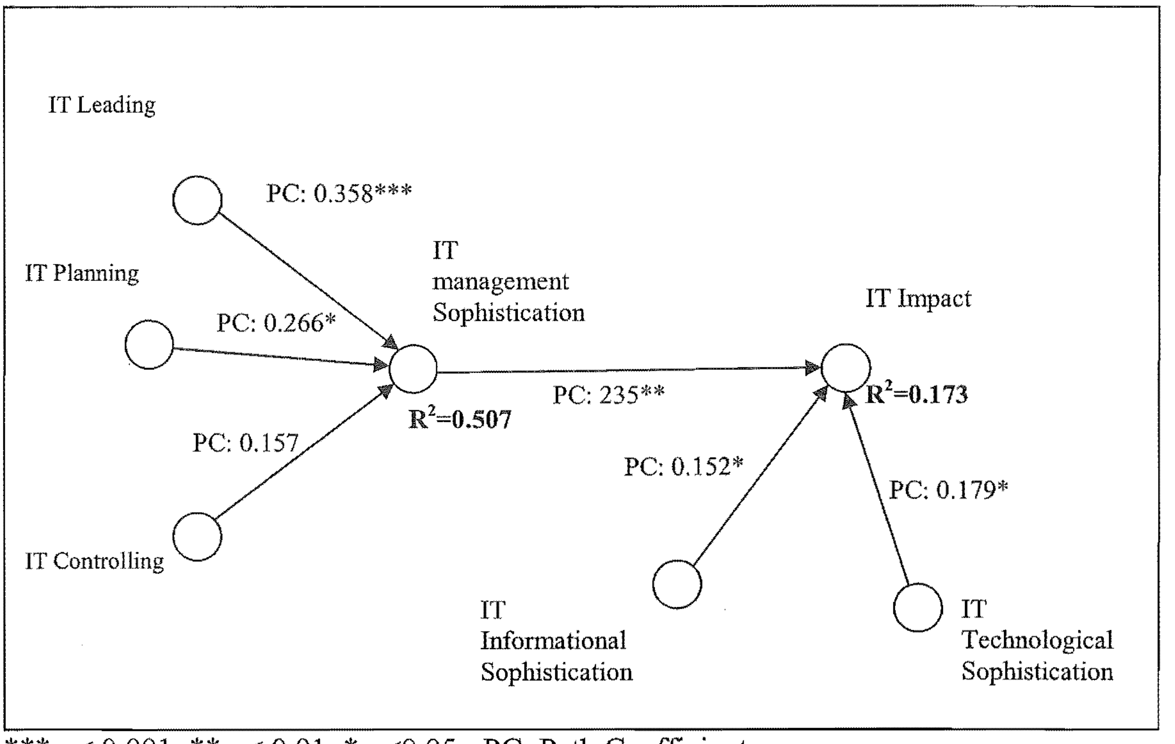
8.7.1 Predictive Power

The R^2 value with respect to the IT management sophistication latent variable in the overall model derived using the combined data set was 0.507 (see Figure 8.3). This value was comparable with the R^2 values of *MangSo*-A ($R^2 = 0.409$) and *MangSo*-B ($R^2 = 0.693$) models. This result also indicated that over 50% of the variance has been explained by the three significant factors (*IT leading*, *IT planning* and controlling) identified in the earlier models.

Given that a large number of factors could influence IT impact, and considering that this was an emerging model in theory development rather than theory testing, the R^2 of 0.173 with respect to IT impact was also substantial (Barclay et al., 1994).

8.7.2 Path Coefficients

The path coefficients of the overall model are shown in Figure 8.3 (also see Table 8.7). As far as the three factors characterising the IT management sophistication latent variable were concerned, all path coefficients fall within the acceptable range of greater than 0.1 (i.e. *IT leading* =0.358, *IT planning* =0.256, *IT controlling* =0.157). The boot strap t-statistic calculation further strengthened this assertion with statistically significant path coefficients of *IT leading* and *IT planning* being recorded. These observations reconfirm the previous finding that these three factors have a substantial effect in explaining the IT management sophistication latent variable.



***p < 0.001, **p < 0.01, *p <0.05 PC: Path Coefficient

Figure 8.3 Structural Relationships of the Overall Model

The effect of the three exogenous latent variables depicted in the overall model on IT impact was also clearly substantiated with the respective path coefficients (i.e. IT management sophistication = 0.235, technological sophistication = 0.179 and the informational sophistication = 0.152) being greater than 0.1 and statistically significant.

Factor/Latent Variable	Path Coefficient	Probability for t-distribution
IT planning➔ IT management sophistication	0.266	0.0186
IT leading ➔ IT management sophistication	0.358	0.0009
IT controlling➔ IT management sophistication	0.157	0.0067
IT management sophistication ➔ IT Impact	0.235	0.0011
Technological sophistication➔ IT Impact	0.179	0.0142
Informational sophistication ➔ IT Impact	0.152	0.0468

Table 8.7. Path Coefficients and their Significance (Overall Model)

8.8 Assessment of Overall Model: Measures

As indicated previously, the four key latent variables were IT management sophistication, IT impact, technological sophistication and informational sophistication. The IT management sophistication latent variable was characterised by three factors – *IT leading*, *IT planning* and *IT controlling*. Therefore, altogether six measurement models represented the overall model. The factor loadings of these individual measures and their significance with respect to the latent variables are given in Table 8.8.

Latent variable/factors		Measure	Loading	Significance
IT management sophistication	IT leading	MGT13	0.8957	p <0.001
		MGT16	0.6983	p <0.001
		MGT21	0.7876	p <0.001
		MGT22	0.7643	p <0.001
		MGT29	0.6177	p <0.001
		MGT23	0.6426	p <0.001
	IT planning	MGT01	0.6683	p <0.001
		MGT02	0.7657	p <0.001
		MGT04	0.8181	p <0.001
		MGT05	0.7392	p <0.001
		MGT06	0.8259	p <0.001
		MGT07	0.5661	p <0.001
		MGT08	0.6886	p <0.001
	IT controlling	MGT14	0.8010	p <0.001
		MGT15	0.7811	p <0.001
		MGT17	0.5199	p <0.001
		MGT18	0.4824	p <0.001
		MGT19	0.7135	p <0.001
		MGT28	0.8165	p <0.001
IT impact		DECMK	0.7131	p <0.001
		STAPR	0.7369	p <0.001
		COMAD	0.7998	p <0.001
		OPCST	0.6964	p <0.001
		REVNU	0.8217	p <0.001
		PROFT	0.8106	p <0.001
Informational sophistication		BUDGT	0.8397	p <0.001
		ANLYS	0.8972	p <0.001
		TREND	0.6665	p <0.001
		RATIO	0.7354	p <0.001
		PLANG	0.6635	p <0.01
Technological sophistication		TECNO	0.8321	p <0.001
		ACCNO	0.4910	p <0.01
		OTTNO	0.5767	p <0.01
		CUSTM	0.4098	-----
		EXPOT	0.5326	p <0.05

p = Probability for t-distribution.

Table 8.8 Factor Loadings and their Significance (Overall Model)

8.8.1 Individual Item Reliability

The factor loadings of all measures in the measurement models of *IT leading* , *IT planning* and *IT controlling* which represented the IT management sophistication construct were substantially high and statistically significant at 0.001 probability level. These results reconfirmed the findings based on the *MangSo*-A and *MangSo*-B models with respect to individual item reliability.

The IT impact latent variable was represented by six measures and their factor loadings were substantially high (ranging from 0.69 to 0.82) and were statistically significant. This result demonstrates that the measures of IT impact were strong and acceptable.

Similarly, the five measures of informational sophistication were also strong and statistically significant. However, it appeared that certain measures (e.g. ANLYS = 0.89 and BUDGT= 0.83) obtained higher factor loadings compared to some others (e.g. PLANG and TREND in the range of 0.66).

The four measures of technological sophistication also fall within the acceptable range, three being statistically significant. Although these can be accepted as satisfactory measures to assess this construct, the loadings did not fall within a close range. Therefore, the power of these measures were not quite significant compared to the rest of the five latent variables investigated in this research.

8.8.2 Internal Consistency

Composite reliability of the six factors/latent variables investigated in the overall model are given in Table 8.9 (see Appendix 16 for detailed calculations). The composite reliability of all these factors exceeded the acceptable level of 0.7 and demonstrates internal consistency. These results also confirm the previous findings based on *MangSo* models that three factors of IT management sophistication (i.e. *IT leading*, *IT planning* and *IT controlling*) passed the test of internal consistency.

Latent variable /Factor		Composite Reliability[41]
IT management sophistication	IT leading	0.8775
	IT planning	0.8871
	IT controlling	0.8465
IT impact		0.8938
Informational sophistication		0.8750
Technological sophistication		0.7110

Table 8.9 Composite Reliability(Overall Model)

8.8.3 Discriminant Validity

Discriminant validity of the measures of the overall model were examined using the three approaches (see page 176), as in the previous assessment of the *MangSo* model. The criteria of these three approaches were based on (a) the magnitude of average variance extracted (AVE), (b) comparison of loadings of individual measures and (c) comparison of AVE with the variance shared between the construct and the other constructs.

8.8.3.1 Magnitude of Average Variance Extracted

Table 8.10 presents the AVE of the measures of three significant factors of IT management sophistication latent variable and the other three latent variables, IT impact, informational sophistication and technological sophistication of the overall model.

41

$$\text{Composite Reliability} = \frac{(\Sigma\lambda_{yi})^2}{(\Sigma\lambda_{yi})^2 + \Sigma Var(\epsilon_j)}$$

Where $Var(\epsilon_j) = 1 - \lambda_{yi}^2$ and λ_{yi} are respective loadings

Latent variable /Factor		AVE[42]
IT management sophistication	IT leading	0.5481
	IT planning	0.5322
	IT controlling	0.4884
IT impact		0.5847
Informational sophistication		0.5871
Technological sophistication		0.3435

Table 8.10 Average Variance Extracted (Overall Model)

As for the IT management sophistication latent variable, the two factors- *IT leading* and planning – clearly pass this test of discriminant validity, where the AVE was greater than 0.5. The factor *IT controlling* also demonstrated a AVE (i.e. 0.488 rounded to 0.5) very close to 0.5 acceptable level.

The AVE of IT impact and informational sophistication were well above the minimum 0.5 level and hence demonstrated discriminant validity. However, the AVE of technological sophistication was found to be less than the acceptable minimum level of 0.5. These results lead to further investigation towards ascertaining the level of discriminant validity of the technological sophistication latent variable.

8.8.3.2 Comparison of Loadings

The component structure matrix of the overall model is given in Table 8.11.

42

$$\text{AVE} = \frac{\Sigma\lambda_{yi}^2}{\Sigma\lambda_{yi}^2 + \Sigma \text{Var}(\epsilon_j)}$$

Where $\text{Var}(\epsilon_j) = 1-\lambda_{yi}^2$ and λ_{yi} are respective loadings

Latent variable/factors		Measures	IT leading	Planning	Controlling	IT impact	Informational sophistication	Technological sophistication
IT management sophistication	IT leading	MGT13	**0.899**	0.650	0.629	0.252	0.241	0.208
		MGT16	**0.698**	0.601	0.630	0.250	0.209	0.176
		MGT21	**0.791**	0.553	0.566	0.272	0.246	0.198
		MGT22	**0.767**	0.586	0.607	0.308	0.240	0.192
		MGT29	**0.618**	0.550	0.451	0.371	0.259	0.263
		MGT23	**0.643**	0.509	0.485	0.288	0.244	0.177
	IT planning	MGT01	0.566	**0.668**	0.483	0.283	0.265	0.309
		MGT02	0.505	**0.766**	0.544	0.205	0.322	0.293
		MGT04	0.533	**0.818**	0.634	0.243	0.309	0.337
		MGT05	0.538	**0.733**	0.452	0.306	0.288	0.314
		MGT06	0.660	**0.826**	0.651	0.318	0.250	0.343
		MGT07	0.574	**0.566**	0.429	0.214	0.241	0.327
		MGT08	0.610	**0.689**	0.524	0.378	0.322	0.405
	IT controlling	MGT14	0.622	0.603	**0.798**	0.184	0.214	0.260
		MGT15	0.594	0.583	**0.781**	0.197	0.219	0.241
		MGT17	0.355	0.407	**0.520**	0.130	0.212	0.136
		MGT18	0.345	0.313	**0.482**	0.152	0.146	0.208
		MGT19	0.575	0.553	**0.714**	0.211	0.132	0.153
		MGT28	0.533	0.582	**0.817**	0.210	0.285	0.291
IT impact		DECMK	0.315	0.363	0.207	**0.713**	0.360	0.257
		STAPR	0.263	0.228	0.174	**0.737**	0.117	0.135
		COMAD	0.281	0.290	0.213	**0.800**	0.258	0.304
		OPCST	0.184	0.232	0.179	**0.696**	0.125	0.167
		REVNU	0.241	0.287	0.211	**0.824**	0.191	0.272
		PROFT	0.205	0.255	0.168	**0.819**	0.163	0.206
Informational sophistication		BUDGT	0.238	0.347	0.205	0.243	**0.846**	0.403
		ANLYS	0.276	0.343	0.294	0.259	**0.897**	0.423
		TREND	0.271	0.325	0.287	0.193	**0.671**	0.391
		RATIO	0.295	0.325	0.316	0.212	**0.735**	0.405
		PLANG	0.251	0.347	0.225	0.193	**0.666**	0.428
Technological sophistication		TECNO	0.221	0.358	0.261	0.256	0.383	**0.832**
		ACCNO	0.163	0.233	0.157	0.149	0.356	**0.483**
		OTTNO	0.040	0.184	0.124	0.178	0.157	**0.577**
		CUSTM	0.180	0.243	0.216	0.128	0.264	**0.416**
		EXPOT	0.159	0.258	0.199	0.159	0.279	**0.518**

Table 8. 11 Component Structure Matrix (Overall Model)

According to this test the measures of a latent variable should be loaded heavily with that particular factor than with other factors. For example, the factor loadings of measures of *IT leading* factor (i.e. MGT13 =0.899, MGT16 =0.698 etc as highlighted in bold under "*IT leading* " column in Table 8.11) should be greater than the respective factor loadings of each row. It was observed that all measures passed the third test of discriminant validity and also reconfirmed the findings based on *MangSo* models. Considering the above criteria, it could be concluded that the instrument held discriminant validity.

8.8.3.3 Comparison of AVE with the variance shared between the construct and the other constructs

The 'correlation matrix' of the six significant factors of the overall model with square root of AVE as diagonal elements are shown in Table 8.12.

	IT leading	Planning	Controlling	IT impact	Informational sophistication	Technological sophistication
IT leading	**0.740**					
IT planning	0.546	**0.730**				
IT controlling	0.523	0.542	**0.699**			
IT impact	0.111	0.138	0.065	**0.765**		
Informational sophistication	0.090	0.146	0.091	0.082	**0.766**	
Technological sophistication	0.064	0.190	0.107	0.095	0.212	**0.586**

*(**Note**: AVE are given in the diagonal elements, bold)*

Table 8.12 AVE and Squared Correlations (Overall Model)

It was observed that the diagonal elements are greater than the off diagonal elements and this test confirms the results of the previous tests that demonstrated discriminant validity of measures related to the factors of this overall model, *IT leading*, *IT planning*, *IT controlling* IT impact, informational sophistication and technological sophistication.

8.9 Chapter Summary

This chapter outlined the development of the overall model and the analysis with respect to its structural significance, and validity and reliability of associated measures. These findings reconfirmed the outcomes of the data analysis related to the IT management sophistication models discussed in chapter 7. The three factors, *IT leading, IT planning* and *IT controlling* emerged again as significant in explaining the *IT management sophistication in small business* construct, and the related measures were found to be valid and reliable.

Furthermore, these results demonstrated the validity of the model relating IT management sophistication, technological sophistication and informational sophistication with IT impact. The validity and reliability of the respective measures of these variables were also established.

Chapter 9

Discussion of Findings

9.1 Chapter Overview

This chapter presents a discussion of the findings with a view to arriving at research conclusions. The outcomes of the literature review, case study investigations, survey, and the PLS data analysis of this research are brought together in this chapter. The discussion examines how well the research findings have satisfied the research objectives and also their relevance to past research findings.

Accordingly, the discussion deals with the three main objectives identified in this research, namely:

a. Definition of IT management sophistication in small business
b. Development of an instrument to measure the IT management sophistication in small business construct
c. Development of a preliminary model relating IT management sophistication, technological sophistication and informational sophistication, with IT impact.

As indicated previously the major emphasis of this research is on the first two objectives (a. and b. above). These two aims are closely related and PLS data analysis of the survey made it possible to address these issues simultaneously.

