Factors that influence the decision to adopt software upgrades in Australian small and medium sized businesses

A dissertation submitted by

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Abstract

Despite the substantial contribution to the software industry by small and medium sized businesses purchasing software package upgrades, to date there has been minimal research on the topic. Most businesses rely on packaged software for administrative and many core business functions. The practitioner press reports that managers experience frustration due to the frequency of software upgrade releases. After reviewing the diffusion of innovation literature, factors thought to influence the likelihood to purchase software upgrades were identified: business characteristics, innovativeness, relative advantage, external influences, complexity of purchase decision, and compatibility. A mixture of qualitative and quantitative methods was used to further explore the factors that influence the decision to upgrade software in small and medium sized Australian businesses. The responses to ten in-depth interviews were used to develop a questionnaire which was mailed to a five thousand small and medium sized Australian businesses. A number of factors were identified through exploratory factor analysis and these were further examined using structural equation modelling to determine which factors contributed significantly to the decision to upgrade software. The analysis concluded that innovativeness of the decision maker, the perceived lack of control in the upgrade decision and the complexity of the upgrade decision had a small but significant influence on the likelihood to upgrade software.

Certification of the Dissertation

I certify that the ideas, interviews, survey work, results, analyses and conclusions reported in this dissertation are entirely my own effort, except where otherwise acknowledged. I also certify that the work is original and has not been previously submitted for any other award.

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Signature of candidate Date

ENDORSEMENT

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1 Introduction

1.1 Research problem and aim

Since the introduction of the personal computers, small and medium sized businesses have adopted computers. Clearly, these businesses now have experience in purchasing a computer and software. The subsequent utilization of computers within these businesses also means they now possess some computing experience and knowledge.

However, computer technology advances quickly, and what was new quickly becomes old. So the initial purchase, of both the hardware and software, will need to be upgraded.

This study will focus on the software upgrade, and aims to determine the main factors that influence the decision to upgrade software in small and medium sized Australian businesses.

The definition of small and medium sized businesses differs depending on the country involved. Since this research is focusing on Australian businesses, the definitions used by the Australian Bureau of Statistics will be used in this research. The Australian Bureau of Statistics (1999) defines small businesses "as those businesses employing less than 20 people" and further defines a medium business "as those businesses employing between 20 or more people, but less than 200 people".

According to Microsoft (2009) "An upgrade is a software package that replaces an installed version of a product with a newer version of the same product. The upgrade process typically leaves existing customer data and preferences intact while replacing the existing software with the newer version." Numerous sources provide very similar definitions. Thus, for the purposes of this study, a software upgrade is a new version of, or addition to a software product that is already installed or in use.

Studies such as those conducted by Maiden and Ncube, 1998; Lai, Trueblood and Wong,1999; Kontio, 1996 and Chau 1995, have dealt with the topic of software selection but only a few research publications have been located that touch on the issue of software upgrades (Howcroft & Light, 2006; Deep, Guttridge, Dani & Burns, 2008; Sawyer, 1999; Ng, 2001; Light, 2001; Carney & Wallnau, 1998 and Montazemi, Cameron & Gupta, 1996). However, these studies have not addressed the specific issue of purchasing software upgrades in the small and medium sized businesses.

Rogers in his seminal work, "Diffusion of Innovations", (1995) proposed five categories for adopters of new innovations; innovators, early adopters, early majority, late majority and laggards. These categories define the willingness and ability to adopt an innovation. They provide a common language for innovation researchers and will be utilized in this research.

There will always be new software innovations, and for those users who have previously adopted software many of their future purchases will involve upgrades of their existing software. Clearly, there is a need to examine the nature of the adoption of software upgrades. With the ever-increasing reliance on and purchases of application software and the subsequent purchase of upgrades it is obvious that this gap needs to be addressed.

1.2 Background to the research

Australians businesses spend heavily on ICT. According to the Australian Trade Commission (2009), ICT spending in Australia was just over US$60 billion in 2008, and "Australian businesses are looking for new generation IT solutions to maximise productivity and generate revenue." Australia has a strong computer services sector with exports of almost $2.6 billion during 2002-03 (Houghton, 2006 p.7). However, our imports exceeded this value and the net result was a "…overall deficit on trade in ICT services in 2002-03 of $569 million." Ignoring the impact that the 2000 Olympic Games had on the ICT services, there have been deficits in the ICT services sector from 1993-94 to 2002-03 as shown in figure 1 below.

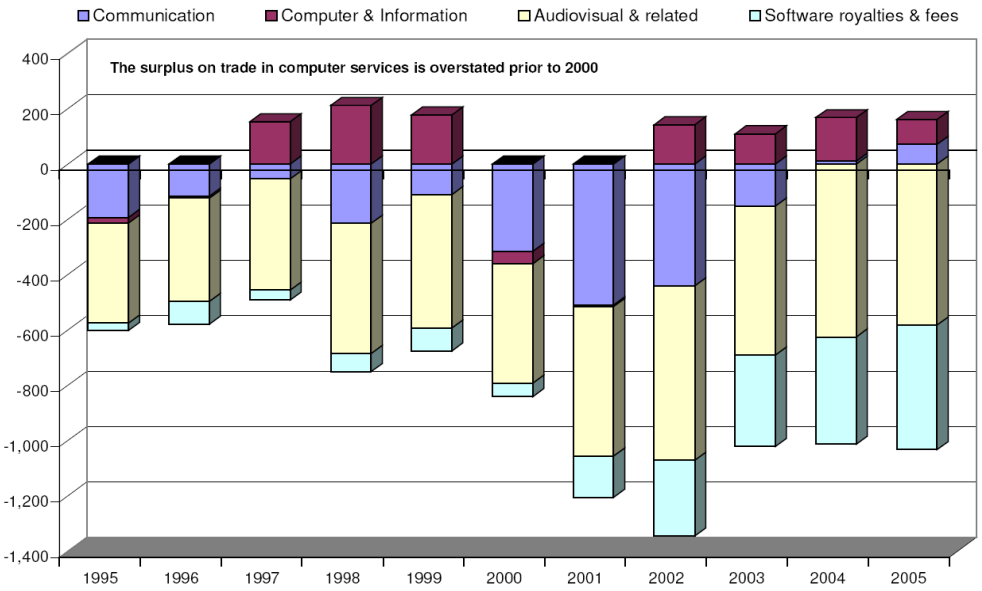

Figure 1.1: Australia's ICT services trade balance, 1995-2005 (AUDm) (Source Houghton, 2006)

While economists and politicians might debate the advantages and disadvantages of a trade deficit, the sheer size of this deficit warrants attention, and the fact that it continues to grow should be of concern. In conjunction with this is the indication that Australia's ICT capabilities are diminishing. Australia's IT industry competitiveness index, shown in table 1.1, dropped from fifth rank in 2007 to seventh rank in 2008 (Thomas 2008).

Table 1.1 IT industry competitiveness index: Overall scores and ranks (Source: Thomas 2008)

Country	Score	2008 rank	2007 rank
United States	74.6	1	1
Taiwan	69.2	2	6
United Kingdom	67.2	3	4
Sweden	66.0	4	7
Denmark	65.2	5	8
Canada	64.4	6	9
Australia	64.1	7	5

In figure 1.2, we see that Australia is among the world leaders in IT spending (Thomas 2008). The Australian federal government is Australia's biggest spender on ICT and it increased the amount it spends by over 20 percent to be "investing" approximately $5 billion annually on technology. (Bajkowski, 2005)

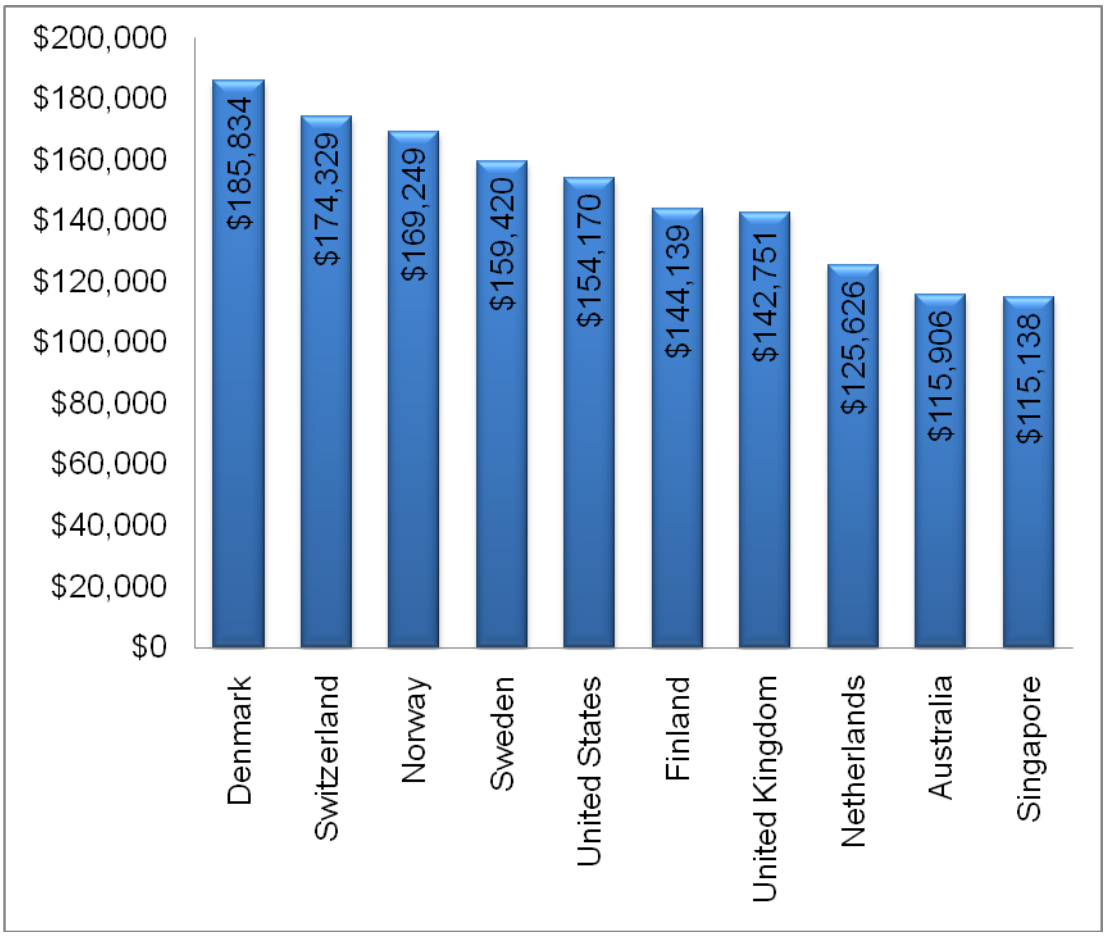

Figure 1.2 IT spending per 100 population in 2007 (Source: Thomas 2008)

However, it is not just government or large organisations that have adopted information technology. One of the main reasons for the increased rate of adoption of computers has been the reduction in the computer prices (Jorgenson 2001). According to Dedrick et al (2003, p16) "the decreasing prices of IT have resulted in a significant increase in its demand, encouraging organizations to substitute IT for labour and for other forms of capital such as plant, machinery, or equipment."

According to Gartner Consulting's Worldwide IT benchmark Service (Business Wire July 26 2005) "small and midsized organizations (under $1 billion in revenue) are spending 53 percent to 60 percent of their total information technology (IT) budget on infrastructure, including data centre, voice and data networks, desktop and help desk." In the US businesses "typically spend over 50 percent of their capital budget on information technology (IT) investments" (Rockart et al., 1996 in Cooper & Bhattacherjee, 2001). IDC (2009) believes IT services will account for 21.1 percent of the ICT spending within Australian manufacturing which is estimated to be worth $4.8 million. Ovum (2009) reported "IT services growth is expect to exceed 4.5 percent in 2010" and by 2013 it is expected to be worth more than $14 billion in Australia and new Zealand. Australian business are investing in IT, which in turn makes software upgrades a significant issue for Australian businesses.

Chesher and Skok (2000) studied the barriers to SMEs getting started but it is now necessary to consider the next stage that the SMEs face. The focus should no longer be on adoption of information technology since most SMEs have done that, but should now be on the understanding how they upgrade their information technology. Chesher and Skok (2000, p.20) found the small business community need "special attention if they are to gain maximum benefit from information and communication technologies."

Love and Irani (2004) found that "different organisation types significantly differ in the amount they invest in IT and their firm size (in terms of turnover and number of employees) does not influence investment levels in IT."

1.3 Significance of the research

Computers were first adopted by larger organisations, but the proliferation of computers has been widespread with small businesses now using computers too. The Yellow Pages Small Business Index (1998) found that in Australian small businesses employing fewer than twenty people nearly three-quarters have a desktop computer, and the 2005 Sensis e-Business report found the 95 percent of all small and medium sized business reported owning a computer. By May 2008, the 2008 Sensis e-Business report stated the figure had climbed to 97 percent. Clearly, software upgrades is an issue all of these businesses need to address.

The growth of computers has been due in part to the improvements in software accompanied by an expansion in commercial off-the-shelf

applications. In 1995 the United States ran an $18 billion trade surplus in off-the-shelf software with Europe alone (Carmel, 1995). The fifth annual BSA and IDC global software piracy study (2007, p.3) states that “by the end of 2007, there were more than one billion PCs installed around the world.” IDC Global anticipates that (2007, p.4) “Globally, businesses and consumers will spend nearly $400 billion on PC software over the next four years.”

The reason for the wide adoption of software packages is they offer many advantages such as lower costs, less risk, high quality, less time to implement, and require fewer resources to obtain.

In 2004, the average amount spent on software by Australian small and medium sized businesses was $3300 (Sensis, 2005). To put this in context, the “average spend for small businesses on computer hardware in 2004 was approximately $4,400, for medium businesses the corresponding spend on hardware was $42,300” and for software, “the average spend for small businesses being $1,900 compared to $31,600 for medium businesses” (Sensis, 2005).

Clearly, Australian small and medium sized businesses spend a significant amount on software. The companies that provide commercial off the shelf packages continually try to improve their product, and to charge for the service. They introduce new features, improve some existing features to make them easier to use, and remodel the software to take advantage of new hardware and operating systems. The result is to entice further spending.

However many consumers have expressed concerns about these improvements for some time. Wysocki (1998) reported that at Aeroquip Corp in USA according, “most office workers at his company use only a small fraction of the computer power, hardware or software, now on their desks.” According to Bove (2005) “Microsoft creates a new product overstuffed with features … to bring the trailing-edge people forward with every release.” So if consumers are not using many of the features of the existing version of the software, why would they be interested in investing in a newer version that will have even more features? Does the degree of utilization of the software impact on the decision to upgrade software?

The use of third party packages brings with it disadvantages such as lack of ownership and lack of control over the code (Stair, 2007). These indirectly expose the business to external changes being forced upon it by the copyright owner of the software. Indeed, the company that owns the copyright to the software will deliver new versions or upgrades to their software when it suits them. Obviously, the timing of the release of the software may not suit the small business purchaser.

The first stage for building or improving any information system is the initiation phase. This is also the stage during which an organisation could decide to purchase rather than build a new system. It is here that the

process of defining the need to change an existing system is identified and examined. The analysis in this phase should include justification for the new system. Businesses have, as Love and Irani (2004, p.13) found, "inherent difficulties in identifying and assessing the benefits and costs" making it difficult for them to perform a proper analysis. Consequently, Love and Irani (2004, p.13) report that business are often uncertain "about the expected impact that the investment might have on the business." Dyerson et al (2009, p.39) reported in the national survey of SMEs use in four sectors, that SMEs are concerned about the cost of their ICT investments and "are uncertain about the business benefits." So, if businesses are having problems with cost benefit analysis for new software, then what procedures, if any, do small and medium sized businesses follow to purchase an upgrade to their existing software?

This question becomes more important given the frequency with which software is being upgraded and the problems encountered with upgrades. A study by Crameri et al (2007) confirms that problems with upgrades are quite common and that severe disruption can result. So while the cost of a software upgrade is often less than the cost of the new product, the total cost per person of the upgrade is significant when all aspects of the upgrade are taken into account. (Wysocki, 1998; Patterson, 2002)

In summary, most Australian small and medium sized businesses have computers, and must therefore deal with the prospect at some stage of upgrading their software. The cost to business individually and collectively is significant. Small businesses have difficulty understanding the impact of the software upgrade, and dealing with the issues of the software upgrades.

Determining the factors that influence the decision to upgrade software in small and medium sized Australian businesses will help to address this significant gap in our knowledge.

1.4 Methodology

This research explores the reasons for adoption of a software upgrade in small to medium sized businesses within Australia. The data collection involves both qualitative and quantitative phases. The qualitative phase provides a detailed view of the variables that influence the decision to upgrade software. The quantitative phase expands the understanding by collecting data from a large sample of the population, allowing quantitative analysis. This is achieved by using a mail survey.

The survey is developed by combining the issues revealed in a review of the literature with those identified in the in-depth interviews. The interviews are conducted with a local convenience sample in southeast Queensland. The survey is pre-tested with knowledge experts and any necessary changes are made. The instrument is then be submitted to a pilot study which is mailed to a random sample of Australian small and medium sized businesses.

The research sample for this study consists of a random sample of owner/managers of small and medium sized businesses who are responsible for the adoption of innovative technologies within Australian small and medium sized businesses. The sample size will be large enough so that a reasonable sized dataset is obtained to enable analysis with Analysis of Moment Structures (AMOS) software. To improve both response rates and the research instrument, the design methods suggested by Dillman (1978) and Frazer and Lawley (2000) are used.

The questionnaire consists of a four sections. The first section contains instructions for completing the survey and the purpose of the survey. The second section contains questions to ascertain the current status of software application adoption within the business. The third section includes items to determine the individuals' perceptions on the upgrading software. The final section collects some demographic information about the respondent and their business.

1.5 Data Analysis

Structural equation modelling techniques have become popular tools in information systems research (Chin, 1998) and will be used to determine from the survey data the factors that influence the decision to upgrade software. Both SPSS V15.0 and AMOS 16 will be used for the analysis of the quantitative data.

1.6 Contributions of the research

The existing knowledge on adoption of innovations and in particular the adoption of technology in small and medium sized business does not address the issue of software upgrades.

Little previous research has been located that deals specifically with the issue of adopting software upgrades to packaged software, especially for small and medium sized business. This research will benefit both the academic and the small business community.

1.6.1 Contribution to academic research

This research will provide a current and comprehensive review of the literature on innovation diffusion of modern technology with an emphasis on upgrade of software. Scales will be developed and refined to measure the decision to upgrade existing software. These scales will provide academics with tools that could be used in both teaching and research.

1.6.2 Contribution to Small Business Practice

The research will provide a greater understanding of how the decision to upgrade applications software is made and may assist with the development of policies and practices that are easy to implement. The measurements on

the extent of use of the existing applications should enable the owner/manager to rate the success of the implementation and thus judge previous decisions.

The outcomes of this research will provide guidelines for owners and managers involved in determining requirements for commercial off the shelf software upgrades enabling wiser decisions which should result in savings for the organisation and a greater appreciation of the usage of the current software.

1.7 Limitations of the research

When researching organisations, a number of factors can operate separately or in combination to confound results.

Organisations use a range of software. Most use generic software such as Microsoft Office, accounting packages, and some software that is specific to their industry. The research will ask the respondent to think of the most important piece of software for the purposes of making responses about software upgrades. Naturally, different respondents will be thinking of different software when they respond to these items.

The research is also confined to Australian small and medium sized business, and therefore may not apply to other organisations given the difference in size and nature of Australian small and medium sized business to small and medium sized business in other countries.

1.8 Outline of the dissertation

This dissertation is organised into seven chapters. Chapter one provides an overview of the information technology adoption. The research problem, significance of the research, contribution, and limitations are also included in this chapter.

Chapter two provides details on adoption of technology and reveals the gap that exists in the current literature on adoption of innovations. The scarcity of research conducted in the area of software upgrades is revealed. Following the literature review a conceptual model showing the possible models for further investigation is presented.

The third chapter explains the sequential exploratory methodology employed in this research. The process for the development of the measurement instruments are discussed, the sample used, the data collection, and statistical techniques to be employed are also presented.
Chapter four will provide the details of the data collected from the interviews - the qualitative phase, together with a discussion of the results.

Chapter five will discuss the analysis and findings of the pilot study. The data collected from the interviews is combined with the data from the

literature review to develop the survey instrument to be employed in the quantitative stage. The guidelines used to construct the survey are presented. The pilot study will provide details on response rate, expected means, and standard deviations from which an appropriate sample size for the full scale study can be determined.

The full scale study is discussed in chapter six. The aim is to collect a sample large enough to split into two halves. This will enable one half to be used to explore the data and the second half will be used to confirm the findings. Two models will be presented and compared.

Chapter seven will be used to present a summary of the research findings and the limitations of the study as well as recommendations for further research.

2 Literature review

2.1 Introduction

Since 1980, when IBM produced its first personal computer, businesses have spent large amounts of money on personal computers and applications software. By 1998, over $1 trillion dollars had been spent in the U.S. alone (Grover et al. 1998) and since then the amount spent has exploded to the point where worldwide IT spending was expected to exceed $3.3 trillion in 2008 (Gartner, 2007). Over this period there has been rapid progress in chip technology, highlighted by Moore's Law, which states "that the number of transistors on a chip will double about every two years and Intel has kept that pace for nearly 40 years" (www.intel.com/technology/mooreslaw/ on 7 Aug 08). This exponential growth in hardware has been paralleled by software improvements making it easier for millions of workers to use desktop computers, even though they know little about computer technology.

As the speed and capacity of computers has improved with each new release, the software running on the machines has changed to take advantage of the faster processing and larger storage. So, while chips are constantly getting faster and are having more features added to them, software vendors are adding new features to their software to exploit the improved chips. This has created what David Flint of Wentworth Research called the "upgrade escalator" (Scott 1998). The upgrade escalator is "the business model designed to entangle the end users into purchasing constantly more expensive and larger software updates"(Open Office, 2008). Diffusion theory provides a general explanation for the way in which innovations are adopted, but is a software upgrade considered an innovation?

According to Sahin and Zahedi, activities undertaken post-sale by software package developers can be classified as warranty, maintenance, or upgrade (2001). Conducting research from the developers' perspective, Sahin and Zahedi define upgrade activities "as adding new functions or features to a software system, in addition to any maintenance and fault removal" (2001 p.471). However, from the user's perspective, a software upgrade is a new version of, or addition to a software product that is already installed or in use. Upgrades may be sold as specially labelled, less expensive upgrade packages to existing users alongside versions of the product made for sale to first-time users. In other models of software distribution, an upgrade may also be available for free or at a cost to existing users. There are two types of upgrades, those released sequentially by suppliers with enhancements or fixes; and secondly, some software products have various editions available simultaneously: users can upgrade from one current version to another (e.g. from professional to enterprise) (Raghunathan 2000). Thus, while an initial purchase of software may be considered an innovation, an upgrade may not be considered an innovation. Therefore alternatives need to be explored to provide the best explanation of the adoption of software upgrades.

The organisation of this chapter is depicted in figure 2.1. The first section will explore the literature concerned with the diffusion of innovations. Following this is a section on the adoption of information technology in small business. The chapter will then explore organisation buying behaviour to expand on the understanding of how businesses make their purchase decisions. Those areas provide the background for the next section on the adoption of software upgrades to inform the research question. Following the research question, possible factors are identified from the literature. From this a preliminary model is posited. The final section of the chapter is a conclusion, which provides a summary.

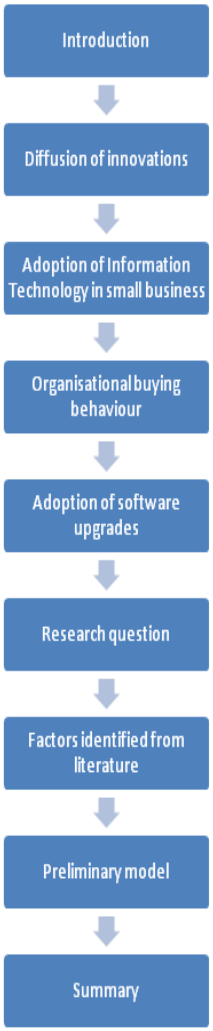

Figure 2.1 Outline of chapter 2

The topics covered in the literature review flow from the parent disciplines of diffusion of innovations, adoption of information technology in small business and organisational buying behaviour as shown in figure 2.2. Each of these areas of literature is discussed in the sections below.

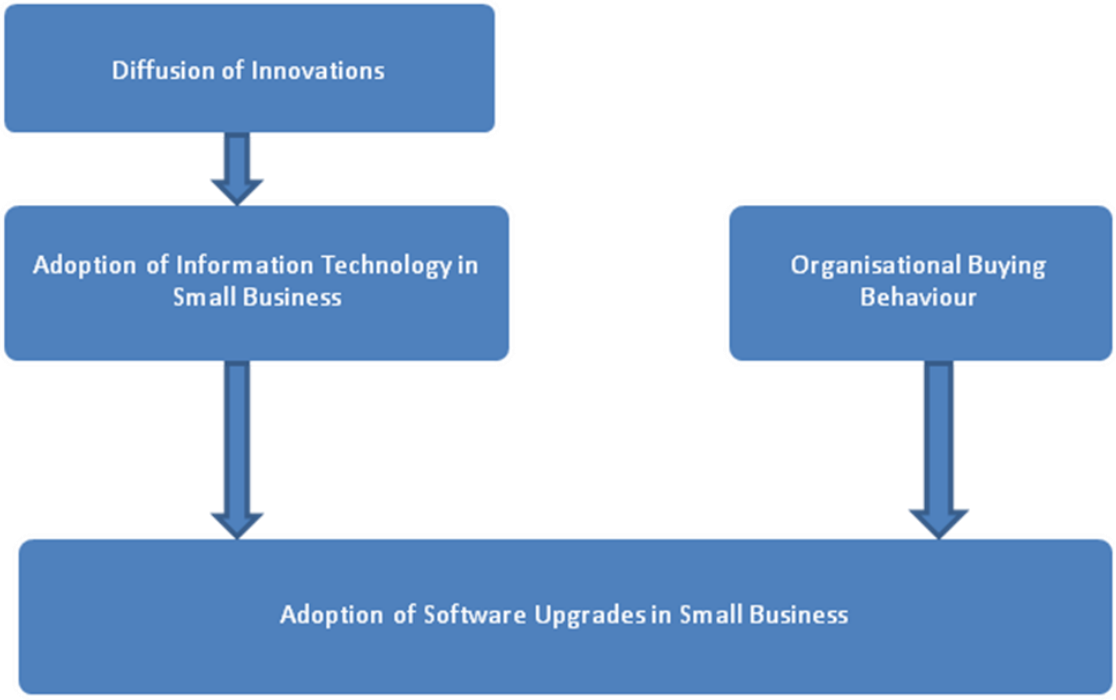

Figure 2.2 Areas of literature relevant to a study on upgrades of office software in Australian small and medium business (Source: developed for this research)

2.2 Diffusion of Innovations

The research into the decision to adopt an upgrade to software is grounded in Rogers' (1995) view of innovation and diffusion. The Rogers model is a comprehensive view of the innovation diffusion process and it identifies the five stages to the decision process to adopt an innovation as knowledge, persuasion, decision, implementation, and confirmation.

Rogers identifies five adopter categories and has shown the distribution of adopters in these categories closely approaches normality. The first 2.5 percent to adopt the innovation are classified as the innovators, the next 13.5 percent are the early adopters, the following 34 percent are the early majority, the next 34 percent are the late majority, and the last 16 percent are the laggards. These are shown in figure 2.3.

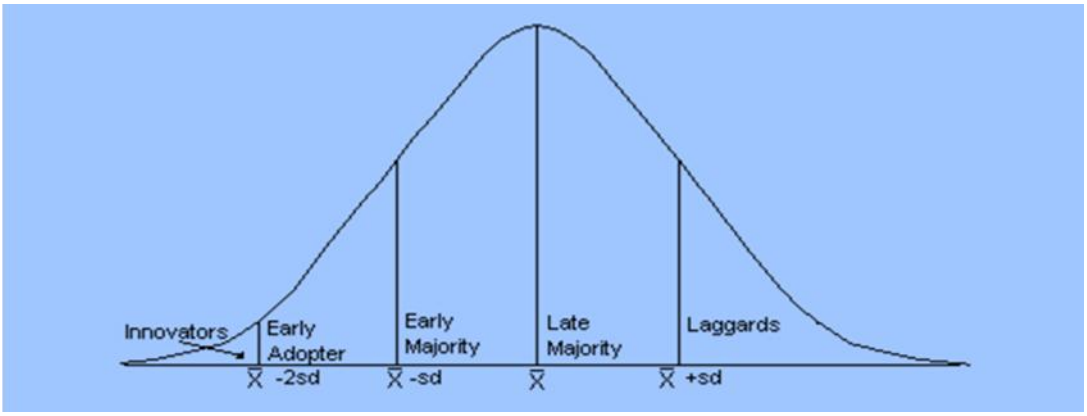

Figure 2.3 Adopter categorization on the basis of innovativeness (Source: developed for this research based on Rogers' categories)

Diffusion is defined as "the process by which an innovation is communicated through certain channels over time among the members of a social system" (Rogers, 1995). The rate of diffusion is best illustrated by the S-shaped diffusion curve shown in figure 2.4.