Chapter Contents

9.2 Characterisation of IT Management Sophistication in Small Business

The case study investigations and the literature review identified five factors – *IT planning, IT organising, IT controlling, IT leading and managing external expertise* – that potentially characterise IT management sophistication in small business. The large scale survey of small CA firms in New Zealand and the associated data analysis confirmed that three of these five major factors were significant (see Figure 9.1). They were *IT planning, IT leading and IT controlling.*

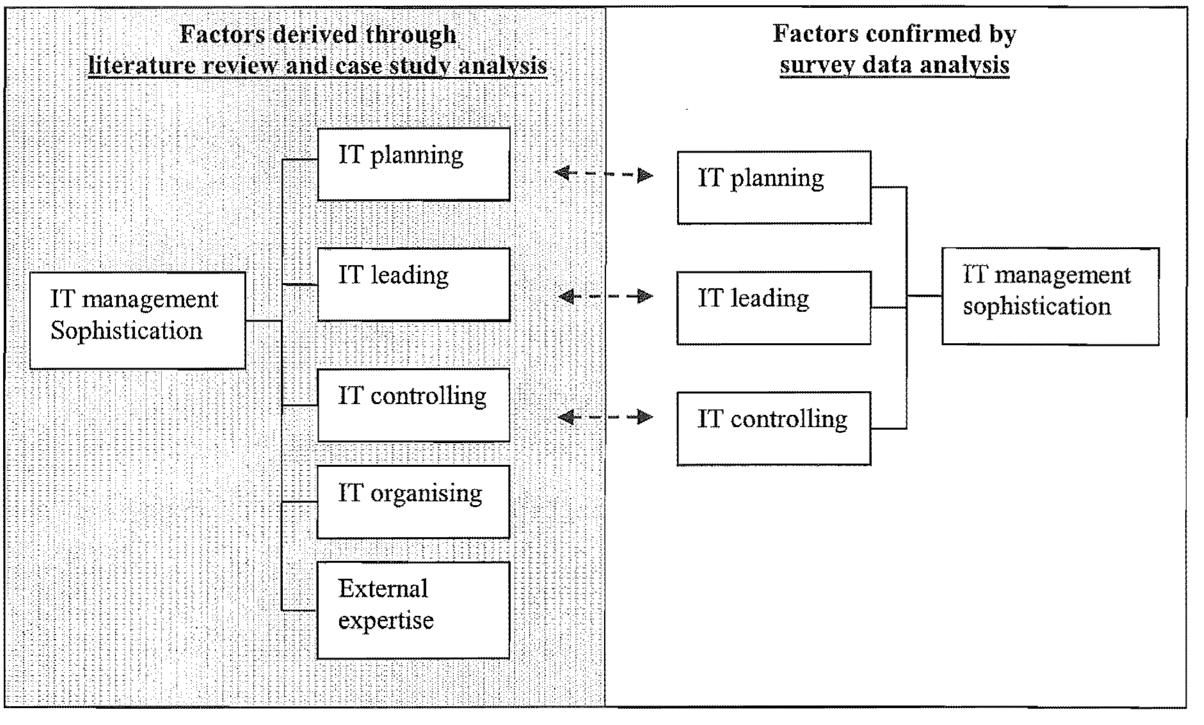
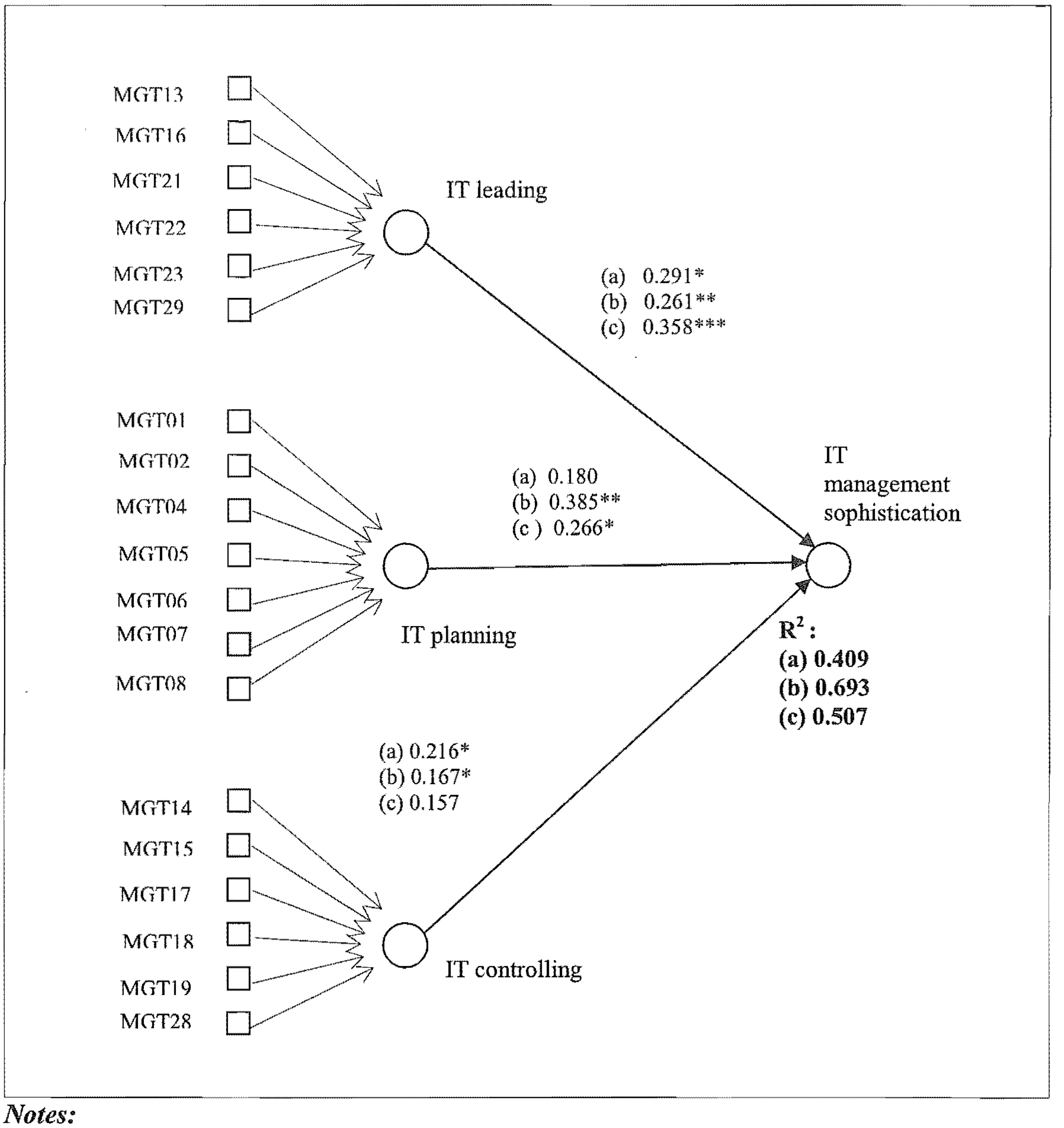


Figure 9.1 Major Factors of IT Management Sophistication

9.2.1 Sub-dimensions of *IT Planning, IT Leading* and *IT Controlling*

Results of the PLS model assessment (See Figure 9.2) strongly suggested that these three factors (i.e. *IT planning, IT controlling and IT leading*) in combination substantially explained the variability of the IT management sophistication construct. In the PLS model construction, the three factors *IT planning, IT leading and IT controlling* were linked as exogenous latent variables to the endogenous latent variable - *IT management sophistication*. The R^2 values of the PLS models derived using split-samples A and B, and the total data set were 0.409, 0.693 and 0.507 respectively. These high R^2 values suggested that a major proportion of the variability of IT management sophistication was explained by the three factors. The path coefficients were substantially high and statistically significant (see pages 185 and 206).



Notes:

(i) Path coefficients between exogenous latent variables and the endogenous latent variable are shown along with the arrow lines.

(ii) Three sets of indicators (a), (b) and (c) represent the PLS analyses that used split-sample A, split-sample B and the total data set respectively (see pages 161-192 for details).

*(iii) Statistical significance of path coefficients are indicated as: ***p< 0.001, **p<0.01, *p<0.05*

(iv) Individual measures of each factor are labelled with variable names used in PLS analysis (e.g. MGT01).

Figure 9.2 Characterisation of IT Management Sophistication in Small Business (Results of three PLS Analyses)

This finding that *IT planning, IT controlling* and *IT leading* are key aspects of IT management sophistication in small firms to a large extent conforms with past research findings. For example, *IT planning* and *IT controlling* have been identified as two major factors that determine IT management, by Earl (1989), Nolan (1973) and Guptha et al. (1997) in the context of large firms, and by Raymond and Pare (1992) in small businesses.

Although *IT leading* has not been regarded as a major sub-dimension of IT management by past researchers, quite a few have referred directly, or indirectly, to this aspect of managing information technology. For example, Feeny and Willcocks (1998) referred to IS/IT leadership as a core IS capability; Sabherwal and Kris (1994) referred to top management involvement in IS planning and top management knowledge of IT; Guptha et al. (1997) had a measure related to the leading role of top management under IT integration (*i.e. "In my firm, top management perceives that future exploitation of IT is of strategic importance"*); and Raymond and Pare's (1992) instrument has a measure of *top management involvement.* It is known that the owner/operator plays a greater role in managing the affairs of small businesses.

It was noted that with the exception of Raymond and Pare's (1992) study, most of these studies were based on large firms. This research provided evidence to confirm that *IT planning, IT controlling* and *IT leading* were equally applicable in determining the IT management sophistication in the context of small business.

According to Raymond and Pare (1992), the managerial dimension of IT sophistication in small business was hypothesised to be *"basically the mechanisms employed to plan, control and evaluate present and future applications"* (Raymond & Pare, 1992, p.8). Later they concluded that *"the managerial dimension* of IT sophistication profile in small business) *is characterised by generally informal computerisation and IT planning process, and a few measures designed to maintain the efficiency and security of operations, and to evaluate the cost of effectiveness of operations"* (Raymond & Pare, 1992, p.13). The emphasis of Raymond and Pare's (1992) characterisation was on the planning and controlling aspects of IT, and the role of leading has not been recognized as a major factor.

However, this research viewed IT management sophistication in small business in a broader perspective and confirmed that in addition to planning and controlling aspects, *IT leading* sub-function has been playing a major role in shaping IT management sophistication. This characterisation of IT management sophistication in small business under three sub-dimensions of *IT planning, IT leading* and *IT controlling* was a substantial step forward in IS research towards understanding this construct.

9.2.2 Role of External Expertise

Although this research did not confirm that *external expertise* was a key sub-dimension of IT management sophistication, there was evidence in past research that this factor plays a major role in using and managing information technology in small firms (Raymond & Pare, 1992; Thong et al., 1996). When the case study findings were subjected to the expert opinion review (see Table 5.2 on pages 117-118), only four factors based on general managerial functions (i.e. planning, organising, controlling and leading) emerged as potential sub-dimensions of IT management sophistication. Later, the *external expertise* factor was brought in, pooling together certain related indicators derived in the qualitative phase of this research. These indicators were acknowledged to be potentially characterising the *external expertise* factor. However, the PLS data analysis of this research based on one split-sample (path coefficient was -0.119 at $p<0.05$) demonstrated that it was significant, whereas the analysis of the other split-sample[43] did not confirm it. Some of the item statements used as measures of *external expertise* factor was also weak. (See also the comments on page 167). These factors tend to conclude that conceptualisation of this factors and the design of the associated measurement instrument were somewhat poor. However, the *external expertise* was excluded from the final model that explained IT management sophistication, considering that the results were not conclusive.

The external support for the use and management of IT in small firms may constitute diverse forms such as obtaining advice and technical support from paid IT/IS consultants, getting help from hardware and software vendors, learning from interaction

[43] See page 184

with peer organisations, and involvement in IT forums, software user groups and professional gatherings. Therefore, it is not proper to reject the proposition that the *external expertise* factor plays a major role in shaping IT sophistication[44] in small business.

One can argue that the use of external expertise may lead either to a positive impact or a negative impact for improved level of IT management. For example, if the company is highly sophisticated with respect to IT management (i.e. having IT expertise within) no external support is required. Therefore, use of external IT consultants may be seen as an indication of less sophistication. This argument will be more applicable to "handing over" the managerial and other tasks to external consultants (i.e. in the extreme case being outsourcing). On the other hand, given that small firms with limited resources could not employ IT experts as regular internal staff, having an expert external IT consultant to assist the "internal team" of managing IT, give rise to "a higher level of sophistication". In such situations, the firms that are "managing" the use of external expertise better, may be considered more sophisticated.

Although external expertise has been conceptualised as a factor similar to *IT planning* and *IT controlling* in this research, this factor may be influencing all key factors of IT management sophistication. Therefore, the alternative approaches for conceptualising the factors related to IT management could be examined.

This shows the importance of investigating further the role of external expertise towards IT management sophistication. An in-depth study towards characterising this construct, estimating its sophistication and understanding its impact on the use and management of IT in small firms will be of great significance. Results of such a study would offer insights into IT impact on organisational performance and the productivity of IT. In this respect the research could be directed towards examining the impact of *external expertise* on each of the underlying factors[45] identified in the research model presented in Figure 9.3.

[44] Here the term IT sophistication is used in a broader sense and may cover several aspects such as IT management and IT usage as identified by Raymond and Pare (1992).

[45] For example a study on the impact of *external expertise* on each of the three sub-dimensions of IT management sophistication, and on technological sophistication and informational sophistication could be an interesting project.

9.2.3 IT Organising

This research initially hypothesised *IT organising* as a factor (in addition to four others) that has an impact on IT management sophistication in small firms, relying on past research (e.g. Nolan, 1973; Gibson & Nolan, 1974; Earl, 1989; Guptha et al., 1997) and case study findings. However, this proposition was not confirmed by the survey data analysis.

A number of factors may have contributed to such a result of the survey data analysis. The measures used in the survey questionnaire (i.e. the respective item statements) may have been poorly conceptualised. (See also the comments on page 166). Furthermore, the role of managing IT in the context of small businesses may not fit well within the scope of a definition based on general management principles. The general management literature indicates that:

> "organising turns plans into action potential by defining tasks, assigning personnel, and supporting them with resources". (Schermerhorn, 1989, p 20).

Since the small firms employ only a small number of personnel the task of assigning specific tasks to different personnel may be minimal. Also, in most cases the IT resources may be shared somewhat loosely among staff.

Therefore, although this research did not confirm that *IT organising* is a sub-dimension that plays a major role in shaping the IT management sophistication in the context of small businesses, an in-depth investigation on this factor is required to make firm conclusions.

9.3 Characterisation of Key Sub-dimensions

Further to the determination of the key sub-dimensions of IT management sophistication in small business, this research identified the indicators of these factors, representing their ground level issues. It must be noted that although the terms *IT planning, IT controlling* and *IT leading* have been used in IT/IS literature in both the small and large business contexts, they do not necessarily refer to the same attributes in the two perspectives. For example, Feeny and Willcocks (1998), referring to core IS capabilities in large UK based companies, identified *business systems thinking* and *architecture planning* as an indicator of *IT planning*. However, according to Raymond and Pare (1992) user *participation in budgeting* and *formalisation of IT planning process* were some of the underlying factors of *IT planning* in small firms. Similarly, this research pointed to more ground level practical issues related to *IT planning* such as *having detailed plans*, and the *recognition of IT planning as an important part in the overall business panning process*.

The results relating to the determination of the indicative factors that characterise these three key sub-dimensions of IT management sophistication in small business are discussed next. These indicators formed the basis for creating the measures of these variables, which constituted the measurement instrument. This detailed characterisation of each sub-dimension and the development of the associated measures with their underlying indicators, are another major contribution of this research.

9.3.1 IT Planning

Table 9.1 presents[46] the underlying indicators of the planning sub-dimension of IT management sophistication confirmed through survey data analysis. Since these were derived on the basis of case study analysis, the indicators are deemed to represent the ground level practical issues related to IT planning in small firms.

All indicators derived through case study analysis which were deemed to be representing *IT planning*, with the exception of MGT03 (i.e. *Having IT plans in the form of written documentation*), were confirmed by survey data analysis. This non-emergence of MGT03 as a significant indicator in characterising *IT planning* could be attributed to a number of reasons. When the planning process is rigorous and the plan is presented in a detailed manner, further mention of written documentation is not necessary. Therefore, this notion of having written plans may have been incorporated in

[46] This table 9.1 also refers to the respective variable names used in PLS analyses and cites the past research references specific to respective indicators.

the indicators MGT02 and MGT04 (see table 9.1). Another explanation is that having a written plan may not be a common feature in small firms. On the other hand, this item statement in the survey questionnaire may have been interpreted by the respondents to mean a well written sophisticated planning document generally found in large businesses. Therefore, the elimination of this item (MGT03) from the final model was not seen as a limitation in the characterisation of *IT planning*.