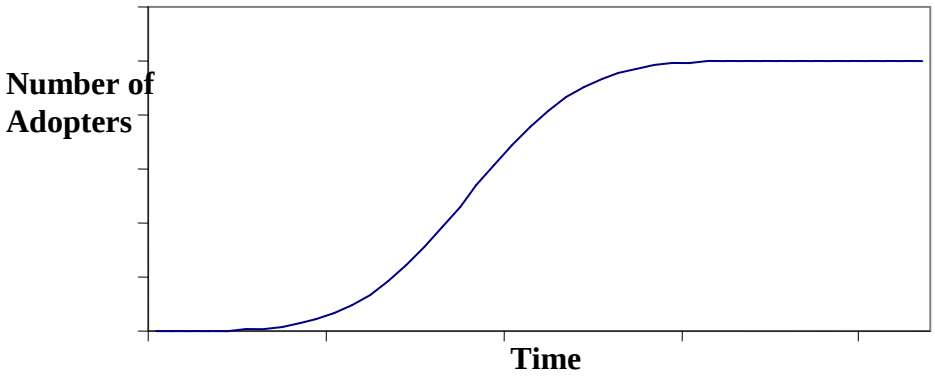

Figure 2.4: S-shaped adopter distribution curve (Source adapted from http://en.wikipedia.org/wiki/Logistic_function)

The research questions addressed by diffusion scholars compare earlier adopters with later adopters, the attributes of the innovation and how it affects the rate of adoption, and why the S-shaped curve "takes off" at about the 1 to 25 percent adoption (Rogers, 1995).

As early as 1990, Brancheau and Wetherbe concluded that innovation diffusion theory did not provide a complete explanation for technology diffusion in organisations. Their work was extended and incorporated into a unified view of the user acceptance of information technology (Venkatesh et al., 2003, p.471) which concluded that "future research should focus on identifying constructs that can add to the prediction of intention and behavior over and above what is already known and understood." However, all of this

prior research has been conducted on adoption of information technology but it has considered the adoption for the first time.

Only a few research publications have been located that refer to software upgrades. However these do not specifically address software upgrades from a small and medium sized businesses perspective. While there will always be new software, the current users have already purchased software, so their future purchases will inevitably involve some upgrades to their existing software. Clearly, there is a need to examine the nature of the adoption of software upgrades. The ever-increasing reliance on and purchase of application software means there will be subsequent purchase of software upgrades. This gap needs to be addressed.

2.3 Adoption of Information Technology in Small Business

Numerous researchers have investigated the adoption of information technology in small business. When comparing these studies, it is important to realize that there is no universal accepted definition of what constitutes a small business. For example, Ryan and Harrison (2000) in their study based in the United States defined a small business as one having fewer than 250 employees, and a medium business as one having 251-1000 employees. This is different from other countries, and in particular Australia. The Australian Bureau of Statistics (1999) definitions for small businesses and medium business are, “a small business is defined as those businesses employing less than 20 people and a medium business is defined as those businesses employing between 20 or more people, but less than 200 people”. Since this research is based on Australian businesses, the Australian Bureau of Statistics definitions were utilized.

Perceived benefits, organisational readiness, and external pressures to adopt were found to be significant factors for adoption of information technology by small organisations (Iacovou et al. 1995). The Theory of Planned Behaviour was used by Harrison et al. (1997) to predict the decision made by executives to adopt information technology in small business. Their model included the decision process based on attitude, perceived control regarding information technology, firm characteristics, and individual characteristics. Individual characteristics and organisational characteristics were also examined by Thong and Yap (1995).

There seems to be agreement within the previous research concerning the importance of the owner/manager’s characteristics and the business characteristics. However, a gap exists within this research. It has not considered the adoption of upgrades. Clearly owner/managers need to understand the implications of the decision to adopt an upgrade and to know whether the decision to upgrade is cost effective for their business.

2.4 Organisational Buying Behaviour

According to Sheth et al. (1999), the purchase decision is a product of the organisational buying behaviour, which in turn has three key inputs, the organisational characteristics, the nature of the purchase and the information sources. This is represented in figure 2.5.

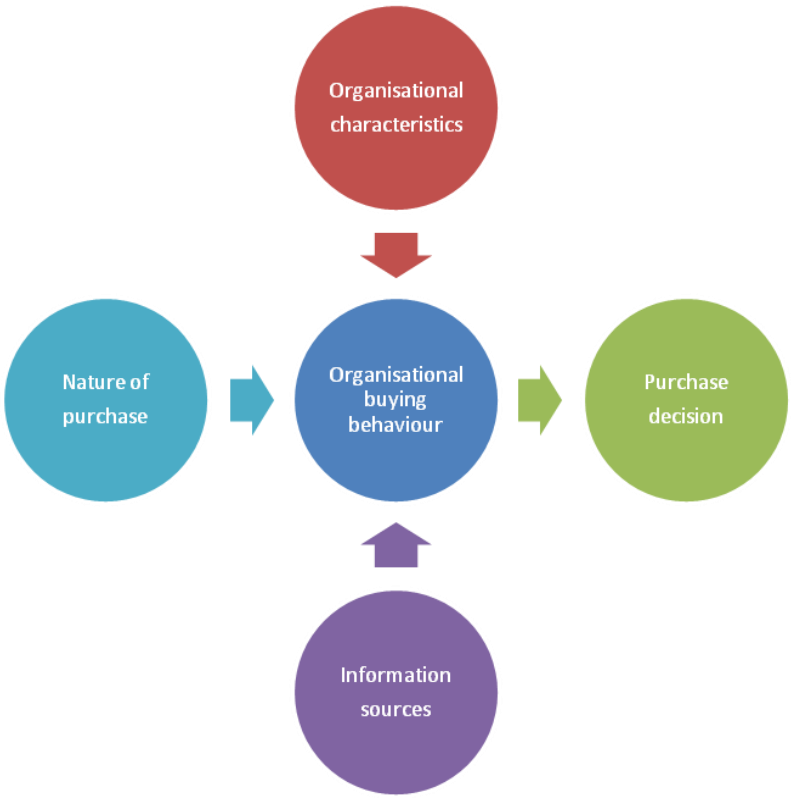

Figure 2.5. Organisational buying behaviour Source: Adapted from Sheth et al. (1999).

The organisational characteristics identified by Sheth et al. (1999) include size, centralization, purchase orientation and rules and procedures.

Organization purchases can be classified into three different buying categories: new task, modified rebuy, and straight rebuy. These different types of purchases vary in complexity and the time involved in making the purchase decision. The straight rebuy is considered as a straightforward decision and consequently requires fewer decision makers, less time and usually deals with less complex products compared with the most complex new task purchase. Mitchell (1998) suggests the modified rebuy lies somewhere between these two extremes in complexity, time to reach a decision, number of people involved in the decision. Purchasing new software would fit the new task buying category, and purchasing another copy of software already owned would be a straight rebuy purchased. This research will determine where on the continuum between a new task purchase and a straight rebuy purchase most businesses consider a software upgrade purchase to be.

Risk associated with the purchase needs to be considered, "…particularly since one's perceptions of risk" would most likely be influenced by the experience in previous purchases (Tanner, 1998).

To facilitate the decision, decision makers rely on information sources that include salespersons, advertisements, product literature, research reports, journals, associations, word of mouth, and vendors (Sheth, 1996).

Undoubtedly, coupled with any purchase of software is the expectation that the new system will result in improvements. A number of factors such as top management support, extent, and nature of user involvement, vendor involvement, quality of system design and the nature of user involvement (Grover et. al, 1998) have been consistently found to show a positive influence on the successful implementation of information systems.

These previous studies dealt with implementation of new systems not upgrades to existing applications software. This research will address the gap that exists in decision to adopt an upgrade to applications software.

2.5 Adoption of Software Upgrades

2.5.1 Hidden costs of software upgrades

The purchase of an upgrade has an obvious financial cost, but additional hidden costs are also incurred when an organisation upgrades its software. Based on the experience of a research institute when it upgraded its operating system the institute found that many of the applications that ran on the previous operating system had to be modified. "This also meant the users had to retrain and learn the use of new commands. Some administrative practices became out of date as a result of the upgrade. The end result was a more efficient and cost-effective system but the cost of accommodating the upgrade went well beyond the retail price of the new software" (Grubb, 2003). Indeed, the costs associated with a software purchase should incorporate other aspects such as an analysis of how well the software will work with the existing software and hardware, whether any data will need to be converted, whether some modification of any software is likely, any ongoing licensing costs, whether the purchase of new hardware will be required, and of paramount importance determine how much staff training may be required (Pereus, 2002).

While investigating Enterprise Resource Planning software Keil and Tiwana (2006, p.237) found "functionality, reliability, cost, ease of use and ease of customization are judged to be important criteria, while ease of implementation and vendor reputation were not found to be significant"

2.5.2 Benefits of software upgrades

The benefits of new software include improvements in usability and functionality over the previous version. Software vendors achieve this by conducting usability tests on the new version. Software vendors have had usability laboratories for many years to test how users would react to potential new products and features (Cusumano & Selby, 1995). Rouse et al. (1997) reported that purchasers considered reputation, ease of use and support as the most important criteria for purchase. The numerous studies based on the technology acceptance model (Davis, 1989) agree with ease of use and the perceived ease of use as being determinants of the intention to purchase. These studies however are based on the purchase of a new product, not and upgrade to an existing product.

2.5.3 Pressure to upgrade software

Vendors can be pressured to upgrade their software. If the operating system is changed then they must upgrade their software to work with the new operating system. The new operating system must gain critical mass to make it worthwhile for the vendor to invest in new versions of their software. However, failure to do so could leave the vendor with an unsupported operating system (DeSantis, 2004). This process places added pressure on the vendors to support multiple operating systems. “If you are lucky, most vendors generally will support two versions before the current release. Anything older is too expensive for them to maintain” (Cohen 2004). This happens because users find they are “forced to upgrade” the operating system for one of their critical applications and they then find they have another application has been broken in the process.

In their examination of the software upgrades, Bradley and Dawson (1998) dealt with obsolescence of computer applications. They found the problems associated with obsolescence of software are compounded by the number of software packages used. With an increase in the number of key software packages being used they found a decrease in the expected time to a second re-release. They also found when dominant packages in an organisation are upgraded then hardware was likely to be upgraded, adding to the cost of the software upgrade process.

2.5.4 Investment analysis

One of the challenges facing managers is establishing a flexible information system infrastructure that will allow their organisations to successfully compete (Brancheau et al. 1996). Increasingly organisations are turning to packaged software to provide solutions. Not surprisingly therefore, the Information Systems discipline has been called on to pay more attention to problems associated with package software use (van den Heever et al. 1997). This issue is becoming increasingly important with purchasers making decisions that often impact core business functions (Rouse & Xiao, 1997). “In 17 percent of the IT investment decisions, executives included

consideration of change management. That is, they incorporated in their investment decision process, costs associated with planning, overseeing, and communicating information to the end users about IT-induced change. Some treated this primarily as an intangible or inestimable cost" (Ryan & Harrison, 2000, p21).

Love and Irani (2004) in an exploratory study of information technology in SMEs found "investment in IT as an act of faith" or the "use of creative accounting" was used as a means of bypassing the justification process.

2.6 Research Question

As technology advances, organisations are faced with the issue of whether they continue with their existing technology or they upgrade. To continually be at the leading edge of technology is an expensive decision to embrace. The vendors' continual push for better and faster products coerces the owner/managers to adopt the technology to remain current. Innovation theory presumes the decision to adopt is voluntary; however this may not be the case with upgrades. For example, the inclusion of electronic mail functions in bundled software may result in the innovators and early adopters not being able to communicate effectively with non-adopters. Consequently, the late adopters feel pressured to adopt earlier to alleviate the problem. The following research question will be addressed by this research.

What are the main factors that influence the decision to upgrade software in small and medium sized Australian businesses?

2.7 Factors identified in the literature

There are a number of factors identified in the literature as being significant or potentially significant influences on the decision by small and medium sized businesses to upgrade their software.

2.7.1 Innovativeness

Some people will readily adopt an innovation, while others are less likely to adopt. According to their readiness to adopt an innovation, Rogers' (1995) identified five types of adopters known as: the innovators, early adopters, the early majority, the late majority, or the laggards. The innovators are the very first users of a product, and are considered to be daring people willing to evaluate new products and to take risks. Early adopters are visionary, leaders in their industry, and who tend to be opinion leaders. The first part of the mass market to purchase is the early majority. They are rarely industry leaders but usually adopt new ideas before the average person. They tend to be pragmatic, cautious, not the first nor the last to buy, and ask others what to buy. The late majority is conservative and not confident about purchasing an innovation. They are followers and will adopt an innovation only after a

majority has tried it. The laggards are the last to purchase. They are usually price conscious, suspicious of change, tradition bound, and have to be absolutely certain.

2.7.2 Business impact

Getting it right is critical. There seems to be little concern about hardware upgrades compared with software upgrades. “It's about software, really ... everything else is just hype," said Paul Lindo, CIO of FB2. "Once our mission-critical software can run on Vista reliably, we'll start to move...Moving before the software is safe, though, is suicide. No matter what kinds of performance boosts you can get" (Rist, 2007). Because organisations “rely heavily on a combination of many vendors’ products,” Benamati and Lederer (2001) p.40) identified ‘incompatibility’ between different software packages to be the second most experienced problem, which they concluded “demonstrates the need for IT to work together.” The most experienced problem Benamati and Lederer found was the demands required to train staff. “Learning IT in today's time conscious environment is not easy and existing IT staff are not always positively inclined to reskill to newer technologies. In addition, hiring staff with necessary skills is difficult due to the current shortage of necessary IT skills in the workforce” (Benamati & Lederer, 2001, p40). According to Ryan and Harrison (2000) only a few firms considered the cost of the employees’ time when determining the training costs.

The impact of the decision to purchase a software upgrade can go beyond the purchase price of the upgrade. New hardware may be required, there may be changes required to other software and of course staff training in the new software needs to be considered. Upgrade costs identified by Ng (2001) consists of software, hardware cost, user training cost, consultancy fees, and cost of data conversion, system analysis, system integration and testing, and a drop in operational efficiency and effectiveness or downtime in relation to the implementation of an upgrade or installation of a new system.

2.7.3 Organisational characteristics

The owners and managers of small and medium sized business are usually involved in the day-to-day activities of the business (McCartan-Quinn & Carson, 1995). They may have limited formal training (Gunasekaran et al 1996) and they typically have fewer human and financial resources (Gunasekaran et al 1996). Because of their size they might face greater challenge in adopting technology (Raymond et al, 1998; Shin, 2006). Previous studies (Yellow Pages 1998; Australian Bureau of Statistics 1999) have reported on different levels of computer usage across the different business sectors, industry, and business size. Organisational characteristics impact on the decision to upgrade computer software should be explored.

2.7.4 Prior experience

Tanner (1998) reported on the influence of experience in the purchase decision. Knowledge and understanding of IT were reported as influences in the adoption of e-Commerce for small businesses (Yellow Pages, 1998) which is consistent with the findings of (Abdul-Gader et al., 1995) who found that if decision makers had more computer knowledge, more computer experience, and higher education levels they were less likely to be alienated by computers. Consequently, the business computer experience together with the decision-makers' computer experience and decision-makers' education level should be examined for their influence on the decision to upgrade computer software.

Many researchers including Davis (1989), Szajna and Scamell (1993), Thompson and Higgins (1994), Taylor and Todd (1995) and Venkatesh and Morris (2000) examined the role of prior experience with computers when developing models of IT adoption. The findings of Taylor and Todd (1995, p.565) showed "that experienced users employ the knowledge gained from their prior experiences to form their intentions." Clearly the influence of prior experience needs to be considered when developing any models of software upgrade adoption. "IT-related knowledge and experience that a business manager possesses" was explored by Bassellier, Benbasat and Reich (2003, p.317) to determine the "intention to champion IT within their organizations."

2.7.5 Educational level

Early adopters of PCs tend to have either a university degree or college diploma according to Kangis & Rankin (1996).

Rogers (1995) established a link between knowledge and decision making and as Bassellier, Bebasat and Reich (2003) found "an IT competent manager to be more likely to take action to champion IT than one who lacks such competence". Indeed, it is not just knowledge or experience with computers, but "highly educated individuals are more likely to know more about information technology and thus exhibit less alienation" (Abdul-Gader et al. 1995). In fact, their study found "decision-maker computer knowledge, computer experience, and education level are closely associated with alienated beliefs and attitudes toward information technology" (p.535).

While Chester and Skok (2000) found education level to influence the level of computer use in small to medium enterprises, they also found other factors that influence the level of computer use. These include the business sector in which the SME operates, and the nature of the products and services, the age of the decision maker (business owner) and the extent to which the business was tied to its suppliers. Clearly if these factors had an influence on the use of information technology for the business, they should also be examined when studying the adoption of software upgrades.

2.7.6 Relative advantage

Innovation characteristics as perceived by the adopters are important factors that affect technology adoption (Moore and Benbasat,1991). Tornatzky and Klein (1982) found that compatibility and relative advantage, and complexity have the most consistent significant relationships across a broad range of innovation types. Relative advantage is defined by Rogers (1995) as "the degree to which an innovation is perceived as being better than the idea it supersedes" (p.15) and "has consistently been found to be a predictor of usage in many IS studies" (Karahanna et al. 2002).

2.7.7 Compatibility

"Compatibility is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters" (Rogers, 1995, p.15). A software upgrade would be considered compatible if it worked with the current hardware, software and files. Getting multiple software components to work together can be challenging (Spinellis and Szyperski, 2004).

2.7.8 Past behaviour

Two factors that may help with the prediction of intention are a measure of past behaviour and the perception of behaviour control (Thompson & Panayiotopoulos, 1999). Perceived behaviour control as a predictor of intention was proposed by Ajzen (1985) and further studies by Ajzen and others (Ajzen, 1988; 1991; Ajzen and Madden, 1986; Madden *et al.,* 1992) support those findings.

2.7.9 Information

According to Martin and Matlay (2001, p.399) "information acquisition and analysis have been identified as key factors affecting the decision making processes in smaller firms." Thomas et al. (1991) reported that ICT adoption and implementation costs could be considerably reduced by gathering sound information and Yap et al. (1992) found that successful ICT adoption in small firms is related to the quality of advice provided by external consultants.

2.7.10 External influences

Government regulations were found to have an impact in the straight rebuy purchases by Polonsky et al (1998) while incentives from the Singaporean government (Yap et al, 1994) had an influence on the adoption of computers in small business. Agencies outside a business, such as government departments, banks, clients, and suppliers can generate a state of affairs necessitating a decision concerning whether or not to upgrade software. For example, changes needed to cope with Y2K changes and the Australian Government's new Goods and Services Taxation (GST) laws in 2000 had a very noticeable impact with increased IT expenditure to achieve compliance.

In 2005, any business involved in importing or exporting goods was forced to comply with Australia's new customs system.

Suppliers who release an excessive number of software upgrades force users to purchase unwanted versions while others are struggling with incompatibility issues (Ellison & Fudenberg 2000). Clients can also pressure firms to upgrade software, for example, in Australia, large retailers such as Coles and Woolworths force small wineries to adopt e-commerce and this often involves upgrading existing software packages.

Tornatzky and Fleischer (1990) identified the external environment as a factor influencing small organisations in adopting technology. The external environment includes industry, government regulations and competitors, and provide the environment in which they must operate. Chau and Tam (1997) found external variables less important to the adoption of open systems and Iacovou et al (1995) identified external pressure, such as competitive pressure, and imposition from trading partners, as an influence on EDI adoption practices in small firms.

2.7.11 Complexity

In business buying, the three customer roles - payer, buyer, and user separate out except where the business is a one-person entrepreneur, who makes decisions equivalent to individual decision making (Sheth, Mittal, Newman, 1999, p613). Generally businesses have policies and rules to govern how quotes are obtained, whether any preferential treatment is to be given and how decisions should be made by the buying organization. They go through formal procedures. This formality is less for small businesses that tend to be similar to house hold buyers. This is because the small business tends to be owner-managed.

A concept widely used in industrial marketing is the buyclass model (Robinson *et al.,* 1967). The buyclass model has been tested with varying degrees of success in measuring individual participation and influence across different buying situations (Gronhaug, 1976; Robinson *et al.,* 1967). The buyclass model prescribes that organizations mainly involved with new buying tasks warrant larger and less rigid purchasing configurations than organizations involved with straight and modified rebuys. However, McCabe (1987) questioned generalizations of findings from small group behaviour to overall organisational structure (Xideas and Moschuris, 1998).

Modified rebuys, involving a change in the product class purchased, or a change in source of supply, or both, exhibited significantly higher levels of risk than straight rebuys and even first-time purchases (Newall, 1977). Clearly, these changes add to the complexity of decision.

When considering a purchase, alternatives are usually considered. The purchase of an upgrade to software is no exception. However, according to Mitchell (1998) "buyers avoid considering alternatives when risk is high and,

although the evidence is limited, suggests some buyclass effect on risk perception." When making a repeat purchase some degree of loyalty to the existing supplier can be an influence on the decision (Patton et al., 1986). For straight rebuys it seems that some degree of loyalty often exists. For modified rebuy situations that have a moderate to high risk, a group decison models such as a voting tend to be used (Wilson et al., 1991). Loyalty is less likely for modified rebuy situations, but if the purchase decision is high risk then Puto et al. (1985) found strong brand loyalty.

It is expected that likelihood of the software upgrade would deminish as complexity increases.

2.8 Preliminary model

A preliminary model of factors influencing the decision to upgrade software is shown below in figure 2.6. It incorporates all of the factors identified from the literature. At this stage it is impossible to suggest whether any of these factors is more influential than the others.

Figure 2.6 Preliminary model showing potential factors factors influencing decision to upgrade software. Source: developed for this research

2.9 Conclusion

The literature reviewed in this chapter has drawn from a range of studies in diffusion of innovations, the adoption of technology in small business and organisational buying behaviour. Eleven candidate factors, as shown in figure 2.6, which could influence the decision to purchase a software upgrade, were identified: Innovativeness, Business impact, Organisational Characteristics, Prior Experience, Educational Level, Relative Advantage, Compatibility, Past Behaviour, Information, External Influences, and Complexity. However, all of the literature has dealt with new purchase decisions rather than upgrades, and specifically software upgrades, necessitating further research dealing specifically with the decision to upgrade software.

The following chapter will discuss the methodology to be employed for this research to answer the research question. The next stage of the research will involve interviewing a sample of business to determine what they consider to be the factors that influence the decision to purchase a software upgrade. Since much of the work from the literature review deals with purchasing software for the first time, and not for an upgrade, it is possible that some new factors will emerge from those interviews, and that those listed above have less importance when purchasing software upgrades.

3 Methodology

3.1 Introduction

The research problem was detailed in the previous chapter and a theoretical model based on the current literature was outlined. This chapter describes the research methodology used to examine the problem. This is achieved by following the steps shown in figure 3.1. Firstly, the philosophy adopted for this research are presented and then the research design utilized in the study, a sequential exploratory methodology is explained. Following on from this the data collection techniques are described. The data analysis procedures adopted are then outlined. Next, the ethical considerations employed in this research are presented. Finally, the conclusions for the chapter are drawn in section 3.9.

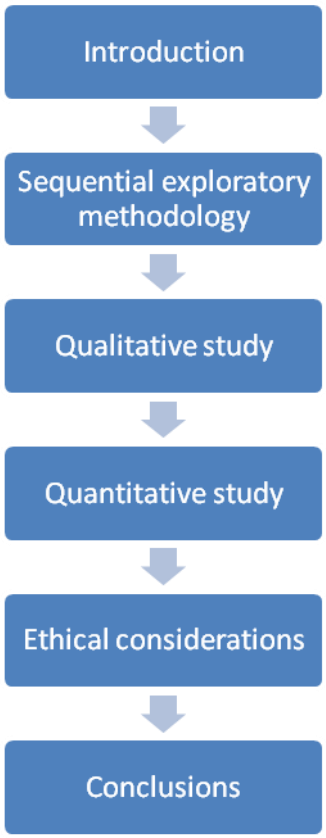

Figure 3.1 Outline of chapter 3

3.2 Research philosophy

Information systems research, according to Mingers (2001, p240) draws upon a assortment of disciplines that "encompass very different research traditions." The positivist philosophy argues that information systems research should be objective, favouring quantitative research methods. Those preferring qualitative research would reject this approach and promote a constructivist method. Having diverse research methods is desirable and information systems research is richer as a consequence (Robey 1996).

Mixed methods combines both the qualitative and quantitative approaches. The aim of the mixed methods approach is the draw on the strengths of both qualitative and quantitative methods. Mingers (2001, p243) argues the strengths of adopting a mixed methods approach, in that a "research study is not usually a single, discrete event but a process that typically process thorough a number of phases." Johnson & Onwuegbuzie (2004, p16) believe mixed methods research should "attempt to fit together the insights provided by qualitative and quantitative research into a workable solution." The pragmatic approach is to adopt research methods that help to best answer the research question.

The previous chapter discussed the diffusion of innovation literature, and factors thought to influence the likelihood to purchase software upgrades were identified: business characteristics, innovativeness, business impact, prior experience, educational level, relative advantage, compatibility, past behaviour, information, external influences, and complexity of purchase decision. However, a gap in the research conducted until now was identified questioning the applicability of these factors.

The research would therefore have to explore the topic. Qualitative research, quantitative research, or a mixture of both was considered. Survey and fieldwork approaches are complementary for information systems research, as traditional survey work is strong in areas where field methods are weak (Gable 1994, Attewell & Rule 1991). Using a mixture of qualitative and quantitative is in keeping with the philosophy of pragmatism, which according to Johnson and Christensen (2008, says researchers should use the approach or mixture of approaches that works. Petter and Gallivan (2004, p.4) suggest that "to the pragmatist perspective, the integration of methods from differing paradigms is a powerful method to enhance the credibility of findings."

3.3 Sequential exploratory design

When considering a mixture of both qualitative and quantitative research, the options consist of undertaking both the qualitative stage and quantitative stage either in parallel or in sequence. Because of the exploratory nature of the research, a sequential exploratory design was considered to be the best methodology to further study the factors that influence the likelihood to purchase software upgrades.

As Petter and Gallivan (2004, p.6) state, "a reason to combine qualitative and quantitative research is for the results of one method (i.e., the secondary method) to help in the development of the primary study." Clearly this approach is sequential in nature, since the results of the qualitative study provide the information needed to help create a questionnaire used in the quantitative study. The stages of a sequential exploratory design are shown

in figure 3.2. This design is a mixed-method approach where both qualitative and quantitative data are collected.

Figure 3.2 Sequential Exploratory Design (Creswell, 2003 p. 213)

Firstly, the qualitative data were collected to enable exploration of "the topic with participants at their sites" (Creswell, 2003 p.212). In-depth interviews were conducted with businesses to provide a detailed view of the factors that influence the likelihood to purchase software upgrades. Only after the analyses of the qualitative data was it possible to develop the survey instrument to be used in the next stage. The survey instrument was used to collect data for quantitative analysis.

The quantitative stage builds upon the understanding gained in the qualitative stage by collecting data from a large number of people thereby enabling some quantitative analysis (Creswell, 2003). The survey was completed in two steps. The first step was a pilot study. The data collected from the pilot study was analysed so that any modifications necessary could be made for the second step, the full scale study. The sample size for the full scale study was designed to be sufficiently large enough to enable the data to be split into two halves for analysis. According to Byrne (2001) using split halves makes it possible to use the first half for exploration and to confirm the findings with the second half.

The first half of the data will be used to explore data to determine the number or the nature of factors that account for the covariation between variables.

This is the approach undertaken when a researcher does not have sufficient evidence to determine the number of factors underlying the data, thus making it inappropriate to formulate hypotheses until the data has been explored (Stapleton, 1997). Therefore, exploratory factor analysis is generally thought of as more of a theory-building procedure as opposed to a theory-testing procedure (Stevens, 1996). After the exploratory analysis some hypotheses can be posited, and these can then be tested with the analysis of the second half.

Following the analysis of the quantitative data from the full scale study, the entire analysis can be interpreted to provide answers to which factors influence the decision to intent to purchase a software upgrade. Thus, the inferences of the first stage of data collection, if correct, can be either confirmed or disconfirmed.

The second stage of the study used a mail survey. Both factor analysis using SPSS and structural equation modelling using AMOS were used for the analysis of the data from the mail survey. Reasons for using a mail survey and factor analysis and structural equation modelling are provided in the following sections.

3.4 Qualitative Study

To determine the information required and from whom it should be sought it is necessary to examine the research question:

What are the main factors that influence the decision to upgrade software in small and medium sized Australian businesses?

The potential factors that influence the decision to upgrade software were identified in the literature review. Following this, in-depth interviews were conducted with local small business to ascertain whether further factors might be considered for inclusion in a survey.

Interviews with representatives from the target population were used because interviews are a recognized technique for exploring the issues and determining the scope of the topic (Sekaran 2003; Zikmund 2000). According to Yin (2003) using multiple interviews is considered an appropriate method for gathering information on the current behaviour which can then be used to produce findings that can be generalized.

3.5 Protocols used in the interviews

The conduct of the in-depth interviews was guided by the following protocol (adapted from Dick 1998):

- Introduction and explanation that the research was about software upgrades within business throughout Australia. This first stage was designed to elicit the perspective of businesses. Talking with people who make the decision to upgrade software will help me clarify issues so that I can develop a questionnaire.
- Discuss why the person was selected and ethical issues such as the taking of notes, and how a survey will be developed from the points made in the interviews. While a tape recorder is not being used, it will be necessary to record some key phrases verbatim.
- Stress that anything they say will be confidential to protect both the interviewee and the business. Permission was sought to take notes during the interviews.
- Obtain consent to proceed.
- Start with a warm-up question about the business.
- Use open-ended questions and when appropriate use a funnelling technique to explore an issues exposed by the interviewee to seek understanding.
- Do not evaluate the responses, but listen to and interpret the information provided.
- Do not interrupt.
- Let the respondent think and discuss their ideas.
- Towards the end of the interview introduce ideas presented in prior interviews to elicit comment.
- Check the understanding to ensure their point is clearly understood.
- Take notes in preference to tape recording the interview. This will force the interviewer to actively listen and to take clear notes. It also removes any concerns associated with being recorded. The aim was not to make a transcript of the conversation, rather to record keywords and phrases.
- Observe the body language and react accordingly.
- When finished, ask if there is anything further they wish to add.
- Thank the respondent for the time and thoughts.