PLS Variable	Indicators of IT planning	Supported Past Research
MGT01	Recognition of IT planning as an important part of the overall business planning process.	Boynton et al., 1994; Davis et al., 1995; Raymond & Pare., 1992; Sabherval & Kris,1994; Guptha et al.,1997
MGT02	Having detailed IT plans	
MGT04	Using a rigorous IT planning process within the firm.	Nolan, 1973; Gibson & Nolan, 1974; Boynton et al., 1994; Raymond & Pare,1992; Sabherval & Kris, 1994; Guptha et al.,1997
MGT05	Having IT system designed to be closely aligned with the overall objectives of the firm.	Earl, 1989 ; Raymond & Pare,1992; Sabherval & Kris,1994; Guptha et al.,1997
MGT06	Frequent review of IT plans to accommodate the changing needs of the firm.	Galliers, 1991
MGT07	Continuous search and evaluation for new IT developments for their potential use in the firm	Nolan,1973; Gibson & Nolan, 1974; Earl,1989; Guptha et al.,1997
MGT08	Using IT to improve the firm's competitive position.	Earl, 1989; Galliers, 1991; Davis et al.,1995; Pollard & Hayne, 1998; Guptha et al.,1997

Table 9.1 Characterisation of IT Planning Sub-dimension

The statistical assessments of PLS models[47] provided strong evidence to confirm that the validity and reliability of these measures were high (see chapter 7). Accordingly, the seven underlying indicators derived in the PLS model were accepted as comprehensive and sufficient for characterising the *IT planning* sub-dimension of the IT management sophistication in small business.

[47] The survey data analysis of PLS models were conducted with split-samples A and B and also with the full data set of the survey .

It is useful to examine how far the approaches of characterising *IT planning* by past researchers correspond with the findings of this research. The concept of *recognition of IT planning as an important part of the overall business planning process* (item MGT01 in table 9.1) has been identified by Boynton et al. (1994) (referred to as *commitment to planning*), Raymond and Pare (1991) (referred to as going into the *organisational objectives*), Sabherval & Kris (1994) (referred to as *involvement of the institution's top management in the IS planning process*) and Guptha et al. (1997) (referred to as *the extent to which the firm is content with IT project priorities are set).* It was noted that the notion of *having very detailed IT plans* (MGT02) had not been identified as a sign of sophisticated IT planning by past researchers. However, the case studies strongly supported this proposition and the PLS survey data analysis confirmed MGT02 as a significant indicator. The underlying factors related to *IT planning*, as identified by Nolan (1973), Gibson and Nolan (1974), Raymond and Pare (1991), Sabherval and Kris (1994) and Guptha et al. (1997), have been broadly covered by the new characterisation of IT planning in this research. For example, *budgetary planning for hardware facilities, user participation in budgeting, needs analysis* and *formulation of IT planning process,* would be dealt with when *using a rigorous planning process* (MGT04). The idea behind the indicator MGT05 has been referred to by Davis et al. (1995) as *IS and business alignment* and Earl (1989) as *linking IT applications to business goals*. Galliers (1991) referred to *interactive planning,* and this concept is quite similar to what has been addressed in item MGT06 of the new characterisation. The factors of *planning for new applications* (Nolan, 1973; Gibson & Nolan, 1974), and *resource forecasting and mapping future infrastructure* (Earl, 1989) were closely related to MGT07. As seen in table 9.1 the *use of IT for competitive advantage* (MGT07) has been identified as a factor that shapes IT planning by Earl (1989), Galliers (1991), Davis et al. (1995), Guptha et al. (1997) and Pollard and Hayne (1998). Raymond and Pare (1992); Sabherval and Kris (1994); Guptha et al. (1997) also have used similar indicators to measure IT management sophistication. (See also section 9.4).

It can be seen that the new characterisation of *IT planning*, as a sub-dimension of IT management sophistication derived by this research, is generally in accordance with the past research findings. Use of the indicator referring to *having very detailed IT plans* was a new feature in this characterisation. Bringing these indicators together, presenting them as a coherent set of indicators, and verifying them in a large population using a survey of small CA firms are important contributions of this research in respect of characterising *IT planning* in the context of small firms.

9.3.2 IT Leading

As seen earlier, another major contribution of this research was the identification of *IT leading* as a key sub-dimension of IT management in small business. The detailed characterisation of this factor was also a significant contribution.

Table 9.2 presents the underlying indicators that represent *IT leading* in the context of small firms. It was observed that all six items deemed representing *IT leading* derived in the qualitative analysis of this research were confirmed by the PLS analysis of survey data (see chapter 7).

Reference to PLS Variable	Indicators of IT Leading	Supported Past Research
MGT13	IT management being characterised by strong leadership	Nolan, 1973; Gibson & Nolan, 1974; Feeny & Willcocks,1998;
MGT16	Managers creating a vision among the staff for achieving IT objectives.	——
MGT21	Managers inspiring staff commitment towards achieving IT objectives.	——
MGT22	Managers directing the efforts of staff towards achieving IT objectives.	Boynton et al., 1994; Pollard & Hayne, 1998.
MGT23	Firm's commitment towards providing staff with appropriate IT training.	——
MGT24	Top management playing an active role in addressing the firm's IT issues.	Earl,1989; Raymond & Pare, 1992; Sabherval & Kris, 1994; Guptha et al., 1997.
MGT29	Top management believing that IT is critical to the business success	Earl, 1989.

Table 9.2 Characterisation of IT Leading Sub-dimension

Four out of seven indicators of *IT leading* (MGT13, MGT22, MGT24 and MGT29 in table 9.2) derived as a result of this research have been regarded as relevant by past researchers. Feeny and Willcocks (1998) made a direct reference *to IS/IT leading* as a major factor of core IT capability in large UK based companies. The item statement

MGT13 (table 9.2) was closely related to this factor. The *EDP manager being placed at a higher position in the management hierarchy* (Nolan, 1973; Gibson & Nolan, 1974) would help them in taking an effective leadership role. The factors representing *IT leading* identified by Boynton et al. (1994) on large firms and, Pollard and Hayne (1998) on small firms, closely resemble the indicator MGT22. *Securing top management support for IT functions* has been identified by Earl (1989), Raymond and Pare (1992), Sabherval and Kris (1994), and Guptha et al. (1997) as a means of recognising the strength *IT leading*. MGT24 of the current characterisation dealt with the same factor. The indicator MGT29 is similar to Earl's (1989) conception of leadership relating to IT management.

Three indicators that were not recognised by past researchers were MGT16, MGT21 and MGT23. Creating vision among staff and inspiring staff commitment toward achieving IT objectives (MGT16 and MGT21) are usual leadership characteristics described in general management (Schermerhorn, 1989; Daft, 1988). MGT23 refers to influence of leadership over IT related training. Employing highly skilled IT/IS qualified staff is not feasible in small firms (see case study evidence on page 96). Therefore, the commitment of top management to provide the relevant training for IT staff is a pertinent characteristic of *IT leading* in small firms.

It can be concluded that results of this research adequately characterise the *IT leading* sub-dimension of IT management sophistication in small business. Past research findings have not provided sufficient insights into characterisation of *IT leading* in the context of small businesses. The influence of top management on leadership behaviour may be stronger in small firms where there is a greater influence of the owner/manager in all managerial activities of the firm. This observation confirms Cragg and King's (1993) finding that managerial enthusiasm encourages IT growth in small businesses. Therefore, this research has contributed towards clarifying the concept of *IT leading* and expanded the level of understanding of this particular sub-dimension of IT management sophistication in small business.

9.3.3 IT Controlling

IT controlling was the third factor that was derived in this research as a key sub-dimension that characterises IT management sophistication in small business. Past researchers have identified controlling of IT resources as a factor that has a major influence on IT management, both in large firms and small businesses (e.g. *large* – Guptha et al., 1997; Earl, 1989; Nolan, 1973; Gibson & Nolan, 1974) and *small* – Raymond & Pare, 1992). Raymond and Pare (1992) have identified certain indicators related to controlling and security aspects of IT management with the view to characterising the broader concept of IT management sophistication in small business. However, in the context of small businesses these studies have not characterised *IT controlling* as an explicit sub-dimension of IT management sophistication.

Reference to PLS Variable	Indicators of IT Controlling	Supported Past Research
MGT14	Monitoring closely the progress of our IT projects.	Earl, 1989; Guptha et al.,1997.
MGT15	Monitoring closely the performance of our IT systems.	Boynton et al., 1994; Sabherval & Kris,1994; Guptha et al.,1997
MGT17	Having comprehensive procedures in place for controlling the use of IT resources (e.g. who can use specific software, who has access to specific databases).	Nolan, 1973; Gibson & Nolan, 1974; Pollard & Hayne.,1998; Raymond & Pare,1992
MGT18	Having comprehensive procedures in place for maintaining the security of information stored in computers.	Davis et al.,1995; Raymond & Pare, 1992
MGT19	Having clearly defined roles and responsibilities for IT direction and development	Nolan, 1973; Gibson & Nolan, 1974; Boynton et al.,1994; Pollard & Hayne,1998; Guptha et al., 1997.
MGT28	Having formal procedures for the acquisition and/or development of new IT systems	Guptha et al. ,1997

Table 9.3 Characterisation of the IT Controlling Sub-dimension

This research determined the underlying indicators that characterise the *IT controlling* sub-dimension of IT management sophistication in small business. Table 9.3 presents[48] these six underlying indicators associated with the *IT controlling* sub-dimension. These

[48] Table 9.3 also contains the references of past studies that are in conformity with the indicators derived in this research.

were initially determined as a result of the case study analysis and literature review, and subsequently confirmed by PLS survey data analysis. This new set of indicators provides a comprehensive means of characterising the *IT controlling* sub-dimension of IT management sophistication in small business and was a significant contribution of this research.

9.4 Measurement of IT Management Sophistication in Small Business

As indicated earlier, the second major objective of this research was the development and validation of an instrument to measure IT management sophistication in small business. In effect the characterisation of this construct under three sub-dimensions and the determination of associated indicative factors, as discussed above, provided the basis for the development of measures that constitute the instrument. Since IT management sophistication in small business was characterised as a multi-dimensional construct, its measurement basically represents the assessment of the sophistication of individual sub-dimensions. The relative importance of each sub-dimension could be further examined depending on the purpose of the measurement and the depth of analysis envisaged.

It was evident that the respective measures of the three sub-dimensions were quite comprehensive and adequately covered the relevant practical issues. The validity and reliability coefficients derived in PLS analysis using the two split-samples and the total data set were high (see chapters 7 and 8 for details). The case study analysis and statistical analysis of survey data confirmed the content validity, construct validity, individual item reliability, internal consistency and discriminant validity.

Review of past research revealed that there had been three attempts to measure IT management sophistication (i.e. Raymond & Pare, 1992; Sabherwal & Kris, 1994 ; Guptha et al., 1997). However, a direct comparison of the results of this research with the past instruments is not feasible due to a number of reasons. Firstly, characterisation of the IT management sophistication construct differs in the three studies. For example, Guptha et al. (1997) characterised this construct under four sub-dimensions where as Sabherwal and Kris (1994) treated it as uni-dimensional. Secondly, the investigation context was specific to each study. Guptha et al.'s (1997) study was based on large firms in the information sensitive financial services industry, while Sabherval and Kris (1994) concentrated on large academic institutions. Raymond and Pare's (1991) instrument was developed in 1991, over a decade ago, for small manufacturing firms in Canada.

However, a number of similarities can be observed with respect to the indicators used to measure the underlying concepts. For example, the measure MGT05 of the new instrument (i.e. *Having IT system designed to be closely aligned with the overall objectives of the firm)* closely resembles the following measures of the past instruments:

a. *The extent to which IS planning takes institutions future plans into account* (Sabherval & Kris, 1994).

b. *Extent to which IT supports business objectives and strategies of the* company (Guptha et al., 1997).

c. *'Organisational objectives'* has also been included in the Raymond and Pare's (1991) instrument.

Review of past literature revealed that the available instruments were not adequate to measure the IT management sophistication in small business (see pages 51-54). The construct definition was not comprehensive in Raymond and Pare's (1992) study[49] compared to this research. This can be attributed to the way the objectives of the two studies were drawn up. Raymond and Pare's (1992) research was meant to understand the *IT sophistication in small firms* in a broader sense, whereas the current research went into detailed characterisation and measurement of the specific dimension of *IT sophistication,* namely, *IT management sophistication in small business*. Accordingly the new instrument was found to be more comprehensive, and richer in its validity and reliability of measuring the construct – *IT management sophistication in small business*. The new instrument viewed IT management sophistication in a wider perspective and dealt with more operational features common to contemporary small firms. It addressed the ground level day-to-day managerial activities rather than looking at conceptual themes.

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[49] The only relevant past research on small businesses.

The simpler, easier to understand presentation and the ease of survey administration were also an advantage of the new instrument. This was clearly an improvement in the context of usability of this instrument in small firms, compared to the length and complexity of Raymond and Pare 's (1992) instrument. Sabherval and Kris's (1994) instrument contained only five measures and leaned towards investigating the *planning* element of *IT management sophistication.* Their construct was conceptualised to be one-dimensional.

Guptha et al.'s (1997) instrument was quite comprehensive and has treated *IT management sophistication* as a multi-dimensional construct with four 'modes', namely, *planning, organising, controlling and integration.* It contained twenty item statements in all. Accordingly, the instrument derived by this research was comparable to Guptha et al.'s (1997) instrument in comprehensiveness, robustness, structure and the length of the questionnaire. The instrument derived to measure IT management sophistication in small business in this research comprised of nineteen measures related to the three sub-dimensions as outlined in the previous section. The new instrument provided a pioneering means of assessing the level of IT management sophistication in small firms. This finding related to measurement of the three sub-dimension of IT management sophistication in small business is a substantial contribution to this area of IS research.

9.5 Effect of IT Management Sophistication on IT Impact

As indicated earlier the third objective of this research was to derive a model that can be used to examine the relationship between the four constructs, namely, IT management sophistication, technological sophistication and informational sophistication with IT impact. The primary concern in deriving this model was to examine the effect of IT management sophistication on the impact of IT on the firm performance. The PLS model relating the four constructs is given in Figure 9.3. (see chapter 8 for details of development of the model). The path coefficients of all three exogenous latent variables were statistically significant and were well within the minimum acceptable levels[50].

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[50] Minimum acceptable level of path coefficients is 0.1 (Hair et al, 1998)

This indicated that the effects of the three latent variables for shaping IT impact in small CA firms are substantial.

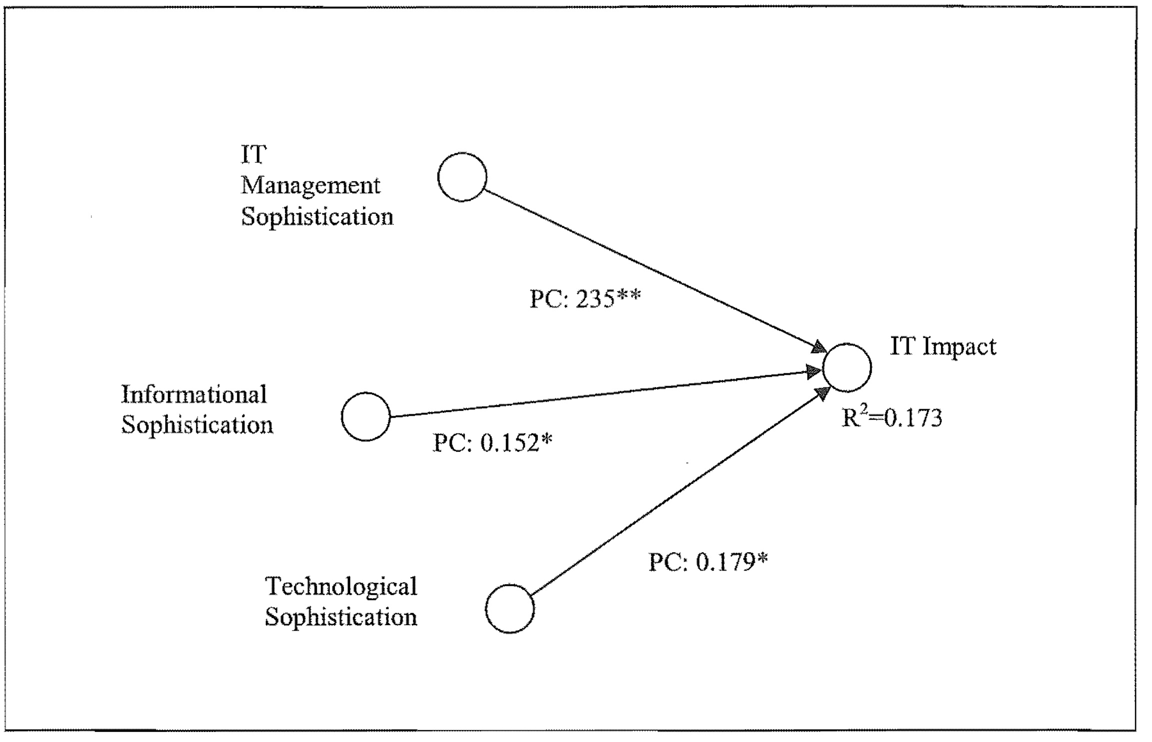

Figure 9.3. Model Relating the Four Constructs

The measures of *technological sophistication*, *informational sophistication* and *IT impact* were primarily derived on the basis of past research findings, and were adopted to this research setting[51]. The PLS data analysis indicated that the validity and reliability of *IT impact* measures were high. Thereby this research further validated the measures derived by Thong et al. (1996) for assessment of *IT impact* in the context of small business.