The businesses were contacted to explain the nature of the research and the purpose of the interview. The most appropriate person to interview was determined at this stage. This person had to be responsible for making the decision to purchase software, and software upgrades. A time and place for the interview was scheduled.

The interviews were conducted by the researcher. They were completed at a location, usually the business' office, and a time that was most convenient for the interviewee. There were often other people nearby. The interviews were unstructured giving the interviewer the opportunity to follow-up on points raised during the discussion. Permission was sought and granted to take notes during the interviews. When critical phrases or keywords were made they were recorded and read back, if necessary, to ensure the correct language had been documented. Thus, even though a tape recorder was not used, the key phrases expressed by the interviewee were accurately

captured. Each interview lasted until no new ideas were forthcoming, which was usually after one hour.

3.6 Quantitative Study

To further explore the issues identified in the interviews it was necessary to collect survey data from a wider sample of Australian small and medium sized businesses. The alternatives considered for conducting the survey were more personal interviews, telephone interviews, an Internet survey, or a mail survey. Personal interviews would be costly and difficult to schedule, and extremely time consuming to conduct in large numbers. For this reason this alternative was rejected. Again, telephone interviews would be costly, difficult to schedule, and time consuming to conduct in sufficient numbers. An Internet-based survey was dismissed for a couple of reasons; those business that are connected to the Internet would not necessarily be representative of the small businesses of Australia and the number of businesses that use the Internet is possibly not representatively dispersed across the small business sector by industry type, business sector, and size of the business.

A mail survey was the logical choice to collect data of an acceptable quantity to enable meaningful analysis to be performed. A questionnaire was mailed to a wide cross-section of the Australian small and medium-sized businesses at a reasonable cost.

3.7 Development of Survey

The development of a scale to measure the factors that influence software upgrade decisions began with a thorough literature search to locate related scales that could provide guidance about needed items. Because no prior studies into software upgrades could be found at the time, it was necessary to develop a new instrument to determine the factors that influence small and medium sized businesses in their decision to upgrade software packages, and the extent to which the identified factors influence the likelihood to upgrade software.

The use of a qualitative method such as interviewing or focus groups as a preparation for survey research has been recommended by previous researchers (Padgett 1998, Weiss 1994, Churchill 1979), thus the items to be incorporated in the survey are derived from the issues and key points made by the interviewees. Where possible the keyword phrases or keywords provided by the interviewee were incorporated into items. This addresses the strategy ‘of using language that your respondents will understand’ (Kumar, 1996, p.119) since the language provided is from their peers.

The general guidelines utilized in item construction followed the procedure shown below in figure 3.3.

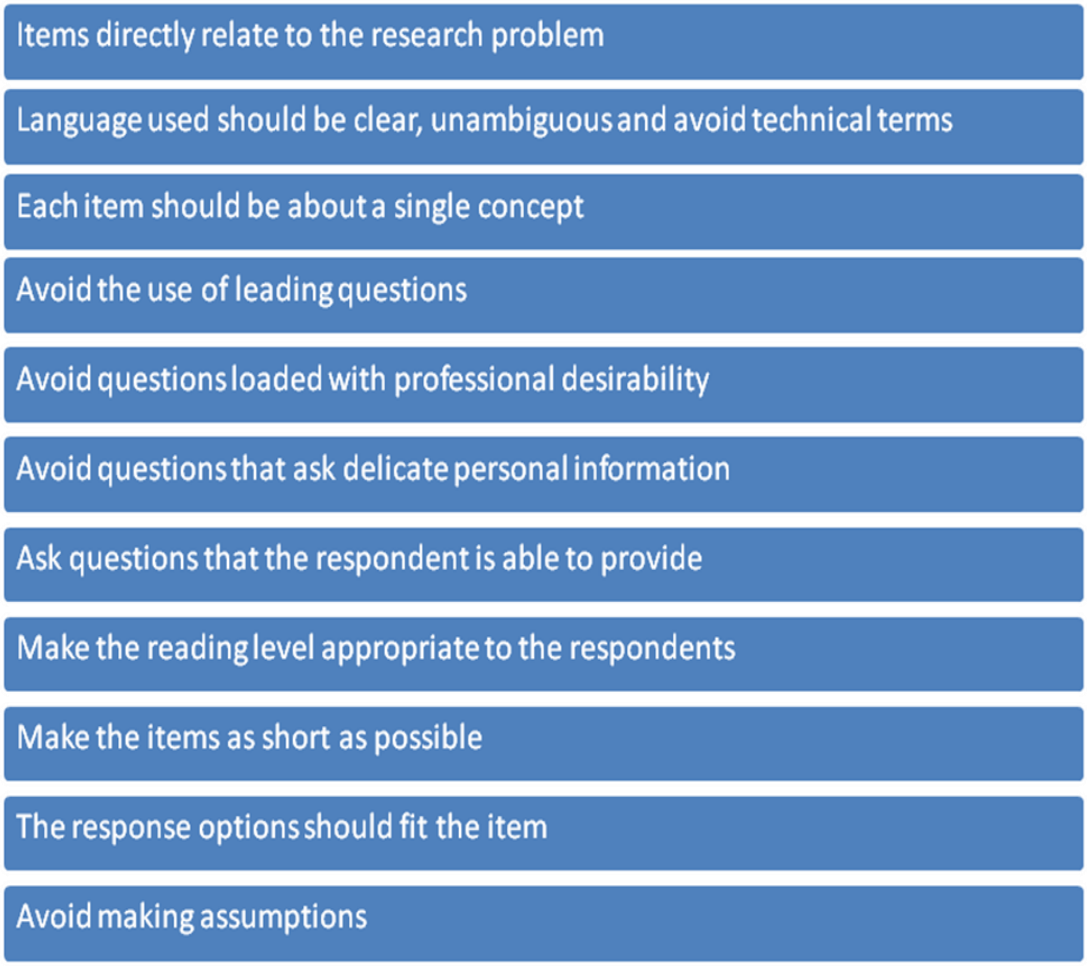

Figure 3.3 Guidelines used in item construction Adapted from Wiersma (2000)

A draft questionnaire was developed and this instrument was pre-tested to improve validity and reliability. After making modifications to the instrument a random sample of small and medium sized business from Australia was surveyed. Figure 3.4, shows the stages that were used to develop the survey instrument.

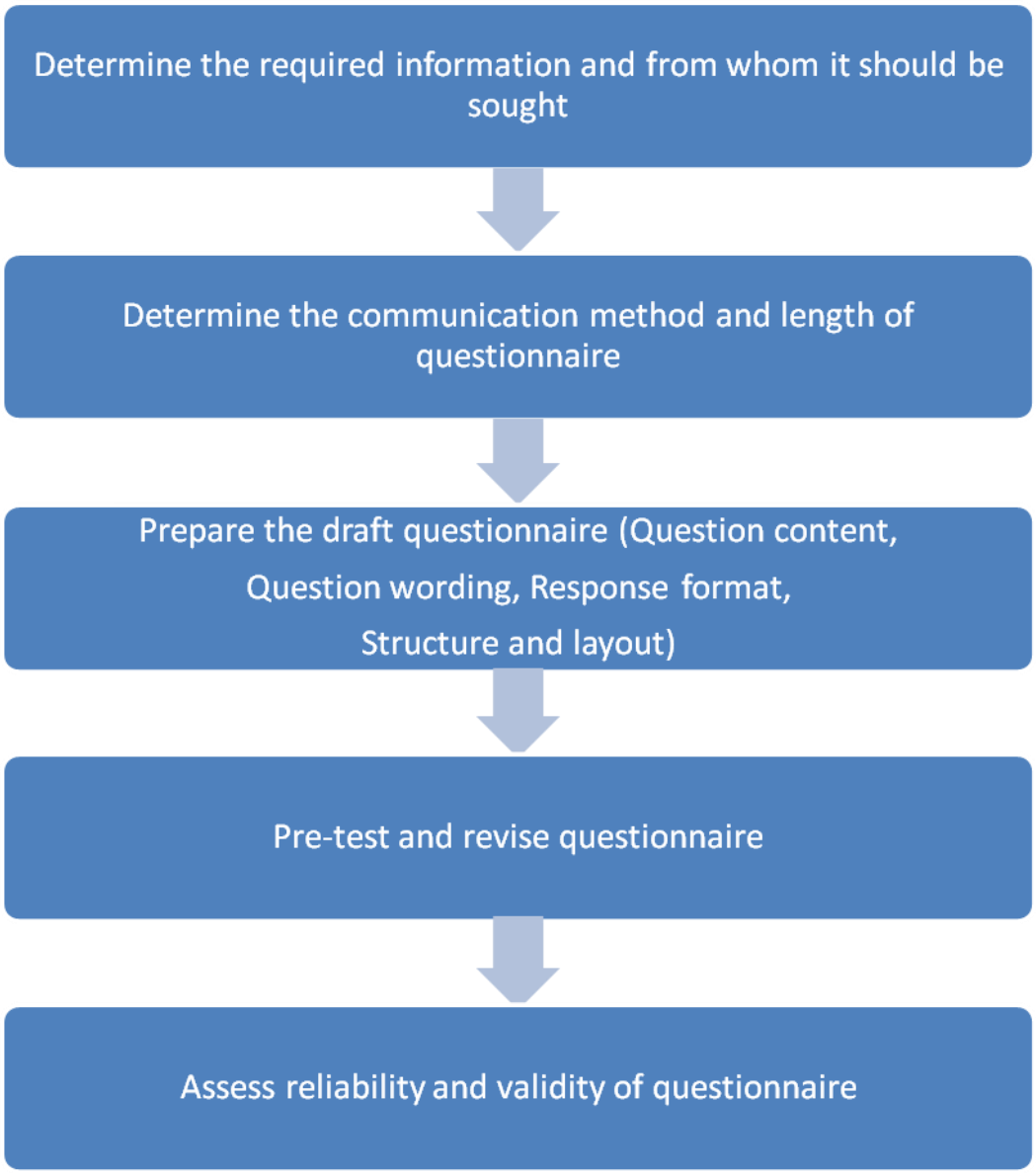

Figure 3.4 Questionnaire design process (Frazer & Lawley, 2000 p.19)

The analysis of the interviews suggested additional items to those found in the literature review. When possible, the actual words used by the interviewees were incorporated into the survey. All items were scrutinized for their relevance to the research problem and the objectives of the research. Demographic questions that were considered pertinent to the survey were also asked. All the items included in the survey were pre-tested for appropriateness before inclusion in the questionnaire by asking a group of researchers experienced in survey research to comment on them. Based on the feedback received some modifications were made.

3.7.1 Prepare the draft questionnaire

The first section of the questionnaire contained instructions on how to complete the survey and purpose of the survey. The second section contained questions to determine the software and applications currently

used in the business. Following this was a section to ascertain the perceptions on upgrading software. The final section asked demographic questions about the respondent and the business.

Considerable effort was made to minimize the length of the questionnaire. An eight-page instrument in the form of a booklet was constructed. White space was used to ensure the layout was not congested and the final result was user friendly. The questionnaire is included as Appendix 1.

3.7.2 Question content

The content of the items used in the survey was based on the findings of the literature review together with responses from the interviews. An attempt was made to include items that covered both the findings of the literature review as well as the findings from the interviews without making the survey too time consuming to complete. The items in the statements about investments in upgrades, influences on upgrades, the upgrade decision were developed predominantly from the interviews. For example, an interviewee indicated the software came with the computer (“bought it as a package” INV 8) prompting an item “I upgrade my software only when I upgrade my computer.” While the items on the survey such as the questions in the section asking “Questions about YOU” has items on educational level and prior experience with computers, topics that were found in the literature review.

3.7.3 Question wording

The following principles were incorporated into the wording of the survey.

Figure 3.4 Question wording guidelines (Frazer & Lawley, 2000 p25)

In order to capture the exact language used by the interviewees, the key phrases used by the interviewees was written down and read back to the interviewees. Then, where possible, the phrases used by the interviewees was utilized in the belief that their language would be shared and understood by their peers and consequently would be more meaningful in the questionnaire. For example, numerous interviewees consulted a friend before purchasing software, some consulted a business associate, and a couple checked it out in magazines, conferences and trade shows, so the items in the section on influences on upgrades referred to these specific sources of information.

The purpose of the survey was not just to gather information, but as stated by Pfleeger and Kitchenham (2001) the data obtained must be capable of enabling the researcher to describe, compare, and explain.

3.7.4 Response format

Seven-point Likert scales with all points labelled were used for the collection of most of the data, with itemised checkboxes used for collection of single

item measures. Likert scales were used for the following reasons. Firstly, according to Cox (1990) Likert scales are most popular for gathering attitudinal responses. It is relatively easy to construct a reliable scale that is both easy to read and to complete. According to Cox (1990) the most appropriate number of responses should be an odd number, and should be seven plus or minus two. The odd number rather than an even number is preferred in circumstances in which it is legitimate for the respondent to have a neutral view. Using a consistent number of responses makes it easier for the respondent since they are not required to adjust as they proceed through the survey. According to Churchill and Peter (1984) scales where all of the points are labelled have a higher reliability than scales where only the end points are labelled. An attempt was made to state most items positively as suggested by Churchill and Peter (1984). The response format used in the survey was generally closed in nature. Respondents were invited to add comments at the end of the survey.

An example of the closed item used to measure how innovative the respondent was included these choices:-

- ☐ Certain
- ☐ Very likely
- ☐ Likely
- ☐ Neither likely nor unlikely
- ☐ Unlikely
- ☐ Very unlikely
- ☐ Definitely not

The scale was clearly marked which made it easy for the respondent to quickly indicate their choice.

3.7.5 Structure and layout

Once the items were designed, the next step was to determine the layout of the elements of the survey. The cover page explained the purpose and importance of the survey. Confidentiality of the responses was assured. The respondents were informed that it would take approximately 20 minutes to complete the survey. A reply paid envelop was provided to remove the impediment of the cost of postage from the respondents. The remaining sections had to flow logically while any aspects that were logically associated with each other were kept together. The first section of the survey asked about the computer hardware and computer use within the business. These questions were followed by questions about the computer software currently used in the business. The next section contained the statements about upgrading software. The final sections asked for some demographic details about the respondent and the business. At the end of the survey, there was an opportunity to provide further comments concerning upgrades of software.

3.7.6 Pre-test and revise questionnaire

In accordance with the advice of Frazer and Lawley (2000) the draft survey was circulated among academic colleagues for comment and feedback who had experience with surveys. The colleagues were given the questionnaire, its purpose was explained, and they were asked to complete it. They were also asked to record how long it took them to complete the survey and to provide feedback on the survey wording, layout and the sequencing of the items. In particular feedback was sought on the wording, layout or sequencing of the questionnaire. As a result of the pre-test some minor changes were made to both the appearance of the survey and some of the language used. After the changes were made the same staff were invited to comment on the revised version. No further changes were made.

3.7.7 Assess reliability and validity of questionnaire

A survey is considered reliable if the repeated application of the survey results in consistent scores. When the survey uses a mutli-item scale then items that comprise the scale should be correlated. To achieve a high level of internal consistency reliability considerable steps were taken to eliminate those items that reduced the reliability of the constructs. More details on the assessment of the reliability are provided in chapters 5 and 6.

Three basic types of validity should concern the researcher. These are: face validity; construct validity; and criterion validity. It should also be stressed that validity is a matter of degree rather than an all-or-nothing concept (Messick 1993; Nunnally & Bernstein 1994) with validation an unending process.

Face or content validity is achieved by asking a sample of experts to pass judgement on the suitability of the items. While this was done, face validity is not considered an adequate measure and both construct and criterion validity needs to be assessed. To assess construct validity two checks are performed. Firstly, convergent validity occurs if all the proposed measures correlate highly with the other measures of the construct then it can be concluded that they measure the same thing (Nunnally & Bernstein 1994). Discriminant validity is the extent to which the construct does not correlate with other constructs. To determine criterion validity, the scores from the scale being validated should be able to predict scores from an identified dependent variable.

3.7.8 Sampling strategy

The sample size plays a role in the generalizability of the results. According to Zikmund (1997, p.473) the sample size can be determined by the following formula:

$$n = (\frac{ZS}{E})^2$$

where n = the sample size,
Z = the confidence interval in standard units,
S = the sample standard deviation or an estimate of the population standard deviation,
E = the maximum allowance for the error.

For a confidence level of 95%, Z = 1.96. Since this is exploratory research, a 10% allowable error should be tolerated, so E=0.1. On a seven point Likert scale, the range is 6 and thus the estimated standard deviation is one sixth of the range, so S=1. By substituting these values into the equation

$$n = (\frac{1.96X1}{0.1})^2$$

the value for n is determined to be 385.

Response rates to the pilot study were used to determine the minimum allowable size of the mail out used in the full scale study.

3.7.9 Data analysis

The data analysis of the pilot study began with an exploratory factor analysis in order to examine the factor structure of the proposed measurements.

Churchill (1979) suggests that Cronbach's alpha be the first measure used to assess the quality of the instrument. Cronbach's alpha can be considered an adequate index of the inter-item reliability of independent and dependent variables if those constructs have reliability values of 0.7 or greater (Nunnally 1978, Sekaran 1992).

According to Holmes-Smith and Rowe (1994) the following steps need to be undertaken to analyse the model. The first step requires the use of a data reduction technique that can be used in structural equation models. This can be achieved by checking the correlations to determine if the measures are related to each other. Possible factors can be extracted by using Principal Component Analysis. Then, for each of the factors identified by the Principal Component Analysis one-factor congeneric measurement models were developed. AMOS provided goodness of fit indicators for the congeneric models. To maximize the reliability of the composite variables, the technique described by Holmes-Smith and Rowe (1994) was employed. This was achieved by computing scale scores as linear combinations of items with factor scores as item coefficients. The composite score reliability is maximized if the weights on each item are the corresponding factor scores rather than unity. Finally, these new composite variables were then used to test and research possible models.

A reason for using congeneric measurement models is that "they allow the most unambiguous assignment of meaning to the estimated constructs" (Anderson & Gerbing 1988, p. 414). A high coefficient alpha is not evidence that a set of measures is unidimensional (Nunnally & Bernstein 1994). It was therefore necessary to measure the reliability using techniques beyond Cronbach alpha.

The preliminary exploratory factor analysis of the data was performed using SPSS version 15. The Structural Equation Modelling was undertaken using AMOS version 7.0. SPSS version 15 was also be used to perform the matrix calculations required to determine the composite score reliabilities.

3.8 Ethical considerations

Utmost care was exercised while conducting this research to ensure the highest ethical standards were observed. For the qualitative study, the interviewees were contacted prior to the interview to prepare for the interview. In keeping with the wishes of the some of the interviewees, the interviews were not recorded. The purpose of the study was explained to each interviewee. Detailed notes were taken and these were approved by the interviewees. An undertaking to maintain the confidentiality of each interview was provided and preserved.

For the surveys, the purpose of both the pilot study and full scale study were explained in a cover page. Contact details for the researcher including a telephone number and email address were provided to the recipients of the survey so that clarification on any point about the survey could be sought by any participants. The confidentiality of each response was guaranteed. Indeed, the anonymity of the respondent made it impossible for the researcher to identify the source of the individual responses. Participation in the survey was voluntary. While the nature of the subject of the survey was unobtrusive, every effort was made to ensure the language used in the survey did not offend or bias against any person on the basis of gender, race, disability, or age. Throughout the entire research the respondents and the data they have provided have been respected.

3.9 Conclusions

The research developed a new instrument for determining the reasons for software upgrades. A large sample was collected to verify both the instrument and findings from this study. Following the data collection and analysis the strengths and weaknesses of the instrument can be reported. In this study, the sample used was large enough to split into two halves. This enabled exploratory factor analysis to be performed on one half of the sample. Following the exploratory analysis some hypotheses were proposed. The confirmatory analysis was performed on the second half of the data to test the hypotheses. Consequently, any findings should be appropriate for the population from which the sample was drawn. The study

could be used for further research with other populations to validate the results.

4 The Qualitative Study

4.1 Introduction

As explained in the previous chapter on methodology, a sequential exploratory design method was adopted. The first stage of this, the qualitative study, was utilized to explore the research question further. In-depth interviews were conducted with businesses at their business sites. The purpose of these interviews was to reveal and identify the dimensions that businesses believe to be important when considering upgrades to their software. When qualitative data is collected first, "the intent is to explore the topic with participants" at their sites (Creswell, p212). Inclusion of the issues raised during the interviews into a questionnaire would help to assure that important points were not overlooked.

Figure 4.1 Outline of chapter 4

4.2 Profile of the business used in the interviews

The fact that all of the businesses used for the interviews were located in a regional city was not considered a limitation at the time the interviews were conducted. There was no reason to believe the views expressed by the interviewees within the businesses of a regional city should be different from views that could have been expressed by interviewees from businesses in other locations.

A variety of business types and sizes were used for the interviews to help ensure a wider and less restricted coverage of the topic. The businesses varied in size, from a staff of 7 to a business with over 300 employees, with most having a staff of less than 20. The sample size for the number of

interviews was not pre-determined; rather a principle of saturation was adopted whereby interviews were arranged with businesses and conducted until no new information was elicited from the interviews. Saturation was achieved after nine interviews with no new points being raised, but one final interview was conducted for confirmation. Thus, a total of ten businesses were involved in the interviews. The industries represented by these businesses also varied. Two were in the finance sector, one was a manufacturer, two were real estate, two retail and the final three were from the service sector. Most of the businesses were local only, while one was statewide business and the other was a national business. The larger businesses included in the interviews were greater than the Australian Bureau of Statistics defined size of 200 for a medium sized business. For the purposes of gathering and understanding the issues this was considered tolerable.

Table 4.1 Profile of businesses participating in the interviews

	Business									
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Type of industry	F	F	M	RE	RE	R	R	S	S	S
Sector	S	L	N	L	L	L	L	L	L	L
Total number of staff	350	16	300	10	17	40	7	18	12	300
Number of IT staff	23	0	0	0	0	0	0	0	0	1
Approximate annual profit.	na	$1.5M	na	$.750	$.7	$2.1M	$.4M	$.6	$.5	na
Age of business (years)	>100	11	35	4	8	>100	2	7	8	35
Manager's computer experience (years)	30	11	20	4	8	20	1	7	8	15
Legend: Type of industry: F=Finance, M= Manufacturer, RE= Real estate, R= Retail, S= Service. Geographical sector: W=State-wide, N=National, L=Local. na=not available										

There was considerable variation in the level of IT expertise. The largest business had an IT staff of 23, and one other business had an IT staff member. The remaining eight businesses did not have an IT staff member. The number of years that the managers had used computers varied.

There was considerable range in the age of the businesses, with the oldest two having operated for over 100 years, and two others being over 30 years old. The six other businesses were less than ten years old.

4.3 Topics explored

The opening question used in the interviews asked the interviewees to state what they felt were the main issues or factors that needed to be considered when upgrading their existing software. The first response from all businesses was an admission that they were reluctant to upgrade the software. There was a common philosophy of "if it ain't broke don't fix it" (INTV9). Given the reluctance to upgrade it was not surprising that the

interviewees felt that if they were forced to upgrade then it is desirable to delay it as long as possible. People believed there were often problems with the first release of software (INTV1, INTV5, and INTV9), including software upgrades, and that any problems discovered with the first release would be corrected before they adopted the upgrade (INTV1). As one interviewee aptly put it, “the second mouse gets the cheese” (INTV9).

When asked to elaborate on what other things would be taken into account, a couple of businesses required an ability to “transfer data” (INTV1 & INTV10) from existing software to new software.

4.3.1 Why do you upgrade your software?

When asked to elaborate on why they upgrade, the reasons given suggest that a considerable amount of thought is put into the decision to upgrade. If the “current software no longer does what we require” (INTV2) or the software offers new or enhanced features (INTV1, INTV2, INTV4 & INTV10), or “it is more user friendly” (INTV5) or it is cost effective (INTV5, INTV1, INTV2, INTV4) then you would upgrade. But there were often other statements that put conditions on the upgrade decision. For example, you “never buy version one” (INTV1, INTV2, INTV5 & INTV9) and “I tripped over a copy of new software otherwise I would never have upgraded” (INTV9). Some felt they were “forced to upgrade” (INTV2, INTV5, INTV10) by external factors such as a change in government regulations, otherwise they would never have upgraded. One suggested they upgraded their software because they were upgrading their hardware (INTV3), and complained that the “new software is not as good as old software” (INTV3). The cost of upgrade was considered, and whether “service is provided with upgrade” (INTV7) was an influence. However, some do not use the existing software to the full extent, “so why would we upgrade”(INTV8)?

4.3.2 Business software upgrade policy

It was clear from the responses that there was not a policy in the businesses regarding the upgrade of software. Indeed, in one business the organisation behaved differently depending on the type of software (INTV10). For the industry specific software there was an elaborate process of cost benefit analysis that was required, and yet for the same organisation the upgrade for Microsoft Office was done without question. The cost of the industry specific software was considerable, but the collective cost of the upgrade to Microsoft Office software was also many thousands of dollars.

4.3.3 Cost-benefit analysis

Only two of the larger businesses performed a cost benefit analysis (INTV1, INTV10). The others did not do a formal cost benefit analysis. One interviewee performed “a quick mental calculation, and used my gut

instincts"(INTV5). Another had a similar, informal cost benefit analysis, where the process was performed "mentally only" (INTV9). The statement that "the office must be needs driven" (INTV9), clearly should not be interpreted as a more formal cost benefit analysis. Benefits were considered by others (INTV1, INTV5 & INTV9). For example, one interviewee could "see no benefit in upgrading word processor for example, since the current version does everything that is required – there are only so many features you need to write a letter" (INTV9). Other businesses had a purchase agreement with a "monthly payment that entitles us to upgrades" (INTV7) and another had some software that is upgraded because of "special agreements with our parent company" (INTV6). The software upgrade must be "easy to use and cost effective" (INTV4).

4.3.4 Advice on the upgrade decision

Most of the businesses seemed to have someone that provided advice concerning the software upgrade. It ranged from the hardware supplier (INTV8), to a friend or neighbour (INTV6), the guys at the head office (INTV4 & INTV6), the accountant, and business associates (INTV4). The IT professionals sought information about the software upgrade from industry magazines and at conferences they attended (INTV1 & INTV10). One interviewee had "lots of people turn to me for advice, but I have him [a guru] to turn to for advice" (INTV9). The 'guru' is an IT colleague he used to work with, and if the 'guru' does not know the answer himself, the guru has technical associates he can ask.

However, for some, they did not know who to ask, because "it's too hard" (INTV8).

The manufacturer had an upgrade written specifically for our business. They turned to the company that they had used before "because they had delivered for them in the past. However, this time they had some new staff and what they produced was not what we wanted. This cost a lot of money and we were not pleased. We have a long association with this company and this time they did not deliver" (INTV3).

4.3.5 Test before purchase

The level of testing seems non-existent or superficial from most. Some saw it operating on someone else's computer (INTV9). Only a couple of businesses tested the software first (INTV1, INTV3). A surprising twist was the business that claimed to be a "test-bed"' for new software, later admitted that they never purchase the first version of software, waiting for bugs to "be ironed out" (INTV5). One business was confident there would be no problems because "the person writing the software will have tested it on a business similar to ours and make sure it works before releasing it" (INTV7). At the other extreme, another business had "no idea about this, you just have

to try it out" (INTV8). In a few cases a demonstration of the software at a seminar (INTV4) was considered an adequate test of the software.

4.3.6 Adopter type

A question was asked to ascertain the type of adopters the interviewees were. Some considered themselves to be innovators, while others were clearly cautious late adopters, unwilling to experiment at the cost of the business, because the "software must do what we want, when we want it, how we want it" (INTV3). Some businesses wanted some level of justification, while others seemed to be excited by technology (INTV4) wanting to experiment and try new things. However, the message from individuals was mixed. On one hand they "love computers, they are great" (INTV4), but they were cautious because "we would not put on brand new software" (INTV4). Another business echoed the caution about new software, but also said "we are considered an innovative business in our industry. The Queensland office of our industry group seeks our advice on how we do things" (INTV5).

4.3.7 Utilization

There was "very limited use of some software" (INTV7), with the industry based software being used more than the other software. There was variation with the use of Microsoft Office within the businesses. The word processor was universally used, with spreadsheets and databases being used less extensively. One business claimed to be "with the macros we use" (INTV9) separating them from the other businesses. Another felt they "really push it (Access) to the limit" (INTV2) and at least one aiming "to use all" (INV1) of their software.

The businesses certainly compared themselves with similar businesses and claim that "we use it a lot more than most; they never look at what else it can do" (INTV4). Some considered themselves to be "ahead of most other offices in our industry… we would be in the top 10 percent" (INTV5). One business made the point that older software "that we have used for sometime is utilized more than the new software because we are still learning what is capable of doing" (INTV6).

4.3.8 Views about ever increasing features

One business had very strong views on the issue of ever increasing features. "The latest packages are overkill. This is why I cannot justify an upgrade; the current software has everything I need. I hate Microsoft, but it is too much of a hassle to swap over to other software" (INTV9). Another business felt this raised a serious question for the business. "Do we adapt the software to us or do we adapt to it" (INTV7)? This business elected to "revamp their systems to match the software" (INTV7). This was by far the most extreme reaction, with another business having no response, while another accepted the ever increasing features in software as a "sign of the times" (INTV4).

They went on to explain that it would be impossible to design a package to suite everyone and another interviewee felt that today people tend to “buy more than they want in case they need it”(INTV5).