However, the measures of *technological sophistication* and *informational sophistication* conceptualised on the basis of Raymond and Pare's (1992) characterisation of IT sophistication were found to be weaker compared to other measures used in this research. Since the development of measures of these two latent variables was somewhat peripheral to the research objectives and the measurement outcomes of the two instruments satisfied the purpose of the study, no further attempt was made to purify the respective measures. Further investigations into these two instruments are required to derive more valid and reliable measures. Such investigations could follow the processes adopted in the development of IT management sophistication instrument in this research.

Raymond and Pare (1992) stated that:

> "...given the ultimate aim of IT to improve enterprise-level performance, fruitful insights may be obtained by employing the sophistication measure to determine the relative impact of each underlying dimension and importance of fit between dimensions" (p. 13)

The model derived in this research provided useful insights towards the above assertion of Raymond and Pare (1992). Substantially higher path coefficient of *IT management sophistication* compared to the other two latent variables (*informational sophistication* and *technological sophistication*) suggested that its influence on shaping *IT impact* is relatively greater than the other two. This finding reconfirmed the proposition that IT management plays a major role in shaping the impact of information systems.

The results of the current research are in conformity with the findings of Boynton et al. (1994) where, a positive relationship had been derived between the IT management climate and IT management process effectiveness. Sabherwal and Kris (1994) also related *IT management sophistication* with *perceived IT success* and three other variables (see page 41). Although the characterisation of this construct and the context of investigation in Sabherwal and Kris's (1994) study were not quite comparable with the current research, it was interesting to observe that the results of the two studies go hand-in-hand. They asserted that the organisations which are more advanced in their management of IT obtain greater benefits from IT. This research extended the validity of the proposition of Sabherwal and Kris (1994) that higher levels of IT management sophistication have greater impact on information systems, over to small businesses.

The three sub-dimensions of the IT management sophistication latent variable should also be incorporated into Figure 9.2, to illustrate fully the research model derived in this research (see Figure 9.3). Conceptualisation of IT management sophistication under three sub-dimensions of *IT planning, IT leading* and *IT control* was also incorporated

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[51] See section 6.3.2 for details.

into this representation. The path coefficients (given along the arrow connections in Figure 9. 4) provided indications pertaining to the significance and the relative influence of exogenous latent variables. This model conceptualized and provided evidence to empirically explain the complex relationships among *IT management sophistication* and *IT impact* along with *technological sophistication* and *informational sophistication.* Since the objective was to develop a preliminary model other possible interactions (e.g. between *IT leading* and IT impact) were not investigated. Such investigations were beyond the scope of this research.

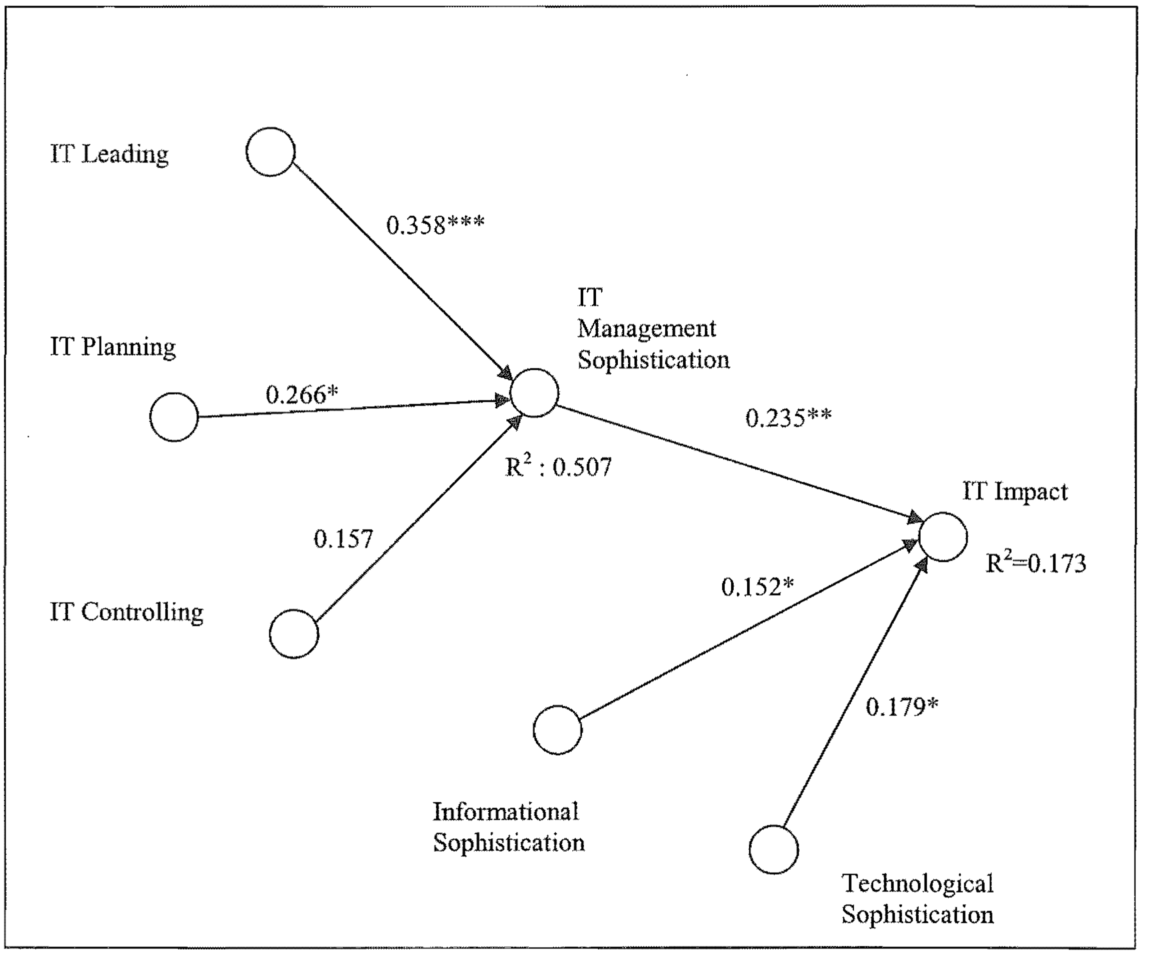


Figure 9.4. Model relating the Four Constructs (Expanded)

This investigation should not be viewed as an attempt to develop a comprehensive model explaining all major factors that influence *IT impact* in small businesses. As mentioned on page 55, this model was developed for the purpose of theory building rather than theory testing. Under these circumstances the somewhat lower R^2 value of 0.173, that explains the effect of the three exogenous variables, was acceptable. This was a preliminary model aimed at relating IT management sophistication to IT impact. This lower value of R^2 suggested that there can be other factors that substantially influence the IT impact in small firms. Development of a comprehensive model that incorporate other likely factors explaining IT impact in the context of small firms is a potential area of interest for future researchers.

9.6 Chapter Summary

This chapter reviewed the findings of the current research in the light of past research findings relevant to the topic area. A comprehensive characterisation of *IT management sophistication in small business* was evolved and the construct was defined under three sub-dimensions, *IT planning, IT leading and IT controlling.* An instrument comprised of nineteen item statements to measure IT management sophistication in small businesses was derived and the validity and reliability of measures were confirmed. The research model derived in this study conceptualized and provided evidence to empirically understand the complex relationships among *IT management sophistication* and *IT impact* along with *technological sophistication* and *informational sophistication.*

Chapter 10

Conclusions, Limitations and Suggestions for Future Research

10.1 Chapter Overview

This chapter, being the last of the thesis, provides a brief review of the research objectives, research methodology and the contributions of the study. The limitations of this research are outlined and the chapter concludes with a series of suggestions for future research.

Chapter Contents:

10.2 Research Objectives

This research was primarily aimed at understanding *IT management sophistication* in the context of small business. The way the firm's information technology is managed has considerable implications on the impact of information systems, and that has the potential to impact on the firm's overall success and the ability to gain competitive advantage (see sections 1.2 and 1.4 in chapter 1).

It was observed that in-depth investigations focusing on the managerial aspects of IT sophistication in the context of small businesses have not been attempted in the past, though there have been several such studies based on large firms. The contribution of the small business sector in most economies is substantial. IT is being increasingly used in small businesses today. This situation brought about the first objective of this study: to characterise *IT management sophistication in small business.*

Furthermore, a valid and reliable instrument to measure *IT management sophistication in small business* was not available. This gap in IS research drew attention to the second objective of the research: *to develop and validate a suitable instrument to measure this construct.*

In order to examine the relative influence of the different aspects of overall IT sophistication (i.e. *IT management sophistication, technological sophistications and informational sophistication*) on the impact of IT on firm performances, a preliminary model was developed as the third objective of this research.

Accordingly this research attempted to bridge an eminent gap in this area of IS research. The discussion of findings presented in the preceding chapter (pages 215-234) demonstrated that this study successfully addressed the main objectives of the research outlined above.

10.3 Research Approach

This study adapted a multi-method approach to investigation. A comprehensive literature review (Chapter 2) was conducted to formulate the research objectives (Chapter 3). A number of case studies in small CA firms were conducted to gain an in-depth understanding of the contemporary ground level issues related to IT management dealing with small chartered accountancy firms in New Zealand. This qualitative phase of investigation resulted in a pool of indicators that potentially represent the IT management sophistication in small firms.

This was followed by a large scale survey of small CA firms in New Zealand. The survey was aimed at assessing the validity and reliability of the results of the qualitative phase of this research in a wider setting (Chapter 4). In addition to the measures of IT management sophistication, measures relating to technological sophistication, informational sophistication and IT impact were also incorporated in the survey instrument. This was needed for the development of the model required by the third objective of this research (see section 6.3 of chapter 6 for details).

A substantial dataset (see pages 140-150) for in-depth statistical analyses was obtained from the survey. This was made possible due to the wide distribution of small CA firms in New Zealand. Although the response rate of 29% of the survey appeared to be somewhat low, the non-response bias analysis (see page 139) did confirm that this was not a limitation for generalisation of findings. It may be also noted that the response rate of small firm surveys were generally poor (see page 140). Furthermore, the survey dataset was adequate for a comprehensive statistical analysis using PLS modelling techniques.

The use of split-samples, firstly to develop and assess PLS models and then to verify their validity and reliability (Chapter 7) was a major strength of this study. The data analysis involving PLS techniques was also used to derive the model relating the three constructs, *IT management sophistication, technological sophistication and informational sophistication* with *IT impact.*

Accordingly, the analytical techniques adopted in the study provided for a rigorous investigation into instrument validation and model development. The PLS modelling techniques found to be appropriate for survey data analysis of this study. The relevant PLS analyses successfully examined the reliability and validity of measurement instrument, and the development and estimation of models that related the study constructs leading the theory development.

The results of the initial case studies and related qualitative methods were successfully incorporated into the development of the survey questionnaire. As the area of investigation is rather new, the examination of operational issues was important to explore the relevant concepts. Also, employing a multi-method approach provided for a rigorous investigation that was helpful in arriving at substantially valid and reliable conclusions in this research. Also, the multi-method approach has been recommended for IS research being an evolving discipline (Galliers, 1991). All in all, the research approach adapted in this research seemed to be fitting with the nature of the investigation.

10.4 Research Contributions

This study made a number of significant contributions to the body of knowledge related to information systems research in the context of small businesses. The major contributions along with their significance are outlined below:

(a) Characterisation of IT management sophistication in small business

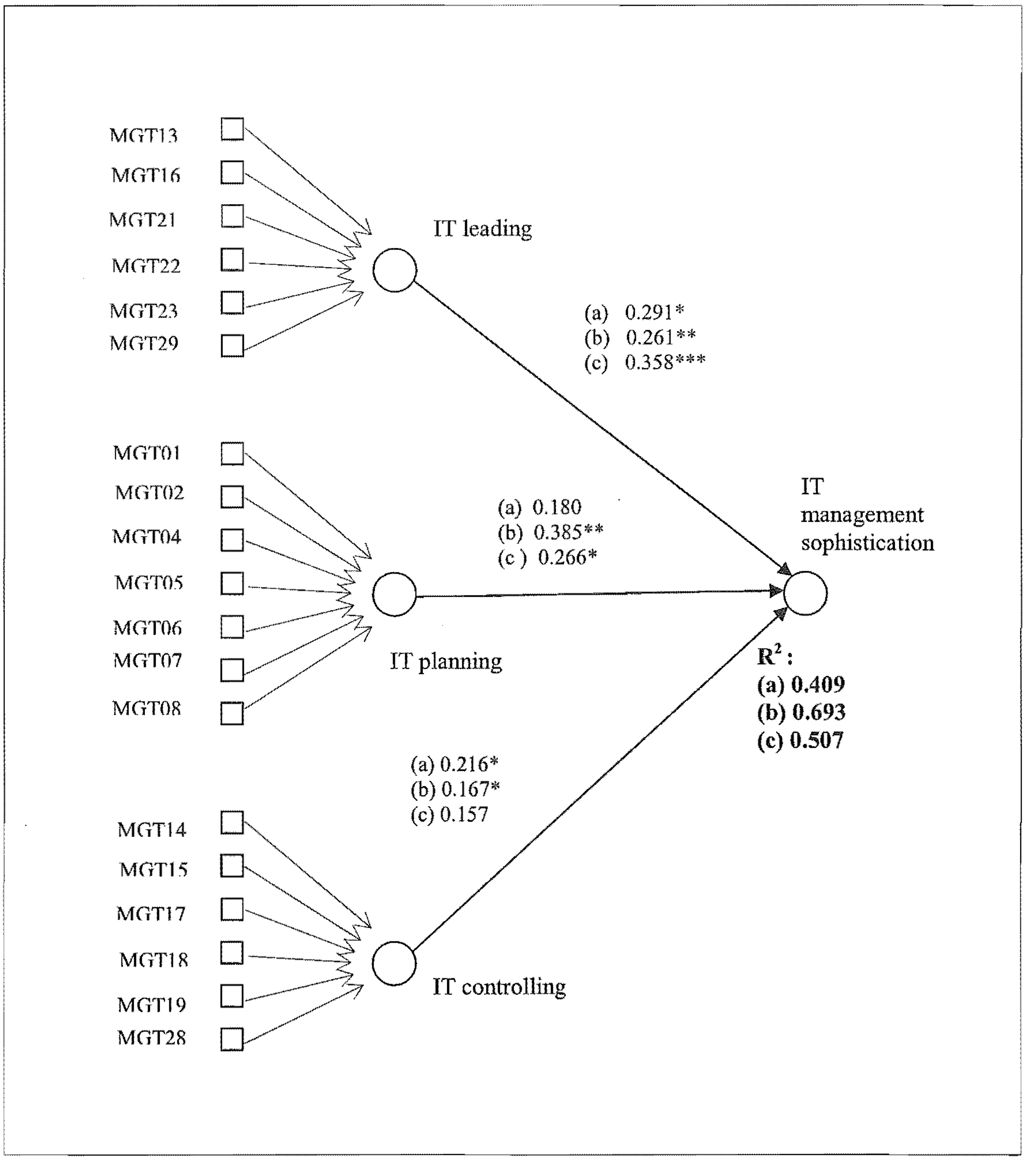
This research characterised IT management sophistication in small business as a multi-dimensional construct representing three factors, *IT planning, IT leading* and *IT controlling* (see figure 10.1). This characterisation of IT management sophistication in the context of small business is a major step forward in IS research towards understanding this construct. This research brought in the *IT leading* sub-dimension for the first time to characterise the IT management sophistication construct. The variability of *IT management sophistication* has been explained substantially by the three sub-dimensions, *IT planning, IT leading and IT controlling.*

The new characterisation has expanded the knowledge with respect to the understanding of IT management sophistication in the context of small business, and the IS researchers can use this finding to further examine the relationship of this variable with other potentially interacting variables. IT management sophistication was deemed to have a substantial impact on the effective use of IT and the potential for providing sustainable competitive advantage to the firm. Hence, characterisation of *IT management sophistication in small business* has prospects to extend the horizon of IS research.

(b) Determination of underlying indicators of the three sub-dimensions and measurement of IT management sophistication in small business

Further to the above mentioned contribution of determining the three sub-dimensions of IT management sophistication in small business, this research identified a pool of indicators of *IT planning, IT leading* and *IT controlling* that can be used to measure the degree of sophistication of each of these sub-variables. These indicators in combination constituted a valid and reliable instrument for measuring IT management sophistication in small business.

The pool of confirmed measurement indicators of IT management sophistication in small business contained nineteen measures. The associated instrument contained the nineteen item statements presented in the form of a survey questionnaire (see table 10.1). The survey respondents from the small CA firms were requested to indicate their opinion on a seven point Likert scale ranging from *"Strongly agree"* to *"Strongly disagree"*.



Notes:

(i) Path coefficients between exogenous latent variables and the endogenous latent variable are shown along with the arrow lines.

(ii) Three sets of indicators (a), (b) and (c) represent the PLS analyses that used split-sample A, split-sample B and the total data set respectively (see pages 156-178 for details).

*(iii) Statistical significance of path coefficients are indicated as: ***p< 0.001, **p<0.01, *p<0.05*

Figure 10.1 Characterisation of IT Management Sophistication in Small Business

The detailed characterisation of the sub-dimensions and the development of the new instrument for measurement of IT management sophistication is the next major contribution of this research. The level of sophistication of IT management in small firms can be assessed using the new instrument. The new instrument could also serve as a benchmarking tool for the assessment of IT management sophistication in small firms and to make comparisons with respect to the level of sophistication of IT management between a number of firms.