One business was frustrated with bloated packages, expressing a desire to use more of the features but lacking the time to do so (INTV2).

4.3.9 Upgrade problems encountered

A few businesses reported that they usually don’t have problems when they upgraded their software, or that the problems are minimal (INTV4, INTV6, INTV10, INTV1). The other business talked about losing files (INTV2), or the new program not being backwards compatible (INTV9). If problems are encountered then some felt they could sort things out for themselves by reading the help files (INTV3). Another agreed the help files are “usually a lot easier than the books. If I am still in trouble then I call the big guys” (INTV6). Others had found that they lost half their files and “the program had to re-installed” (INTV2). They had used backups, but they were not up to date (INTV2).

4.3.10 Concluding interview comments

The businesses feel “a major innovation is needed to justify an upgrade” (INTV9) but the software upgrades usually “provide a big improvement in speed” (INTV9). The businesses were all positive about their use of computers with one business stating they consider “software as very exciting” (INTV4). While industry based software has its strengths, one highlighted weakness was that “you need to keep staff as long as possible because you cannot get someone in cold to take over” (INTV10).

4.4 Conclusion

The ninth interview provided no new comments or ideas beyond those already determined from the earlier interviews, but one final interview was conducted to be sure all of the critical ideas had been elicited. The comments obtained from the interviews were used to draft items for the survey, so that the methodology explained in the previous chapter could be enacted. The comments from the interviews are in appendix 4.

5 Pilot Study

5.1 Introduction

The aim of this research is to explore the factors which influence small and medium businesses in their decision to upgrade their software packages. The previous chapter reported on interviews that were conducted to explore this question. Those interviews provided a number of insights into the factors that local business consider when making the decision to upgrade the software. However, there were only a small number of businesses involved in the qualitative study limiting the ability to generalize the results. To explore the subject further so that the results could be considered applicable to all small and medium enterprises within Australia further research needs to be undertaken. This second phase will, according to Creswell (p.212) "expand the understanding" by collecting data from a large number of people thus enabling some quantitative analysis. The steps involved in this stage are outlined below in the figure 5.1.

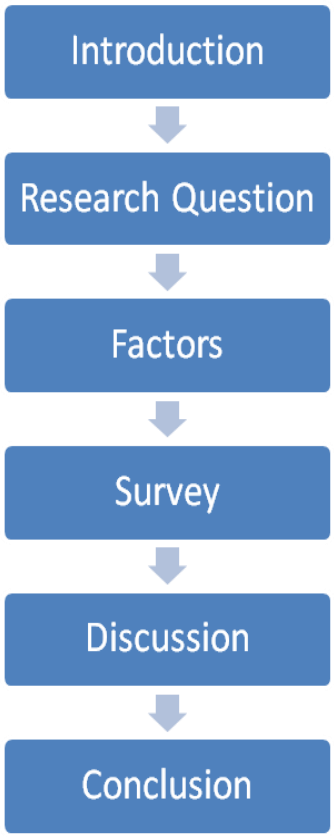

Figure 5.1 Outline of chapter 5

5.2 Factors

The research question addressed in this study was:-

What are the main factors that influence the decision to upgrade software in small and medium sized Australian businesses?

To explore the question, the literature on diffusion of innovations, organisational buyer behaviour and adoption of information technology in small business was examined to find factors that influence the adoption of software upgrades in small and medium sized businesses. From the literature review, eleven candidate factors, as shown in figure 5.3, were identified: Innovativeness, Business impact, Organisational Characteristics, Prior Experience, Educational Level, Relative Advantage, Compatibility, Past Behaviour, Information, External Influences, and Complexity. Each of these factors is now discussed in turn.

Figure 5.2 Potential factors identified in the literature review

5.3.1 Innovativeness of the manager

In his comprehensive work on diffusion of innovation, Rogers (1995) depicted the rate of adoption as a normal distribution curve rising as the proportion of adopters increased from the innovators and early adopters to the early majority. At this point, the rate of adoption peaked and then the late majority and laggards also took up the innovation.

5.3.2 Business Impact

Change management is one of the most critical challenges a small business would face with when upgrading software. Not only do the direct costs of the software have to be considered, but possible hardware costs, user training, testing, data conversion need to be considered as well (Nah & Delgado, 2006). Businesses may also experience downtime while the new software upgrade is being installed and then face a reduction in operational efficiency when the software is implemented (Ng, 2001).

5.3.3 Organisational Characteristics

Previous studies have considered business size and sector influence on IT usage (Kagan et al. 1990; Cragg & King 1993; Igbaria et al. 1997) while studies in marketing research have shown organisational demographics such as size, location, industry category, type of ownership, number of employees, characteristics and composition of employees, and the sphere of operations have an impact on the decision-making behaviour of the business (Sheth et al. 1999).

Organisational behaviour and management literature establishes that small organisations are different to larger organisations in terms of formalisation, centralisation, complexity and personnel ratios (Daft 1998).

Furthermore, research has highlighted that compared to large firms, small organisations have a flat structure and are managed by their owners in an organic, free-flowing, personalised management style that encourages entrepreneurship and innovation, less formalised decision-making structures and procedures, and more freedom for employees to depart from the rules (Daft 1998, Attewell & Rule 1991). In terms of IT adoption, small firms tend to neglect training, are averse to consultants and reluctant to seek external help (Cragg 2002). Therefore, small firms should not be considered to be scaled down versions of large firms (Richardson 2002).

5.3.4 Prior experience

Previous studies have confirmed Rogers's assertion that innovation adoption is positively associated with certain personal characteristics of potential adopters such as education level, experience and cosmopolitanism (Robertson & Gatignon 1986).

5.3.5 Educational level

Numerous studies (Card et al., 1999; Machin, 1996; Doms et al., 1997; Gretton et al., 2004). have reported increased computer use being associated with higher education levels of the organisation. According to Bayo-Morionesa and Lera-Lópezb (2007) higher levels of education in an organization increase the likelihood of adopting innovations in ICT.

5.3.6 Relative advantage

It has been claimed that one of the best predictors of an innovation's rate of adoption is relative advantage (Al-Gahtani 2003). In the case of software upgrades, relative advantage refers to the degree to which the new version is perceived to be superior to the current version in use. The degree of relative advantage may be measured in economic terms by return on investment, but social-prestige factors, convenience, and satisfaction are also considered to be important components (Jones & Lynch 1999).

Although payback period and cost benefit calculations are employed for economic analysis of IT investment decisions, it has been reported that evaluating intangible benefits of IT causes problems not encountered in investing in traditional assets. Consequently, formal appraisal techniques do not appear to be used in many IT investments (Ballantyne & Stray 1999), a situation which may contribute to the widespread concern in organisations that investment in IT does not deliver value (Jones & Hughes 2000). Apart from the economic advantages, perceived ease of use and perceived usefulness of software should also be considered in upgrade decisions (Montazemi & Cameron 1996).

5.3.7 Compatibility

Compatibility in terms of software upgrades refers to the degree to which the new version is perceived as being consistent with the existing hardware, file structures, operation, ease of data transfer to other applications and previous software versions, and requirements of the users. In recent times, incompatibility of upgrades has caused problems for users, for example, files created with Lotus 123 release 2 could not be accessed on computers running the earlier version (Ellison & Fudenberg 2000).

5.3.8 Past behaviour

Past behaviour is often the strongest predictor of future behaviour (Ouellette & Wood 1998), but the relationship between past-behaviour and future-behaviour is not especially meaningful. The link is possibly because whatever allowed someone to behave in a certain manner in the past might allow them to be so disposed in the future. The adoption of software upgrades and hardware upgrades in the past might be a good predictor of software upgrades in the future.

5.3.9 Information

Because many small businesses make decisions in a similar fashion to house hold decisions, the views of business associates and friends may influence the small business decision to adopt a software upgrade. House hold purchasing decisions tend to be characterized by more of a normative orientation (Burnkrant & Cousineau, 1975). The ability to observe the software upgrade would be a significant aspect of an information gathering exercise.

5.3.10 External influences

Agencies outside a business, such as government departments, banks, clients, and suppliers can generate a state of affairs necessitating a decision concerning whether or not to upgrade software. For example, changes needed to cope with Y2K changes and the Australian Government's new Goods and Services Taxation (GST) laws in 2000 had a very noticeable impact with increased IT expenditure to achieve compliance. Recently, any

business involved in importing or exporting goods was forced to comply with Australia's new customs system.

Suppliers who release an excessive number of software upgrades force users to purchase unwanted versions while others are struggling with incompatibility issues (Ellison & Fudenberg 2000). Clients can also pressure firms to upgrade software, for example, in Australia, large retailers such as Coles and Woolworths force small wineries to adopt e-commerce and this often involves upgrading existing software packages.

5.3.11 Complexity

Rather than focus on the complexity of using the new version of software, this research considers the complexity of the purchase decision. Consumer behaviour research differentiates between the new buy decisions, for example the first time a particular software package is purchased, and the other extreme, a straight re-buy situation. Between them on the new buy – re-buy continuum is the modified re-buy class. New buy decisions are complex and could adversely affect an organisation's financial position, product quality, and corporate morale. However, straight re-buy decisions are less complex, low-involvement and routine (Sheth et al. 1999).

A purchase of a software upgrade would usually be considered a modified re-buy. The more the purchase task is like a new buying task, the greater the need for information, more time is spent on the decision, a greater emphasis is placed on finding a good solution, advice is sought from technical persons, price is considered less important, evaluation criteria are more important, and alternatives will be considered (Anderson et al. 1987).

Software upgrades which can be considered discontinuous innovations would be more complex and closer to a new buy decision, while continuous innovations would be closer to a straight re-buy decision. Continuous innovations require little or no behavioural change by the adopter. An example of a continuous innovation is downloading software from the supplier's web site rather than upgrading from a CD ROM. Discontinuous innovations necessitate changes by the adopter, for example users of Microsoft Office will find the new version 12 a challenge as it uses XML-based default file formats and has had a major interface revision. It is expected that as the complexity of the purchase decision increases, the likelihood of upgrade purchase would decrease.

5.4 Survey

After completing the interviews, the second stage of the research project involved a survey of small and medium sized businesses to measure the effect of the identified factors on the decisions of managers to upgrade software. In this section, firstly the design and execution of the survey is explained, followed by the response and demographics of respondents. Values for the dependent variable, likelihood to upgrade software are

reported, followed by two of the factors type of adopter and complexity of purchase decision. The large set of items, relating to perceptions, is analysed with factor analysis to extract key factors, then a regression model is applied to determine the contribution of the factors to the dependent variable.

5.4.1 Survey Design

A questionnaire was designed to collect information based on the variables identified during the literature review and interviews. The questions were multiple-choice style with tick boxes provided. The dependent variable, likelihood to upgrade most important software offered seven choices: certain, very likely, likely, neither likely nor unlikely, unlikely, very unlikely and definitely not. Innovativeness of manager was measured on a five point Likert scale: first to buy, early adopter, majority, late adopter, last to purchase. Complexity of purchase decision was presented as a seven point Likert scale with new purchase at one extreme and repeat purchase at the other end. For the items regarding perceptions, respondents were presented with statements and requested to indicate their level of agreement on a seven point Likert scale from strongly disagree to strongly agree.

A random sample of 1000 business names and addresses was selected from Dun and Bradstreet's Australian Small Business database, and the questionnaires were mailed during November 2000. Responses were sight-checked for completeness, keyed into Excel, and transferred to SPSS to calculate frequencies and perform factor analysis and regression modelling.

5.4.2 Survey response and demographics

From the 1000 organisations to which questionnaires were mailed, 13 were undeliverable: 987 were received by organisations. Of these, 165 responded (153 complete, 12 incomplete), giving an effective response rate of 16.7 percent which is within the typical range of 10-20 percent for mail surveys to business establishments (Paxson 1992). A chi-square test confirmed the distribution of responses from Australian States was consistent with the distribution of the sample. Therefore it was a valid sample in terms of Australian geographic location.

5.4.3 Business and manager characteristics

The survey responses were evenly split between small (48%) and medium (52%) businesses. Although 21 percent of respondents reported an annual turnover of less than AUD$1 million, most (55 percent) had a turnover in the range of $1-10 million, and almost one quarter reported a turnover in excess of $10 million. As far as the geographic span of operations, variety was reported with 16 percent operating in their local area; 18 percent state-wide; 39 percent interstate; and 28 percent internationally.

Respondents were asked to select their position titles. Some respondents chose more than one position title; it is not surprising in a small firm that the

owner is also CEO, director, and financial controller. The most popular selection was owner/manager (43%), followed by financial controller (23%). Most of the respondents (78%) were responsible for providing the final approval for software upgrades, and many performed the role of recommending the purchase (31%) and specifying requirements (38%). The respondents reported high levels of education with 36 percent having completed a university degree, 20 percent a higher degree, and 27 percent a certificate or diploma. The computer experience of the respondents was extensive: the majority (71%) had been using computers for more than 10 years, with 21 percent between five and ten years. In terms of the most important software for the business, almost half the respondents nominated accounting software (48%), followed by industry specific software (11%), and word processing and database software (both 10.5%).

5.4.4 Likelihood of upgrade purchase

If a new version of their most important software was released, the respondents reported a positive intention with three fifths (61%) reporting they would be likely to purchase, compared to only one fifth (20%) who were unlikely or intending not to purchase the upgrade (details in table 5.1). Almost 21 percent of respondent recorded that they were certain to purchase the new version.

Table 5.1: Likelihood of software upgrade

Likelihood of purchase upgrade to most important software	Frequency	Percent
Certain	32	20.9%
Very likely	27	17.6%
Likely	34	22.2%
Neither likely nor unlikely	30	19.6%
Unlikely	16	10.5%
Very unlikely	9	5.9%
Definitely not	5	3.3%
Total	153	100.0%

5.4.5 Innovativeness of manager

In terms of innovativeness, respondents were requested to self-select their adopter type in regards to purchasing software upgrades for their most important software. The results as shown in table 5.2, indicate the majority chose the third category (equating to Rogers' early majority class).

Table 5.2: Innovativeness in regards purchase of software upgrade for most important software

Adopter type when purchasing the software upgrade for most important software	Frequency	Percent
Enthusiastic, innovator, first to buy, risk taker, evaluator	5	3.3%
Visionary, early adopter, leader in your industry, others ask your opinion	39	25.5%
Pragmatic, cautious, not the first nor the last to buy, ask others what to buy	94	61.4%
Conservative, late adopter, not confident, follower, doubtful	13	8.5%
Sceptical, last to purchase, have to be absolutely certain	2	1.3%
Total	153	100.0%

5.4.6 Complexity of purchase decision

When asked to record on a seven point scale how they viewed the purchase of a software upgrade as a new purchase or a repeat purchase, the majority of respondents (56%) indicated the purchase was more like a repeat purchase than a new purchase decision (24%). One fifth of the respondents chose the neutral mid-point.