Using the new instrument, the IS researchers and practitioners can make assessments with respect to the level of IT management sophistication in small CA firms. For example, survey data of the current research could be used to classify the small CA firms in New Zealand into a number of sub-groups of different levels of sophistication, ranging from high to law. Also, observations can be made with respect to the stronger and weaker areas (associated with the sub-dimensions) of IT management sophistication of a particular firm. Such information can also be used to take suitable steps to make necessary improvements in IS implementation in small firms. For example, if the IT planning area is found to be weak in a particular firm, concentrating on that aspect of IT management might be more productive to practitioners, rather than looking into the managerial issues in general.

IS researchers in the small business sector can use the new characterisation and measurement instrument for further investigating the relationship between this construct and other relevant issues such as its impact on organisational performance and how IT management sophistication shapes the IT strategy. Such studies will provide valuable insights into the effect of IT on overall business strategy for gaining competitive advantage.

Sub-dimension	Reference to PLS variable	Measure (the item statements as appeared in the original instrument)
IT Planning	MGT01	Our firm recognises IT planning as an important part of the overall business planning process.
	MGT02	Our IT plans are very detailed.
	MGT04	We use a rigorous IT planning process within our firm.
	MGT05	Our IT system is designed to be closely aligned with the overall objectives of the firm.
	MGT06	Our IT plans are frequently reviewed to accommodate the changing needs of the firm.
	MGT07	Our firm is continuously searching for and evaluating new IT developments for their potential use in the firm.
	MGT08	In our firm, IT is used to improve the firm's competitive position.
IT Leading	MGT13	IT management within our firm is characterized by strong leadership.
	MGT16	Our managers have created a vision among the staff for achieving IT objectives.
	MGT21	Our managers have inspired staff commitment towards achieving IT objectives.
	MGT22	Our managers have directed the efforts of staff towards achieving IT objectives.
	MGT23	Our firm is committed to providing staff with appropriate IT training.
	MGT29	Our top management believes that IT is critical to the success of our business.
IT Controlling	MGT14	We closely monitor the progress of our IT projects.
	MGT15	We closely monitor the performance of our IT system(s).
	MGT17	We have comprehensive procedures in place for controlling the use of IT resources. (e.g., who can use specific software or access specific databases).
	MGT18	We have comprehensive procedures in place for maintaining the security of information stored in our computers.
	MGT19	In our firm, the roles and responsibilities for IT direction and development are clearly defined.
	MGT28	Our firm has formal procedures for the acquisition and/or development of new IT systems.

Table 10.1 The Item Statements of the Measurement Instrument

c) Research model relating the four constructs

Development of the final overall research model that related *IT management sophistication* and *IT impact* along with *technological sophistication* and *informational sophistication* is the next major contribution of this research (see figure 10.2)

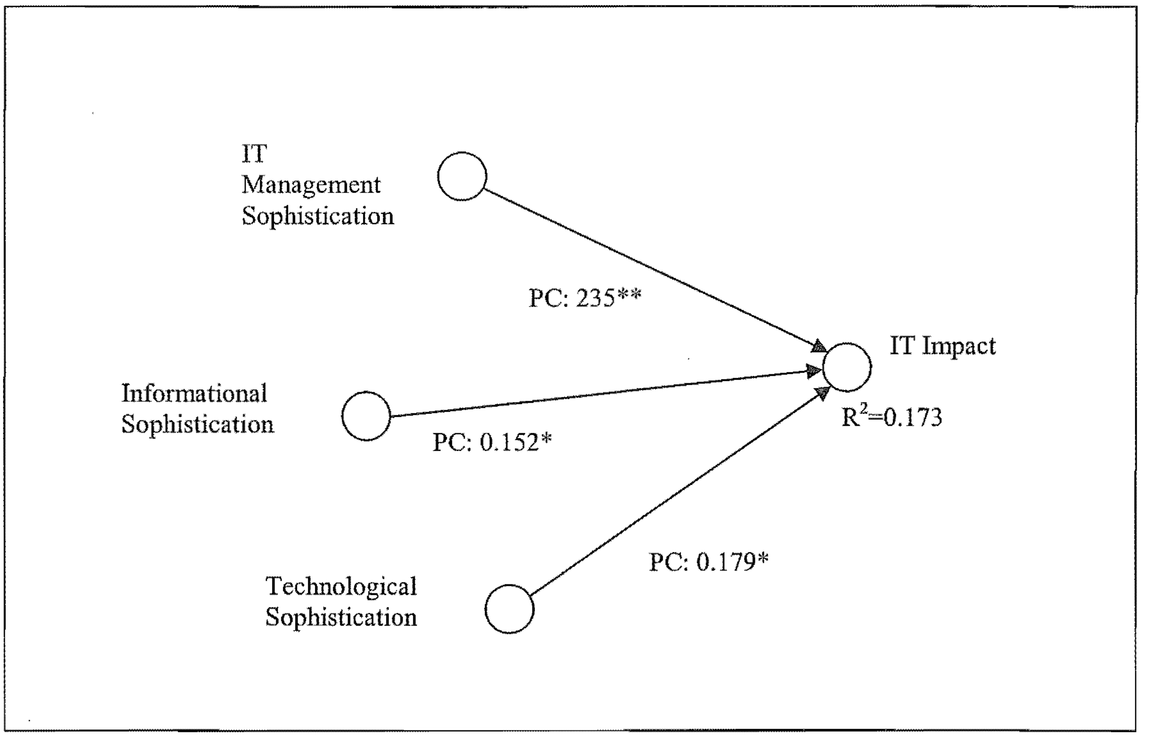


Figure 10.2. Model relating the Four Constructs

This research model conceptualized and provided evidence to empirically understand the complex relationships among *IT management sophistication* and *IT impact* along with *technological sophistication* and *informational sophistication*. While confirming Raymond and Pare's (1992) proposition with respect to high influence of *technological sophistication* and *informational sophistication* on *IT impact*, this research provided strong evidence to show that the influence of *IT management sophistication* on IT impact is substantially high, in the context of small businesses. This result helps IS researchers to understand the relationship between the adoption of information technology and its impact on the firm performance.

(d) Other insights

This study also draws attention to other important insights relevant to IS research in the context of small businesses. Four insights that have major implications on future research are identified below:

- Although the three variables, *IT management sophistication, technological sophistication* and *informational sophistication,* of the overall model explain the variability of *IT impact* substantially, these three variables are not adequate to fully explain its variability. Therefore, there may be other factors that might contribute towards shaping the IT impact in the context of small firms. Further research may be directed towards understanding this variable to get a complete picture with respect to the role of information systems and their success in small firms.

- This research revealed that the role of *external expertise* could not be regarded as a sub-dimension of IT management sophistication. Furthermore, the role of *external expertise* on various aspects of IT use and management in small firms was so substantial that this factor cannot be ignored in explaining the associated relationships. This insight opens up another area of research towards understanding the contribution of external expertise in the small business sector.

- Although this research initially hypothesised *IT organising* to be a major factor that had an impact on IT management sophistication in small firms, the survey data analyses did not confirm that proposition. It is not clear at this stage whether this is due to reasons such as:

    - the role of managing IT in the context of small businesses may not be clearly fitting within the scope of 'management' in general,

    - the indicators used in this research to measure *IT organising* was not appropriate, or

    - in fact *IT organising* is not a major factor that had an impact on IT management sophistication in small businesses.

Therefore, the concept of *IT organising* in the context of small businesses may have to be revisited in an later in-depth investigation.

- Researchers in the field of information systems can learn from the methodological approaches adopted in this research. This research used a rigorous approach for definition of research constructs, determination of associated measures and analysis of their reliability and validity of the instruments using a large scale survey and PLS data analysis. These methods can be successfully adopted in future research aimed at characterisation of new research constructs and development of associated measurement instruments.

10.5 Limitations of the Research

No research is without limitations and some drawbacks. The insights gained from such limitations will be useful in the application of the research findings with due caution and with an appreciation of the context in which the investigations were conducted. They will also help future researchers to learn about better management of research projects. This section outlines the major limitations of this research:

- Use of small chartered accounting firms as the study population has both advantages and disadvantages. Conducting investigations on a wide-spread service industry provided valuable insights into the small business sector in New Zealand. The extensive use of information technology in CA firms provided the necessary variability leading to a successful data analysis in research of this nature. On the other hand, the somewhat unique characteristics of this industry restrict the generalisability of research findings.

- Although the decision to confine the case studies and the large scale survey to small and medium sized chartered accountancy firms placed obvious limitations on the generalisation of findings, this study population satisfactorily allowed an in-depth examination in the area of investigation.

  Restriction of case studies to four CA firms in Christchurch region may also appear to be a limitation. However, since the objective of such case studies was the identification of the related operational issues for subsequent validation, the time and resources devoted to this phase of investigation seemed adequate. The four firms selected for the case studies generally represented a range of low, medium and high levels of sophistication with respect to management of information technology. The follow-up discussions with the small firm IT consultants and a major software provider to CA firms strengthened the validity of the case study findings.

The validity of this research could have been improved, if more case studies had been conducted at the end of case study analysis to future investigate the factors such as *external expertise* and the associated measures. This may be seen a limitation that could be avoided if more time and effort have been devoted at that stage of research.

- In the survey administration, only one senior staff member dealing with IT systems of the small firm was identified per firm for completion of the questionnaire. A more unbiased rating of the level of IT management sophistication in a particular firm could be obtained if more than one staff member was approached for this purpose. Therefore, an improvement to survey administration towards obtaining more than one response from each firm may be required, especially when individual firms are assessed using the new instrument.

- It was noted that the survey response rate was poor, although somewhat typical of small business research surveys. Hence, further strategies may have to be adopted for obtaining an enhanced survey response rate in small-business-related surveys. One alternative would be to conduct the survey through e-mail and such advanced communication modes. This is a practically feasible option, given that most small firms are now accessible through the Internet. However, since this study is related to IT management sophistication such an approach would result in bias towards "high tech" firms being a high proportion of respondents. Therefore, such methods may be used only in combination with (or to supplement) mail survey approaches, rather than to replace it altogether.

- The measurement instruments with respect to technological sophistication and informational sophistication were found to be weak, and further research could be conducted in this area.

- The broad objective of the measures of *IT impact* used in this research was to obtain an assessment on the benefits that IT can provide (i.e. IS success). Typically, IS researchers have used a number of methods (often in combination) to evaluate success of IT systems. (Thong et al.,1997; Naylor et al., 1994; Zinatelli et al., 1996; Burgess, 2002). The measures of system usage, the impact upon organisational performance and the measures of user satisfaction are such examples.

  This research was confined only to one of these approaches (i.e. impact upon organisational performance) whereas using more than one method in combination may provide a better assessment (e.g. Thong et al., 1997). Accordingly, it is a limitation of this research that the measurement of the benefits IT can provide to only a single method of investigation. However, since the objective of this research was the development of a preliminary model for understanding the relationship between other study variables and the impact IT on firm performances, the assessments used in this investigation were adequate.

10.6 Suggestions for Future Research

As is the case with all research, this study opened up a number of avenues for future research, having provided successful answers to the research questions investigated. These include broadening the scope of investigations to overcome the limitations identified in this research, the use of research findings to further explore their applications and to understand the relationships with other related constructs. Accordingly, suggestions for future research are outlined below:

- Investigate the role of the *external expertise* factor in shaping IT sophistication, and to characterise this construct and develop and validate an instrument to measure its sophistication. For example, the impact of *external expertise* on each of the three sub-dimensions of *IT management sophistication*, and on *technological sophistication* and *informational sophistication* may be investigated separately. Results of such a study will guide IS researchers and small business IS practitioners for effective use of external IT/IS expertise.

- Generalising the findings of small business IS research across a wider audience is found to be a difficult task, mainly due to the diversity of small business sector. Burgess (2002) asserted that:

> This[53] is (almost) impossible, as it is very difficult to generalise results for such a diverse range of businesses. Most small business researchers overcome this by selecting a particular niche of small businesses to examine, or reporting at a very general level.

  Obviously, further research will be required for generalising the applicability of the IT management sophistication instrument in other types of small businesses. Therefore, further research can be conducted covering other industries/sectors of small business, not limited to the chartered accountancy industry in New Zealand. For example, the instrument developed in this research can be tested in other service industries such as small legal firms, and also in small manufacturing concerns. Similarly, the instrument can be tested in small firm populations in other countries such as Australia. Testing the newly developed instrument in this manner is important for generalisation purposes and determining the benchmarks and defining norms[54] for different types of industries and study situations.

- Technological sophistication and informational sophistication related to information technology applications in small firms may be further investigated and more appropriate instruments can be developed and verified. This will help IS researchers to better understand these concepts and use such knowledge for making improvements for effective IT use in small firms.

- In-depth investigation to explore the impact of *IT organising* towards shaping IT management sophistication in small businesses will be useful to clarify further, the concept of IT management in small business. This is particularly applicable

[53] generalising of research findings

[54] Last step of development of measures as proposed by Churchill, (1979).

since previous IS researchers (e.g. Nolan, 1973, Earl, 1989, Guptha et al., 1998) identified organising of IT resources as a major function of IT management.

- Investigations can be directed towards identifying and characterising the factors that influence IT impact in small firms. The preliminary research model derived in this study demonstrated that there could be other factors that have an effect on IT impact. Such a clear and comprehensive understanding of the entire spectrum of variables that have an effect on IT impact will be useful for the IS researchers and practitioners in their progress towards more productive adoption and use of information technology in small firms.

- This research presented a streamlined approach for characterising constructs and development and validation of measures associated with such constructs in the information systems field. This knowledge can be applied to investigate and understand concepts such as sophistication of e-commerce and e-security in the context of small businesses.

10.7 Chapter Summary

This is the concluding chapter of this thesis. A brief review of the research objectives, relevance of research methodology adopted in this study, major research contributions, limitations of this research and suggestions for future research related to the area of investigation have been outlined in this chapter. Small chartered accounting firms represented a wide spread service industry in New Zealand with heavy usage of computer systems. Accordingly, this study has brought about a significant piece of IS research focused on the services sector of small businesses in New Zealand.

Appendix 1: Case Study Method

A-1.1 Introduction

Although there is no generally accepted definition of case study research, the relevant characteristics provide a clear understanding of the method. A case study examines a phenomenon in its actual setting, employing multiple methods of data collection, generally qualitative tools. In this process, information is gathered from one or more entities (i.e. people, groups or organisations). Neither experimental control nor manipulation of variables is employed in this method (Benbasat et al., 1987; Yin, 1994; Cavaye, 1996).

Basically, two possibilities are available for the case researcher to go about identifying the number of cases selected for study. The researcher can opt for a single-case or can go for a multiple-case design. The single case design is useful in specific instances. For example, multiple-cases are desirable when the intent of the research is exploration or description, theory building, or theory testing. In addition, multiple-case design yields more generalisable research results, where the findings are not merely limited to a particular research setting. Such cases for the multiple-design should be selected so that the researcher can extend and revise the initial propositions. (Benbasat et al. 1987; Yin 1994; Miles & Huberman, 1994).

A-1.2. Steps in Case Research

The first step in case study research is the identification of suitable cases for investigation. In a situation where there is well-informed theory and the major research issues are clearly defined, it may be possible to select a 'critical case', which represents the issues under investigation. If the objective of the researcher is to extend a theory to cover a wide range of circumstances, it may be appropriate to select an 'extreme case'. When there is little available theory, an 'exploratory case' could be used to begin the process of theory development. It is relatively unimportant if a particular case is initially selected. What is needed is any case within the relevant area to begin the process of theory development. Then additional cases will be used to extend the theory and arrive at a rich theoretical frame work (Ryan, Scapens & Theobald, 1992).

The other major steps are preparation, collection and assessment of evidence, identification and explanation patterns, theory development and report writing. It may be emphasised that these steps may not follow a linear sequence, but may entail a complex interactive process (Ryan et al., 1992).

Preparation includes the review of literature and available theories, and also determining how to go about data collection and other relevant activities. Having a case study protocol or a detailed plan of action covering all stages ranging from the case selection to analysis and reporting, is quite useful in going about case study research. This is a major tactic for increasing the reliability of case study research and for guiding the investigator in carrying out the case study (Yin, 1994).

A-1.3 Data Collection

The data collection methods of a case study approach may be diverse. The major sources of data are documentation, archival records, interviews, direct observation and physical artefacts. The interviews may be based on open-ended questions or they can be focused on certain specific issues. Preliminary planning is an important step in case study research. A case study protocol may be prepared, and this basic plan will provide guidance for conducting the case studies (Benbasat et al., 1987; Ryan et al., 1992; Yin, 1994).

A-1.4 Validity and Reliability

In case study research, *contextual validity* is assessed in order to ascertain the reliability and validity of the data. This is achieved first by assessing the validity of each piece of evidence by the process of triangulation, in which different kinds of evidence on the same issue are compared. This may be done by interviewing other subjects, checking additional records or taking further observations. The validity of a particular source is also assessed by collecting evidence from other sources.

It is also important to minimise the personal bias of the researcher in making interpretations. For example, the personal qualities of the researcher such as the background, the cultural upbringing, the attitude and relationships may influence the process of interpreting case study data. This may not be an issue in the case of quantitative research where the interpretations are mostly guided by statistical parameters. One way of minimising the personal bias is using more than one researcher, possibly with different backgrounds (Ryan et al., 1992).

A-1.5 Analysis and Exploration of Patterns

Various themes and patterns emerge as the case study research progresses. Such themes and patterns can be established by examining the pieces of individual case study evidence separately and analysing them in combination with other similar cases. Case study analysis includes identification and explaining such patterns and themes that can be generated from case study evidence. Such findings can be reviewed with past research findings and related literature to arrive at generalisations.

Case study findings can also be reviewed by professionals and practitioners who have expertise in the related field and can verify the patterns and themes emerging from case study data. Consultation of experts in the relevant fields at different levels has been used as the means of reviewing the substance of the items generated by the qualitative methods. Chan (1997) made use of peer researchers and practice professionals to determine qualitatively, the face validity and discriminant validity of measures of her new instruments. These reviews were also used to determine clusters of measures which combined to form major factors and to improve the presentation quality. (Chan, 1992; Chan et al., 1997)

A-1.6 Significance in IS Research

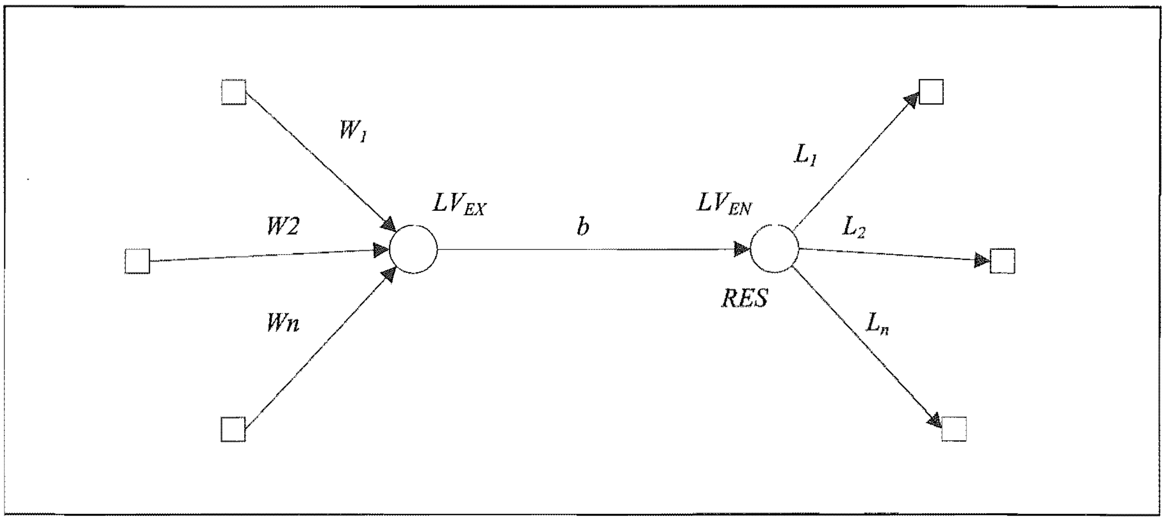
Case study research is suitable for exploring how small business is managed in the context in which the processes are applied. Understanding small business and its interaction with the environment may be better examined by collecting descriptive data and determining the appropriate theory explaining its existence, using case study approach (Romano, 1989). Case research is clearly useful in IS research where exploration of a natural setting or focusing on contemporary events is quite relevant (Benbasat et al., 1987). The case study approach has been used successfully by many IS researchers. (e.g. Cavaye, 1996; Cragg, 1986; Galliers 1991; Kaplan, 1988; Lee, 1989).

Appendix 2: PLS Modelling: Analytical Techniques

A-2.1 PLS Techniques

The main principle behind PLS analysis is an iterative combination of principal components analysis relating measures to constructs, and path analysis permitting the building of a system of constructs. The hypothesising and building of the relationships between measures and constructs, and between constructs and other constructs are guided by the theory that explains the particular relationships. The parameters representing the measurements and path relationships are estimated using ordinary least squares techniques (Barclay et al. 1995).

The first step in PLS analysis is the specifying of structural model linking latent variables and the construct-to-measure relationships in the measurement model. A sample generic PLS model is illustrated in Figure A2-1.



Key:	$X_1, X_2 \ldots X_n$	*: X - Variables, Measures or Indicators*
	$Y_1, Y_2 \ldots Y_n$	*: Y -Variables, Measures or Indicators*
	LV_{EX}	*: Exogenous Latent Variable*
	LV_{EN}	*: Endogenous Latent Variable*
	$W_1, W_2 \ldots W_n$	*: Regression Weights*
	$L_1, L_2 \ldots L_n$	*: Loadings*
	b	*: Path Coefficient (ie simple regression coefficient) between* LV_{EX} *and* LV_{EN}
	RES	*: Residual in the Structural Model* (R^2)

Figure A-2.1 Generic PLS Model – An Illustration

The latent variables are represented by circles and the measures by squares in the illustration in Figure A-2.1. Hence, the structural model comprises of the two circles and the arrow between them. The measurement model of LV_{EX} latent variable for example, comprises measures X_1, $X_2 \dots X_n$, and the arrow connections between the measures and the latent variable.

In the structural model the latent variables can be represented as exogenous or endogenous constructs. An exogenous construct is shown as predicting or 'causing' an endogenous construct . An exogenous construct is consistent with the idea of an independent variable, while an endogenous construct is consistent with that of a dependent variable (Barclay et al. 1995). The endogenous latent variable is represented in the diagram as a circle with an arrow head leading towards it.

In the measurement model the measures or indicators are associated with the latent variables. They can be specified as either formative or reflective. The formative indicators are viewed as the causative variables that influence the formation of the latent variable. Reflective measures are created from the perspective that they all measure the same underlying phenomenon (or latent variable). The fact that a certain set of indicators reflect an underlying latent variable considerably well can be ascertained from the way the measures vary in response to the changes of the respective latent variable. When an actual level of phenomena of the latent variable changes in a particular direction (increase or decrease), each indicator should also change in the same direction. In the above illustration the variables X_1, $X_2 \dots X_n$ represent formative indicators while Y_1, $Y_2 \dots Y_n$ are reflective.

Three main criteria may be considered in deciding if a set of manifest variables is formative or reflective:

a. Background theory/substantive knowledge

   If the theory indicates that the latent variable is viewed as giving rise to those observed measures, then it is modelled as reflective.

b. Research objective

   If the research objective is an explanation or prediction of observed measures, reflective design would be specified.

a. Empirical conditions.

> The formative indicators are relatively independent of one another. However, the stability of estimates such indicators can be affected, depending on the sample size and multi-colinearity among. (Barclay et al. 1995; Chin 1998a).

Having constructed the structural and measurement models, the PLS estimates such as loadings, weights, path coefficients and R^2 are estimated, using computer software packages[1]. These values in turn are used to assess the reliability, validity and significance of the measurement and the structural model structures.

There is some debate as to whether loadings are suitable for the estimation of formative measures. In the case of formative measures it is argued that the loadings seem to be misleading because the intraset correlations for each block of indicators were never taken into account in the estimation process and for such measures weights are estimated (Chin, 1998a). However, weights can be transformed into loadings and the loadings are used for interpretative purposes and calculations of reliabilities. Using factor loadings for such computations is consistent with the traditional interpretation of canonical correlation results (Barclay et al., 1995). This approach has been used by a number of IS researchers (Chan 1992; Chan et al. 1997; Rivard et al. 1988; Zenatelli, 1994).

PLS analysis provides for a very rigorous assessment procedure to estimate the validity and reliability of measures and to evaluate the significance of the structural model. Although the parameters of the measurement and structural models are estimated together, a PLS model is analysed and interpreted in two stages:

(i) The assessment of the reliability and validity of the measurement model

(ii) The assessment of the structural model (Barclay et al. 1995; Chin 1998a; Chin et al.)

These methods of assessment are outlined next.

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[1] The software packages used in this research was PLS-Graph [100 variable] version 3.00 build 176 @1993-2000 of Software Modeling Inc.

A-2.2 Measurement Model

The measurement model must first be examined for a satisfactory level of construct validity. There are a number of criteria for assessment of the validity and reliability of the measurement model in PLS:

- *Individual item reliability*
- *Internal consistency*
- *Discriminant validity*

A brief account of these estimates, their computation and the criteria of evaluation are given next.

A-2.1.1 Individual Item Reliability

Individual item reliability is used to decide whether or not an item should be included in the construct measure (Mills & Huberman, 1996; Straub & Carlson, 1989). In PLS, individual item reliability is assessed by examining the loadings (Barclay et al. 1995; Chin, 1998b). The interpretation of factors and the significance of factor loadings may depend on several criteria such as practical significance, statistical significance and the number of variables. The practical significance (based on theoretical knowledge and experience) is considered more important when considering a factor. As a rule of thumb, loadings greater than $\pm$ 0.3 are considered to meet the minimum level; loadings of $\pm$ 0.40 are considered more important; and if the loadings are $\pm$ 0.50 or greater, they are considered to be practically significant. (Hair et al. 1998).

A loading represents the correlation of the variable and the factor. Therefore, the squared loading is the amount of the variable's total variance accounted for by the factor. Thus the loading must exceed 0.70 (0.707 to be precise) for the factor to account for 50% of the variance (Carnines et al. 1979). However, extremely high loadings (eg. 0.8 and above) are not typical and practical significance is important for considering if a factor should be included in a model.

The higher the number of variables being analysed, the lower the acceptable level of a loading for a particular variable to be considered significant. Sample size also should be taken into consideration in deciding the significance of a factor. The larger the sample size, the smaller the acceptable level a loading of a variable for consideration as significant. A general guideline is that a factor with a loading of 0.5 may be acceptable as significant at 0.05 confidence level, given that the sample size exceeds one hundred and twenty (Hair et al. 1998).

A-2.1.2 Internal Consistency

Internal consistency is concerned with the homogeneity or single factoredness of the observations (Bagozzi, 1980; Mills & Huberman, 1996). The measure of internal consistency (also referred to as composite reliability) developed by Fornell and Larcker (1981) for evaluating structural equation models is used as a measure of reliability. It is computed as the sum of the loadings, all squared, divided by the sum of the loadings, all squared, plus the sum of the error terms[2]. This measure is superior to Cronbach's alpha since it uses the item loadings estimated with the causal model. (Fornell & Larcker, 1981). The guideline used here is that the calculated value of internal consistency should be equal to or greater than 0.70 for 'modest' reliability applicable in early stages of research (Nunnally, 1978).

A-2.1.3 Discriminant Validity

Discriminant validity indicates the extent to which a given construct is different from other constructs. The average variance extracted (AVE) is used to assess discriminant validity in PLS analysis. AVE[3] is computed as the sum of squared loadings, divided by the sum of squared loadings, plus the sum of the error term. This is a measure of the

---

2

$$\text{Internal Consistency} = \frac{(\Sigma\lambda_{yi})^2}{(\Sigma\lambda_{yi})^2 + \Sigma \text{Var}(\epsilon_j)}$$

Where $Var(\epsilon_j) = 1 - \lambda_{yi}^2$ *and* λ_{yi} *are loadings*

3

$$\text{Average Variance Extracted} = \frac{\Sigma\lambda_{yi}^2}{\Sigma\lambda_{yi}^2 + \Sigma \text{Var}(\epsilon_j)}$$

Where $Var(\epsilon_j) = 1 - \lambda_{yi}^2$ *and* λ_{yi} *are loadings* average variance shared between the construct and its measures (Fornell & Larcker, 1981).

For a variable to be accepted as having sufficient discriminant validity, it is recommended that the AVE should be greater than 0.5. This means that 50% or more of the variance of indicators should be accounted for by the measures (Chin, 1998a).

Another benchmark for discriminant validity is that the AVE should be greater than the variance shared between the construct and other constructs in the model. Accordingly the square root AVE of each latent variable should be greater than the squared correlation between two variables (Barclay et al., 1995).

A further criterion for discriminant validity is that each indicator must load more heavily on its associated construct than any other construct. This is consistent with first generation techniques and is assessed by examining the component structure matrix (also called factor pattern matrix) in which loadings of each item of all constructs are shown. The interpretation is similar to that of principal component factor analysis (Chin, 1998a; Thompson ,Higgins & Howell, 1991).

A-2.3 Structural Model

Assessment of the structural model includes the verification of the statistical significance of estimates, examination of the predictive power of the model, and, consideration of path coefficients. This examination enables establishing the relationships among the latent variables of the structural model.

A-2.3.1 Statistical Significance of PLS Estimates

The statistical significance of PLS estimates (e.g. loadings and path coefficients) of the measurement and structural model needs to be examined for confirmation of the relationships between latent variables. In computer based PLS modelling software packages, the statistical significance estimates are computed in two ways:

- Bootstrap re-sampling
- Jackknifing.

Bootstrap re-sampling represents a nonparametric approach to estimate the precision of estimates. A number of sub-samples are randomly drawn from the pool of data to obtain the estimates for each parameter of the PLS model (Chin, 1998b). In the case of jackknife estimation, a number of sub-samples are created by removing one or more cases of the total data set (Barclay et al., 1995).

In general, both jackknife and bootstrap standard errors should converge. However, the jackknife method is viewed as less efficient than the bootstrap because it can be considered as an approximation of the bootstrap. On the other hand the computational time is shorter for jackknife estimation.

A-2.3.2 Predictive Power

A measure of the predictive power of a model is the R^2 value of the endogenous construct. This value should be interpreted in the same manner as R^2 obtained from multiple regression analysis (Barclay et al., 1995). This indicates the amount of variance in the construct explained by the model (Chin, 1998b). Even relatively lower values of R^2 seem adequate for predictive purposes in a given context. For example Barclay et al. analysing a model of computer use concluded thus:

> The results in this model indicate that 27 percent of the variance in Utilisation and 32 percent of the variance in Performance Outcomes was explained. Given the context, where a large number of factors could impact both utilisation and Performance Outcomes, the variance explained by this relatively parsimonious model is substantial (Barclay et al. 1995, page 299).

A-2.3-3 Path Coefficients

Whether a particular construct should be retained or not depends on the value of the respective path coefficient. The rule of thumb is that paths with coefficients of 0.1 or greater between first-order constructs are considered substantive and should be retained (Chan, 1992). The statistical significance of the path coefficients can be estimated using the bootstrap method for further examination.

Appendix 3: Mail Survey - Covering Letter

Accountancy, Finance, and Information Systems Department
University of Canterbury Telephone: +64-3-364- 2987(Ext. 7378)
Private Bag 4800 Facsimile: +64-3-364-2727
Christchurch Email: tsu l l@its.canterbury.ac.nz

1 August 2000

Practice Partner/ Senior Manager
....
....

Dear Sir/Madam

Information Technology in Small CA Firms:
Where do you stand?

Undoubtedly IT is a vital tool in small Chartered Accountancy firms today. To aid understanding how best the firms make use of this tool, we are conducting a study about IT management practices and effectiveness among small and medium sized chartered accountancy firms in New Zealand. You will be exposed to a range of very useful ideas relating to the management and use of IT as the immediate gain in completing the attached questionnaire which will not take more than 20 minutes.

We are asking for your firm's position on managing computers, its use and its effectiveness. Your participation in completing this questionnaire ideally by the managing partner or the next senior person responsible for IT in your firm is very important to this study. We would like you to complete the questionnaire and return it in the self addressed envelope provided within the next two weeks.

Even if you feel that your firm is very small or computers have very little to do with you at present, your views are sought as the full picture of the industry is required. Since IT is so common and make a huge contribution for accountancy practices we believe that all firms will benefit in some way from this study.

The information you provide will be treated in a **completely confidential** manner and full anonymity will be maintained throughout the course of the study.

A summary of the study will be made available to interested firms and individuals.

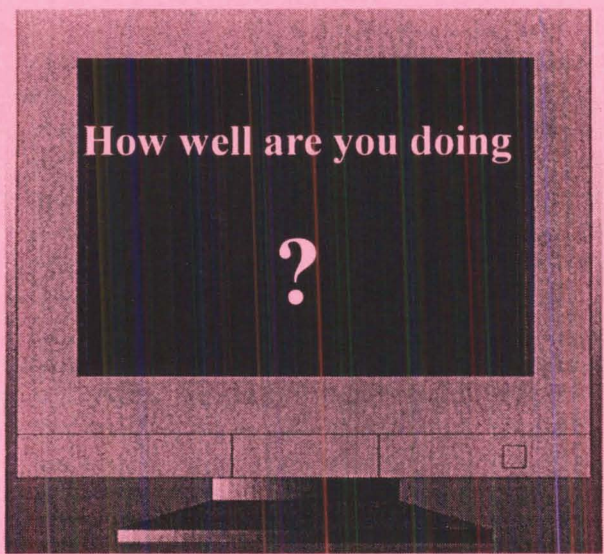
Thank you for your assistance.

Yours Sincerely

Theek Suraweera

Appendix 4: Mail Survey - Questionnaire Booklet

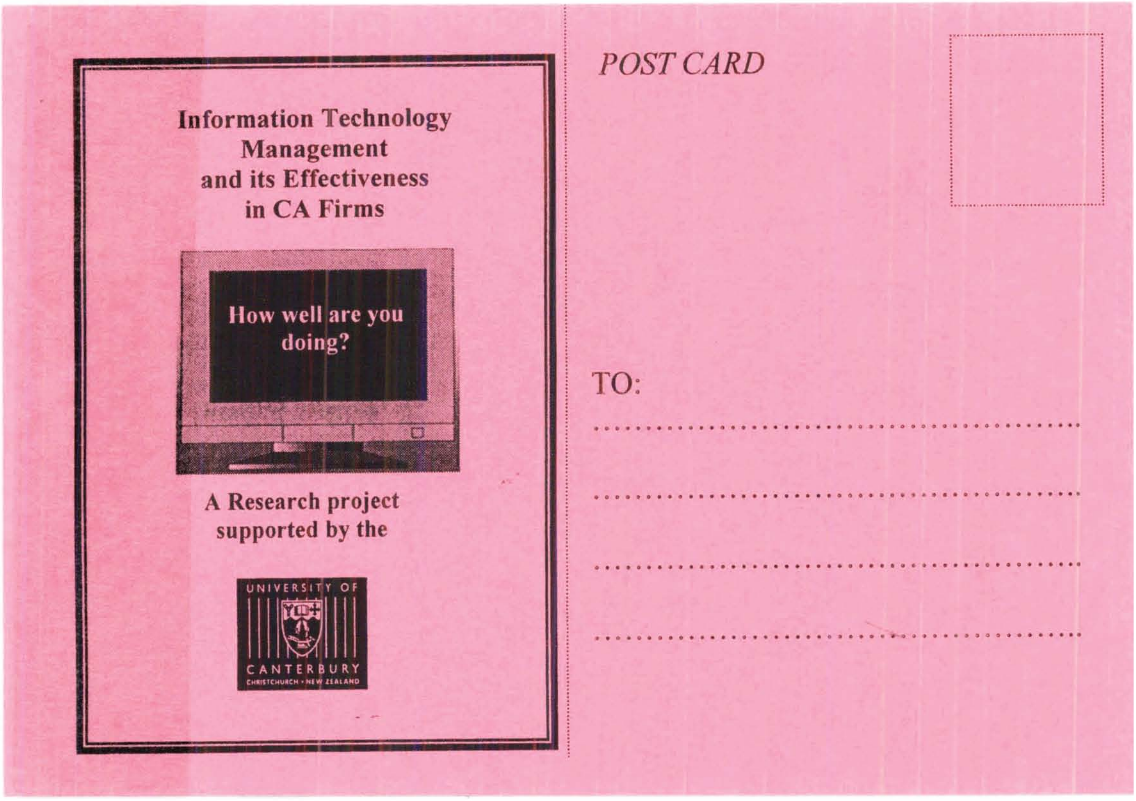
Information Technology Management and its Effectiveness in CA Firms



A research project
supported by the

UNIVERSITY OF
CANTERBURY
CHRISTCHURCH • NEW ZEALAND

Appendix 5: Mail Survey –Reminder Postcard (Pre-Printed)



Appendix 6: Mail Survey: Introductory Note appeared in the ICANZ Journal

To the public, the brand acts as a visual cue and people recognise the logos, their colours, typography and styles

7844, e-mail: *anita_anderson@icanz.co.nz*). Style sheets are available on request.

New Business Partner — Clayton Ford

Specialist recruitment agency, Clayton Ford, is the latest company to become an Institute business partner.

"The new relationship will be mutually beneficial," says Business Development Manager Scott Fisher. "It's a chance for Clayton Ford to become closer to Institute members and for members to benefit from Clayton Ford's services."

Clayton Ford specialises in the recruitment of finance, accounting and banking staff. This includes permanent positions, executive leasing, contract and temporary appointments, and specialist consultants in all areas.

Positions range from finance management/CFO-level appointments, through to specialist financial analysts, systems and accounting positions, to graduates.

The company has offices in Wellington and Auckland, and associates who can handle recruitment in other areas. They are also able to provide job opportunities for New Zealanders travelling overseas. For more information see the Jobs section of the Institute's Web site, *www.icanz.co.nz*

Research

Small accounting practices are under the microscope in a new study supported by Canterbury University's Department of Accountancy, Finance and Information Systems.

The study will explore how practices manage their IT planning, organisation and control, the aim being to create a way of measuring management sophistication. This could then be used to help evaluate and improve a firm's performance.

Researchers Theek Surraweera, Paul Cragg and Annette Jones have already interviewed practice managers in 10 small accounting practices and IT consultants from the major software companies. More questionnaires are being circulated, and the researchers look forward to members' participation.

Chartered Accountants Journal October 2000 page 46

Appendix 7: Mail Survey – Pilot-Test Covering Letter and Evaluation Questionnaire

Accountancy, Finance, and Information Systems Department

University of Canterbury | Telephone: +64-3-364-2987 (Ext. 7378)
Private Bag 4800 | Facsimile: +64-3-364-2727
Christchurch | Email: tsu11@its.canterbury.ac.nz

22 September 2000

XXXXXXXXXXXX
XXXXXXX
XXXXXXXX
XXXXXXXXXXXXXXs

Dear Sir/Madam

Management and the Effectiveness of Information Technology in CA firms:
Where do you stand?

I am a doctoral student at the University of Canterbury, Christchurch currently conducting research in IT management in small accountancy practices. You are kindly invited to participate in a pilot-test and evaluation of my survey questionnaire. It is about Information Technology (IT) management practices and effectiveness among small and medium sized chartered accountancy firms. The study findings will aid our understanding of both the practices and their effectiveness. In participating in this short exercise you will gain access to a range of very useful ideas relating to IT management, IT use and effectiveness of IT in CA firms.

Your participation and input in this exercise is very important to my study. This pilot questionnaire and evaluation form is being distributed to only a few selected CA firms. It will be followed by a nation-wide survey. **Completion of the questionnaire should take no more than 20 minutes.**

The information you provide will be treated in a **completely confidential** manner and full anonymity will be maintained throughout the course of the study. Individual data will be collated and reported as group data only. No identifying information gathered in this study will be released to your organisation, the University, the public, or other researchers. **Participation is completely voluntary.**

The survey questionnaire and evaluation form are meant to be completed by the **person responsible for managing IT/computer systems in your firm.** The evaluation form is designed to gather comments and opinion on the survey itself (e.g. survey administration, time taken to complete the questionnaire, any difficulties encountered in providing answers) and overall impressions. A self-addressed pre-paid envelope is also enclosed for returning completed questionnaire. **I would be grateful if you would pass these documents onto the person responsible for managing IT/computer systems in your firm.**

For further information, clarification or discussion, please contact me at the above address or by phone - (03) 364-2987 Ext. 7378; fax - (03) 364-2727; e-mail -<tsu11@its.canterbury.ac.nz> . I would like to express my sincere appreciation in advance for your consideration of, and assistance in this study.

Yours Sincerely

Theek Suraweera

A Survey of IT Management and its Effectiveness in CA firms

PILOT-TEST EVALUATION

1. How long did it take you to complete the questionnaire? ....minutes
2. Did you have any difficulties in answering the questions in:

PART A: IT Management

- ❑ NO
- ❑ YES ⟶ If YES, please make specific comments below:

....
....
....

PART B: IT Use

- ❑ NO
- ❑ YES ⟶ If YES, please make any specific comments below:

....
....
....

PART C: IT Effectiveness

- ❑ NO
- ❑ YES ⟶ If YES, please make any specific comments below:

....
....
....

PART D: General Information

- ❑ NO
- ❑ YES ⟶ If YES, please make any specific comments below:

....
....
....

3. What is your overall impression of:
   a. the layout of the questionnaire

....
....
....

   b. the types of questions asked

....
....
....

   c. the complexity of the survey

....
....
....

4. Any other comments:

....
....
....

Appendix 8: Mail Survey Results: Frequency of Total Full-time Staff

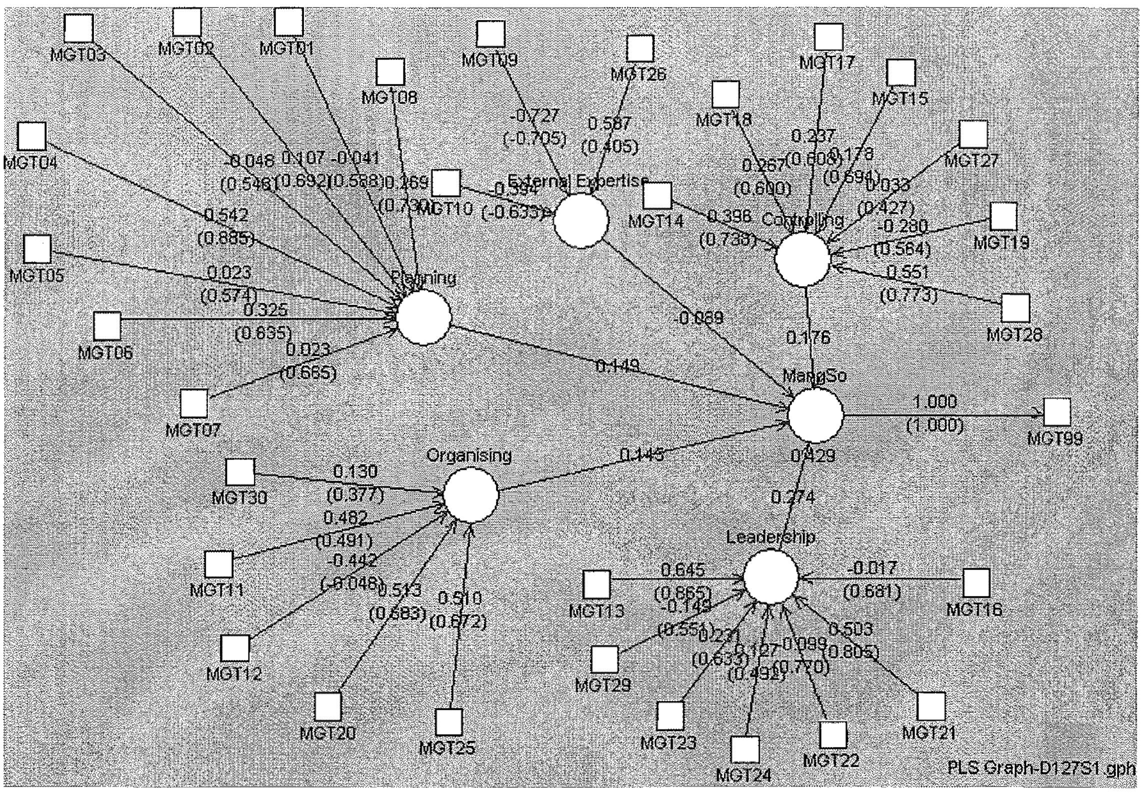
Total Full-time Staff	Frequency	%	Valid %	Cumulative %
1	44	11	11.1	11.1
2	48	12	12.1	23.2
3	36	9	9.1	32.3
4	34	8.5	8.6	40.9
5	34	8.5	8.6	49.5
6	23	5.8	5.8	55.3
7	19	4.8	4.8	60.1
8	18	4.5	4.5	64.6
9	20	5	5.1	69.7
10	6	1.5	1.5	71.2
11	10	2.5	2.5	73.7
12	14	3.5	3.5	77.3
13	2	0.5	0.5	77.8
14	9	2.3	2.3	80.1
15	6	1.5	1.5	81.6
16	7	1.8	1.8	83.3
17	2	0.5	0.5	83.8
18	11	2.8	2.8	86.6
19	4	1	1	87.6
20	5	1.3	1.3	88.9
21	2	0.5	0.5	89.4
22	5	1.3	1.3	90.7
24	1	0.3	0.3	90.9
25	1	0.3	0.3	91.2
26	3	0.8	0.8	91.9
27	1	0.3	0.3	92.2
28	1	0.3	0.3	92.4
30	2	0.5	0.5	92.9
32	1	0.3	0.3	93.2
33	3	0.8	0.8	93.9
34	1	0.3	0.3	94.2
35	4	1	1	95.2
37	1	0.3	0.3	95.5
40	1	0.3	0.3	95.7
42	1	0.3	0.3	96
43	1	0.3	0.3	96.2
48	1	0.3	0.3	96.5
50	1	0.3	0.3	96.7
52	1	0.3	0.3	97
60	3	0.8	0.8	97.7
63	1	0.3	0.3	98
68	1	0.3	0.3	98.2
76	1	0.3	0.3	98.5
84	1	0.3	0.3	98.7
100	1	0.3	0.3	99
110	2	0.5	0.5	99.5
500	1	0.3	0.3	99.7
830	1	0.3	0.3	100

Appendix 9: Number of Full Time Staff and Overall IT Management Variable Scores

Number of Full Time Staff	Indicators/Values	
1	Mean Score	3.7
	Number of Firms	44
	St. Deviation	1.68
2	Mean Score	3.9
	Number of Firms	48
	St. Deviation	1.53
3	Mean Score	4.46
	Number of Firms	35
	St. Deviation	1.4
4	Mean Score	4.33
	Number of Firms	33
	St. Deviation	1.49
5	Mean Score	4.65
	Number of Firms	34
	St. Deviation	1.15
6	Mean Score	4.43
	Number of Firms	23
	St. Deviation	1.65
7	Mean Score	4.26
	Number of Firms	19
	St. Deviation	1.24
8	Mean Score	4.18
	Number of Firms	17
	St. Deviation	1.38
9	Mean Score	4.75
	Number of Firms	20
	St. Deviation	0.79
10	Mean Score	4.5
	Number of Firms	6
	St. Deviation	1.05
11	Mean Score	4.33
	Number of Firms	9
	St. Deviation	1.12
12	Mean Score	4.43
	Number of Firms	14
	St. Deviation	1.6
13	Mean Score	4.5
	Number of Firms	2
	St. Deviation	0.71
14	Mean Score	5.11
	Number of Firms	9
	St. Deviation	1.05
15	Mean Score	5
	Number of Firms	6
	St. Deviation	1.26
16	Mean Score	5
	Number of Firms	6
	St. Deviation	1.26
17	Mean Score	5.5
	Number of Firms	2
	St. Deviation	0.71

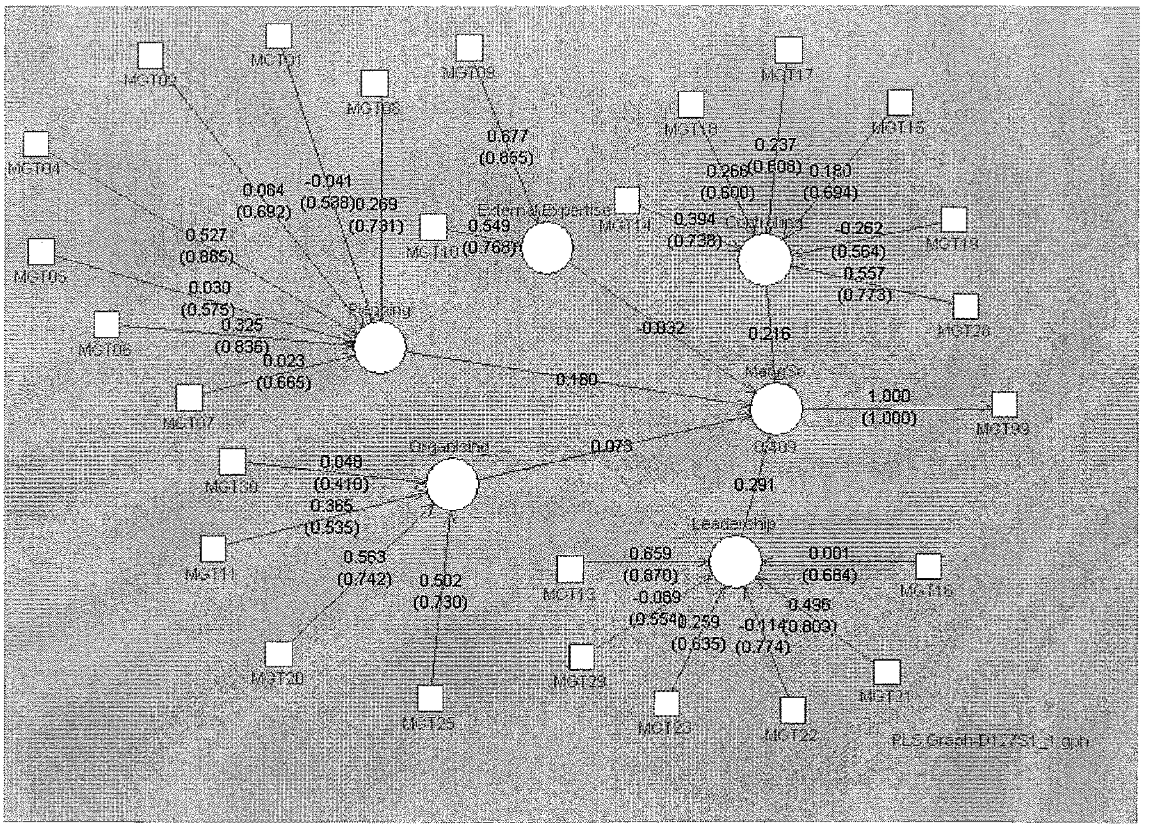
Number of Full Time Staff	Indicators/Values	
18	Mean Score	4.73
	Number of Firms	11
	St. Deviation	1.01
19	Mean Score	4
	Number of Firms	3
	St. Deviation	1.53
20	Mean Score	4.25
	Number of Firms	4
	St. Deviation	0.5
21	Mean Score	6.5
	Number of Firms	2
	St. Deviation	0.71
22	Mean Score	5.75
	Number of Firms	4
	St. Deviation	1.26
24	Mean Score	7
	Number of Firms	1
	St. Deviation	.
25	Mean Score	5
	Number of Firms	1
	St. Deviation	.
26	Mean Score	4.5
	Number of Firms	2
	St. Deviation	0.71
27	Mean Score	6
	Number of Firms	1
	St. Deviation	.
28	Mean Score	6
	Number of Firms	1
	St. Deviation	.
30	Mean Score	5.5
	Number of Firms	2
	St. Deviation	0.71
32	Mean Score	6
	Number of Firms	1
	St. Deviation	.
33	Mean Score	5
	Number of Firms	3
	St. Deviation	1
34	Mean Score	5
	Number of Firms	1
	St. Deviation	.
35	Mean Score	5.67
	Number of Firms	3
	St. Deviation	0.58
37	Mean Score	6
	Number of Firms	1
	St. Deviation	.
42	Mean Score	5
	Number of Firms	1
	St. Deviation	.
48	Mean Score	7
	Number of Firms	1
	St. Deviation	.

Appendix 10: *PLS GRAPH* Output: Representation of MangSoA Model (Initial)



Note: IT leading is identified as Leadership

Appendix 11: *PLS GRAPH* Output: Representation of MangSoA Model (Refined)

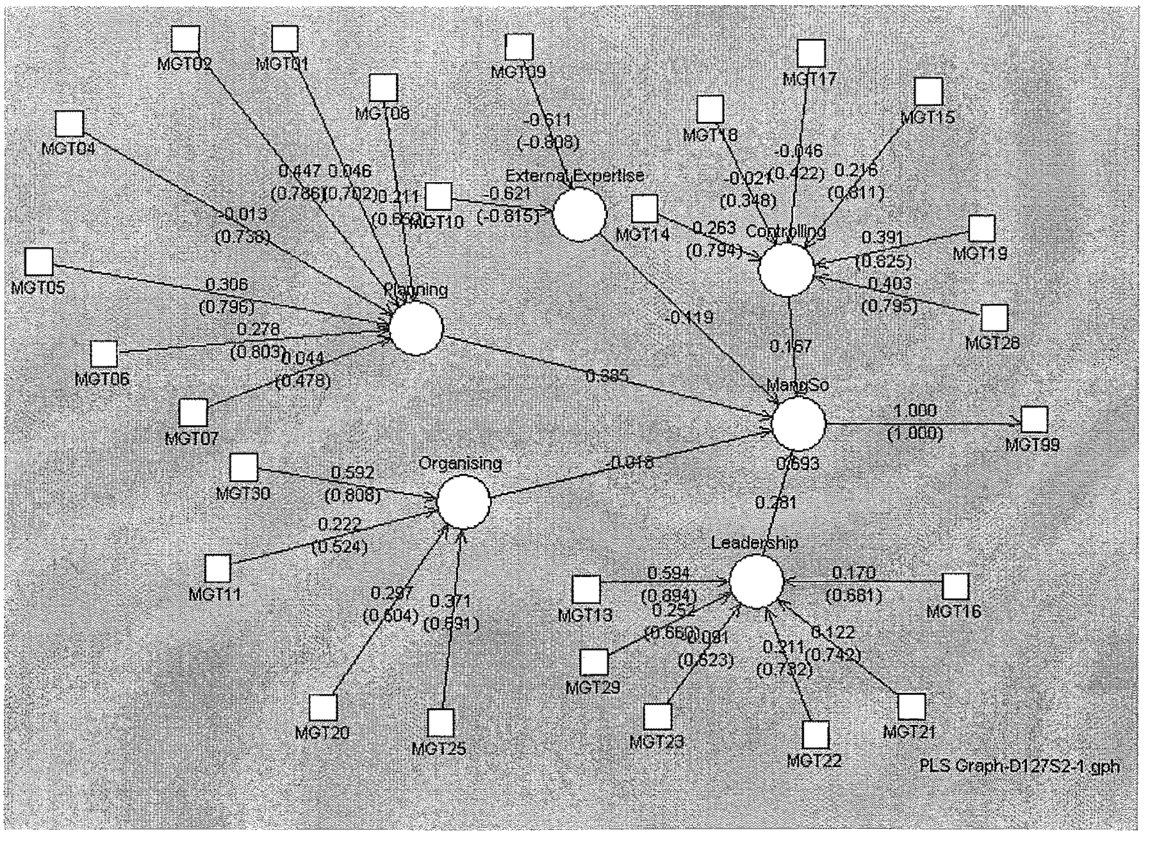


Note: IT leading is identified as Leadership

Appendix 12: Validity and Reliability Calculations: MangSo-A (Refined) Model

Latent Variable	Measure	Loading (L)	L^2	Sum of L^2	Sum of L	(Sum of L)^2	(1 - L^2)	Sum of (1 - L^2)	Composite . Reliability	AVE	SQRT of AVE
LEDERSHIP-inward											
	MGT13	0.8695	0.7560				0.2440				
	MGT16	0.6844	0.4684				0.5316				
	MGT21	0.8087	0.6540				0.3460				
	MGT22	0.7737	0.5986				0.4014				
	MGT29	0.5537	0.3066				0.6934				
	MGT23	0.6355	0.4039	3.1875	4.3255	18.7100	0.5961	2.8125	0.8693	0.5312	0.7289
PLANNING-inward											
	MGT01	0.588	0.3457				0.6543				
	MGT02	0.692	0.4789				0.5211				
	MGT04	0.8855	0.7841				0.2159				
	MGT05	0.5746	0.3302				0.6698				
	MGT06	0.8355	0.6981				0.3019				
	MGT07	0.6649	0.4421				0.5579				
	MGT08	0.7308	0.5341	3.6131	4.9713	24.7138	0.4659	3.3869	0.8795	0.5162	0.7184
ORGANISING-Inward											
	MGT11	0.5352	0.2864				0.7136				
	MGT20	0.7421	0.5507				0.4493				
	MGT25	0.7305	0.5336				0.4664				
	MGT30	0.41	0.1681	1.5389	2.4178	5.8458	0.8319	2.4611	0.7037	0.3847	0.6203
EXT_EXP inward											
	MGT09	0.8545	0.7302				0.2698				
	MGT10	0.7677	0.5894	1.3195	1.6222	2.6315	0.4106	0.6805	0.7945	0.6598	0.8123
CONTROL-Inward											
	MGT14	0.7378	0.5443				0.4557				
	MGT15	0.6945	0.4823				0.5177				
	MGT17	0.6085	0.3703				0.6297				
	MGT18	0.6	0.3600				0.6400				
	MGT19	0.5637	0.3178				0.6822				
	MGt28	0.7728	0.5972	2.6719	3.9773	15.8189	0.4028	3.3281	0.8262	0.4453	0.6673

Appendix 13: *PLS GRAPH* Output: Representation of MangSo-B Model



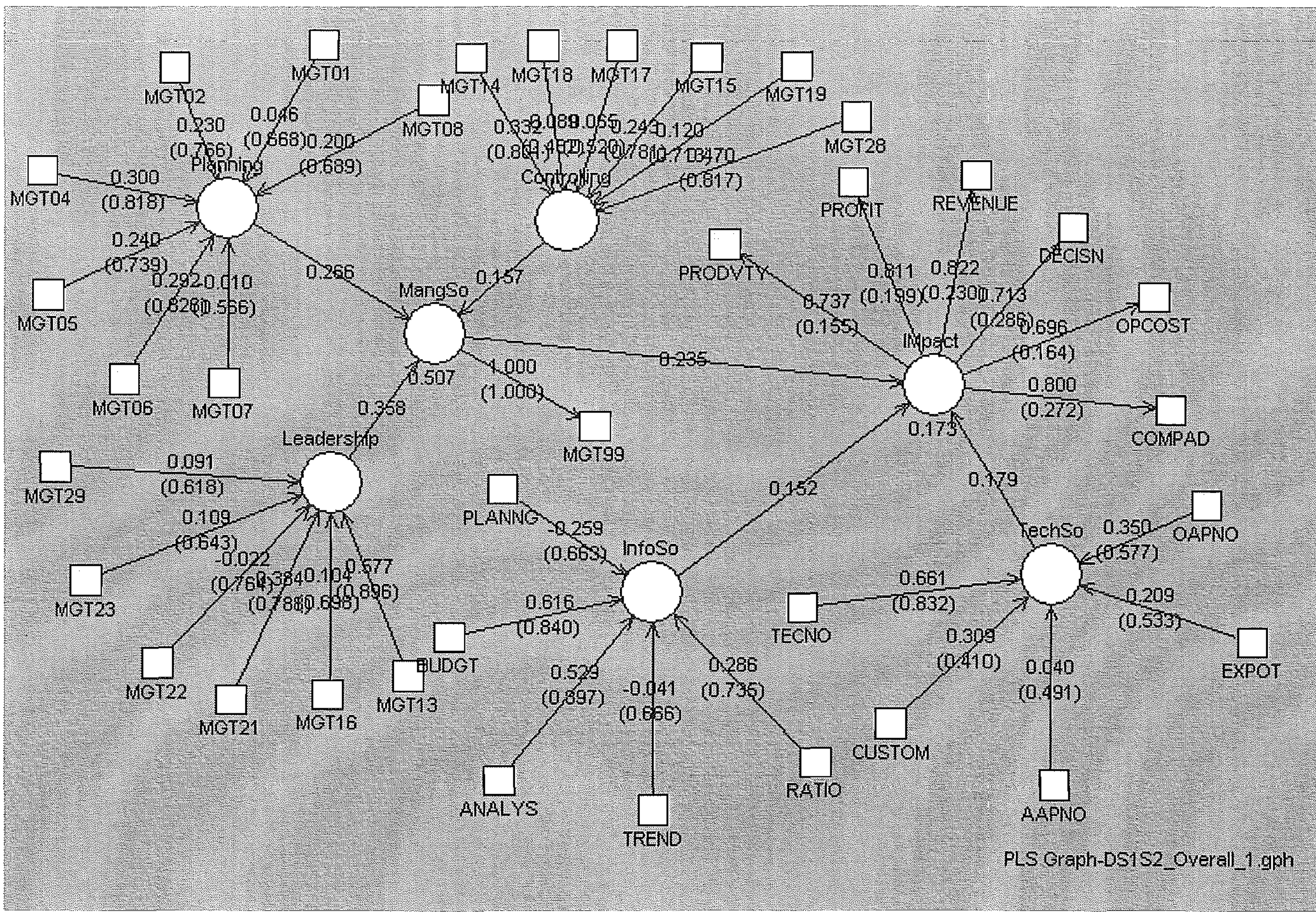
Note: IT leading is identified as Leadership

Appendix 14: Validity and Reliability Calculations:

MangSo-B (Refined) Model

Latent Variable	Measure	Loading (L)	L^2	Sum of L^2	Sum of L	$(\text{Sum } L)^2$	$(1 - L^2)$	Sum $(1 - L^2)$	Composite Reliability	AVE	SQRT of AVE
LEDERSHIP-inward											
	MGT13	0.8937	0.7987				0.2013				
	MGT16	0.6806	0.4632				0.5368				
	MGT21	0.7417	0.5501				0.4499				
	MGT22	0.7325	0.5366				0.4634				
	MGT29	0.6599	0.4355				0.5645				
	MGT23	0.6231	0.3883	3.1723	4.3315	18.7619	0.6117	2.8277	0.8690	0.5287	0.7271
PLANNING-inward											
	MGT01	0.7025	0.4935				0.5065				
	MGT02	0.7859	0.6176				0.3824				
	MGT04	0.7377	0.5442				0.4558				
	MGT05	0.7957	0.6331				0.3669				
	MGT06	0.8032	0.6451				0.3549				
	MGT07	0.4779	0.2284				0.7716				
	MGT08	0.6517	0.4247	3.5867	4.9546	24.5481	0.5753	3.4133	0.8779	0.5124	0.7158
ORGANISING-Inward											
	MGT11	0.5244	0.2750				0.7250				
	MGT20	0.5037	0.2537				0.7463				
	MGT25	0.6913	0.4779				0.5221				
	MGT30	0.8079	0.6527	1.6593	2.5273	6.3872	0.3473	2.3407	0.7318	0.4148	0.6441
EXT_EXP inward											
	MGT09	-0.8079	0.6527				0.3473				
	MGT10	-0.8152	0.6646	1.3173	-1.6231	2.6345	0.3354	0.6827	0.7942	0.6586	0.8116
CONTROL-Inward											
	MGT14	0.7936	0.6298				0.3702				
	MGT15	0.8114	0.6584				0.3416				
	MGT17	0.4215	0.1777				0.8223				
	MGT18	0.3478	0.1210				0.8790				
	MGT19	0.8251	0.6808				0.3192				
	MGt28	0.7952	0.6323	2.8999	3.9946	15.9568	0.3677	3.1001	0.8373	0.4833	0.6952

Appendix 15: *PLS GRAPH* Output: Representation of the Overall Model



Notes:

Corresponding variable names used in the PLS output are:

IT Leading	- Leadership	STAPR	- PRODVITY	PLANG	- PLANNG
CUSTM	- CUSTOM	PROFT	- PROFIT	BUDGT	- BUDGT
ACCNO	- AAPNO	REVNU	- REVENUE	ANLYS	- ANALYS
EXPSP	- EXPOT	DECMK	- DECISN	TREND	-TREND
OTTNO	- OAPNO	OPCST	- OPCOST	RATIO	-RATIO
TECNO	- TECNO	COMAD	- COMPAD		

Appendix 16: Overall PLS Model: Validity and Reliability Calculations

Latent Variable	Measure	Loading (L)	L^2	Sum of L^2	Sum of L	(Sum $L)^2$	$(1 - L^2)$	Sum of $(1 - L^2)$	Composite. Reliability	AVE	SQRT of AVE
LEDERSHIP- inward											
	MGT13	0.8957	0.8023				0.1977				
	MGT16	0.6983	0.4876				0.5124				
	MGT21	0.7876	0.6203				0.3797				
	MGT22	0.7643	0.5842				0.4158				
	MGT29	0.6177	0.3816				0.6184				
	MGT23	0.6426	0.4129	3.2889	4.4062	19.4146	0.5871	2.7111	0.8775	0.5481	0.7404
PLANNING- inward											
	MGT01	0.6683	0.4466				0.5534				
	MGT02	0.7657	0.5863				0.4137				
	MGT04	0.8181	0.6693				0.3307				
	MGT05	0.7392	0.5464				0.4536				
	MGT06	0.8259	0.6821				0.3179				
	MGT07	0.5661	0.3205				0.6795				
	MGT08	0.6886	0.4742	3.7254	5.0719	25.7242	0.5258	3.2746	0.8871	0.5322	0.7295
CONTROL- Inward											
	MGT14	0.801	0.6416				0.3584				
	MGT15	0.7811	0.6101				0.3899				
	MGT17	0.5199	0.2703				0.7297				
	MGT18	0.4824	0.2327				0.7673				
	MGT19	0.7135	0.5091				0.4909				
	MGt28	0.8165	0.6667	2.9305	4.1144	16.9283	0.3333	3.0695	0.8465	0.4884	0.6989
INFOSO- Inward											
	BUDGT	0.8397	0.7051				0.2949				
	ANALYS	0.8972	0.8050				0.1950				
	TREND	0.6665	0.4442				0.5558				
	RATIO	0.7354	0.5408				0.4592				
	PANNG	0.6635	0.4402	2.9353	3.8023	14.4575	0.5598	2.0647	0.8750	0.5871	0.7662
TECHSO-Inward											
	TECNO	0.8321	0.6924				0.3076				
	AAPNO	0.491	0.2411				0.7589				
	OAPNO	0.5767	0.3326				0.6674				
	CUSTOM	0.4098	0.1679				0.8321				
	EXPOT	0.5326	0.2837	1.7177	2.8422	8.0781	0.7163	3.2823	0.7111	0.3435	0.5861
IMPACT- Outward											
	DECISN	0.7131	0.5085				0.4915				
	PRODVTY	0.7369	0.5430				0.4570				
	COMPAD	0.7998	0.6397				0.3603				
	OPCOST	0.6964	0.4850				0.5150				
	REVENU	0.8217	0.6752				0.3248				
	PROFIT	0.8106	0.6571	3.5084	4.5785	20.9627	0.3429	2.4916	0.8938	0.5847	0.7647

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