5.4.7 Analysis of perceptions regarding software upgrade purchase

In the questionnaire, a seven point Likert scale was used to gauge the strength of agreement or disagreement to 53 statements. Coding the responses 1 for strongest disagreement up to 7 for strongest agreement, a numeric value was calculated for each item. Factor analysis was conducted on the 53 items to reduce the number of items and to enable variables to be classified. Kaiser-Meyer-Olkin measure of sampling adequacy at 0.673 is considered adequate (Francis 2003 p.160) and Bartlett's test of sphericity is significant, indicating that there are significant correlations between the variables sourced from the survey data.

The initial attempt at data reduction suggested too many factors. A recognised method of determining the number of factors is the use of scree plots (Tabachnick & Fidel, 1996). Examining the scree plot, shown in figure 5.3 shows, to see where the first sudden change in the slope of the curve occurs suggests that the number factors could be reduced to seven.

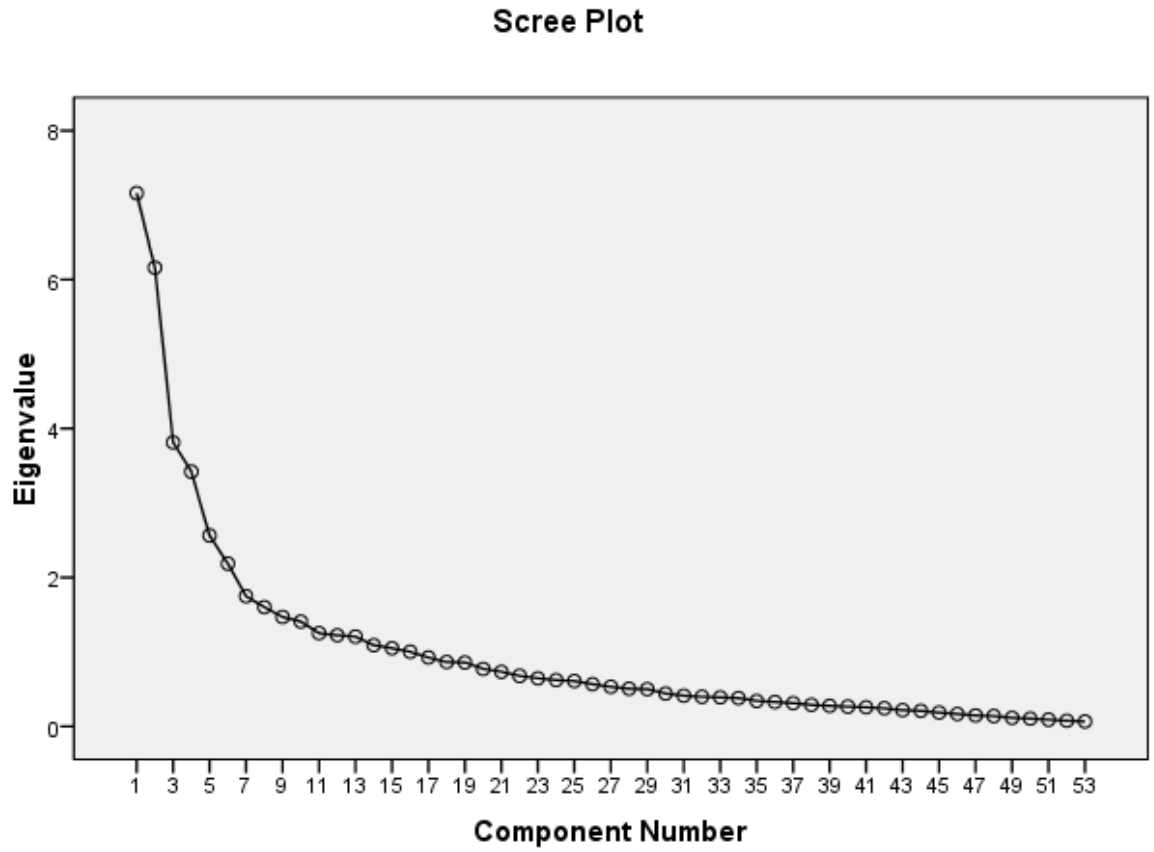

Figure 5.3 Scree plot

The data were then forced to fit a seven factor solution with a new analysis. Variables that loaded by more than 0.3 on more than one factor were removed and the analysis repeated. The final analysis revealed not seven but six factors as items that cross loaded were removed from the analysis.

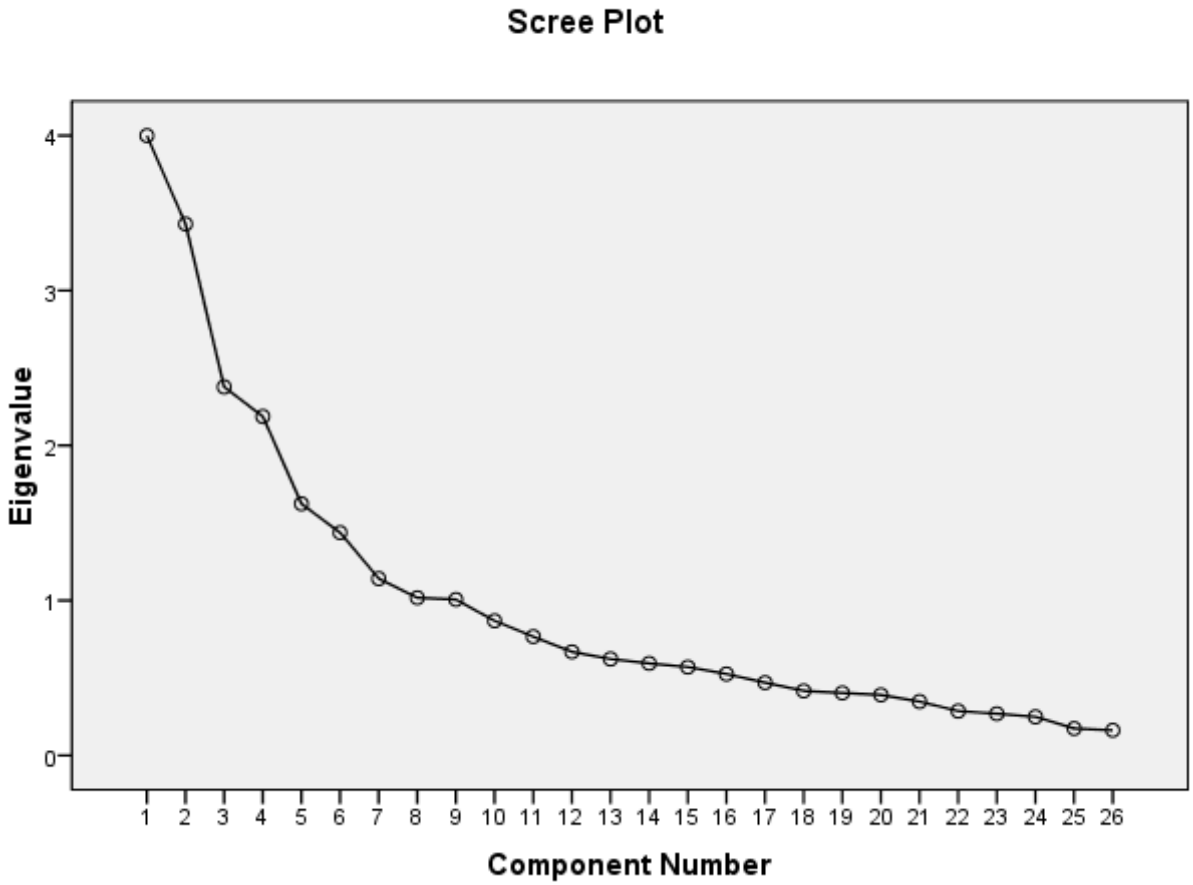

Figure 5.4 Scree plot after items removed

Principal component analysis identified six factors which accounted for 57.9 percent of the variance. These factors together with their factor loadings are shown in table 5.3 below. Factor 1, the first factor extracted accounted for 12.618 percent of the variance and contains items all associated with perceived potential relative advantage. The sixth factor extracted was also concerned with advantages as will be shown later.

Table 5.3 Factors extracted 1

	Component					
	1	2	3	4	5	6
i15	.835					
i23	.804					
i16	.802					
i13	.731					
i22	.688					
d3		.765				
d5		.701				
d1		.701				

d8		.568				
d9		.562				
d10		.363				
i29			.782			
i30			.763			
i26			.720			
i32			.666			
i17			.536			
f5				.802		
f3				.754		
f6				.605		
f4				.600		
i12					.839	
i11					.834	
i9					.782	
i37						.766
i3						.738
i33						.585

Table 5.4 Factor 1

Potential perceived relative advantage	
I15. I will upgrade my software if it is more efficient.	0.835
I23. The software upgrade should keep the business up-to-date.	0.804
I16. I will upgrade my software if it is easier to use.	0.802
I13. I will upgrade my software if it means I can do my work faster.	0.731
I22. The software upgrade should keep the business competitive.	0.688

The second factor extracted is concerned with the decision, the complexity, or nature of the decision. This factor explains 10.46 percent of the variance extracted.

Table 5.5 Factor 2

Perceived complexity of purchase decision	
D3. The decision to upgrade software is very time consuming.	0.765
D5. The decision to upgrade software is risky.	0.701
D1. The decision to upgrade software is very complex.	0.701
D8. I need specialist advice to make the decision to upgrade software.	0.568
D9. When faced with a software upgrade I consider switching to another brand of software.	0.562
D10. After I have upgraded I question whether I made the correct decision.	0.363

The next factor extracted deals with how compatible the upgrade will be with the existing hardware and software. These items indicate how the upgrade might impact on the business.

Table 5.6 Factor 3

Business Impact	
I29. I determine what new hardware will be required before I upgrade software.	0.782
I30. I determine how my current software will be affected before I upgrade software.	0.763
I26. I check that the software upgrade will not require new hardware.	0.720
I32. I determine how the business will be affected before I upgrade software.	0.666
I17. My current software serves my needs.	0.536

A factor emerged related to accessibility of information concerned with software upgrades. Observability was defined by Rogers (1995) as the degree to which the results of an innovation are visible to others and was identified by earlier researchers as an important characteristic of innovations. The easier it is for individuals to see the results of an innovation, the more likely they are to adopt it. If managers are able to readily find information describing the software upgrade in trade magazines, Internet and conferences, then they may be more likely to purchase it. Items linked to how easy it would be to find out about the upgrade or to observe it before purchase were the extracted as the fourth factor. This factor accounted for 8.864 percent of the variance extracted.

Table 5.7 Factor 4

Observability	
F5. I check magazines before I buy a software upgrade.	0.802
F3. I check information on the Internet before I buy a software upgrade.	0.754
F6. I buy a software upgrade only after seeing it at a conference, seminar, or trade show.	0.605
F4. I seek the advice of a friend or relative before I buy a software upgrade.	0.600

The items extracted in factor 5 are concerned with the lack of control often felt with software upgrades. This factor accounted for 8.851 percent of the variance extracted.

Table 5.8 Factor 5

External influences	
I12. I am expected to upgrade software too often.	0.839
I11. Software upgrades are released too often.	0.834
I9. Software upgrades are only a way of making money for software companies.	0.782

Factor 6 accounts for 6.983 percent and the items in this factor are aligned with the actual advantages of software upgrades. Thus, the factor analysis produced two factors associated with the advantages of upgrades, factor 1, and factor 6, with distinct differences. As shown by the method used to extract the factors, these two factors do not cross load strongly.

Table 5.9 Factor 6

Advantage of software upgrades	
I37. The software upgrade increases the benefits of the software.	0.766
I3. The new versions of software are always easier to use.	0.738
I33. A software upgrade improves your customers' satisfaction.	0.585

5.4.8 Revised research model

A stepwise regression was conducted with the variables sourced from the survey data to determine which factors were the strongest predictors in the decision to upgrade software. The results are displayed in table 5.10.

Table 5.10: Regression model

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df 1	df 2	Sig. F Change
1	.578(a)	.334	.330	1.339	.334	75.724	1	151	.000
2	.609(b)	.370	.362	1.306	.036	8.653	1	150	.004
3	.628(c)	.394	.382	1.286	.024	5.828	1	149	.017
a Predictors: (Constant), innovativeness; b Predictors: (Constant), innovativeness, perceived relative advantage c Predictors: (Constant), innovativeness, perceived relative advantage, complexity									

Innovativeness by itself explains 33.4 percent of the variation in likelihood to upgrade, with a further 3.7 percent explained by perceived potential relative advantage; and 2.4 percent by perceived complexity of purchase decision. Contrary to previous research and the findings from the interviews of the preliminary study, the following factors did not contribute to the likelihood of software upgrade purchase: external influence; business characteristics, prior experience, education level, compatibility; past behaviour, perceived actual relative advantage, and observability.

5.5 Discussion

The analysis was clearly limited by the size of the sample, providing an incentive to undertake the full scale study with a larger sample. The current

sample had only 153 usable responses, with 53 perception items. This is far less than the recommended ratio of five subjects per variable.

In considering additional factors not included in the study, diffusion of innovation and the technology acceptance model do not seem to offer any candidates. Although trialability was not explicitly identified in either the literature or the interviews, there were items concerned with this within the survey. These items were not extracted as a factor. There were also other items relating to ease of use and usefulness but these either loaded with perceived potential relative advantage, actual relative advantage or were eliminated by the factor analysis.

Although this research supports the influence of three factors (innovativeness, perceived potential relative advantage, and complexity of purchase decision) on the likelihood to upgrade, the model fitted only explains 39 percent of variance. By comparison, an often cited model, the technology acceptance model (Davis 1989) in a study with students explained 36 percent of the variance while Plouffe et al (2001) reported that the technology acceptance model explained 32.7 percent of the intention to adopt in their study using merchants.

5.6 Conclusion

Clearly, further research is needed to fully understand the factors influencing the decision of small and medium sized businesses in upgrading software packages. Following on from this pilot study, a full scale study using a larger sample was undertaken. A larger sample enables the use of structural equation modelling to explore the relationships between the factors to better understand the software upgrade decision. The discussion and analysis of the full scale study is reported in the following chapter.

6 Data Analysis and discussion of the full scale study

6.1 Introduction

In the analysis of the pilot study it was found that the likelihood of a small business to upgrade their software was influenced by three factors, the innovativeness of the purchaser, the perceived potential relative advantage of the software upgrade, and the complexity of the purchase decision. A constraint on that analysis was the size of the data and therefore further analysis using a larger dataset was considered necessary.

The previous chapters identified and justified the research approach for this stage of the research, the full scale study. This chapter analyses the data gathered using that methodology and has six sections as depicted in figure 6.1. After this introduction, the representativeness of this sample with respect to the Australian population is profiled and tested in section 6.2. Next, the data preparation strategies of cleaning and screening are described in section 6.3 followed by the descriptive analysis of the data in section 6.4. The measurement component of the analysis explores and tests the suitability of the data for further statistical testing using exploratory factor analysis in section 6.5, with confirmatory factor analysis reported in section 6.6 and then structural equation modelling is used to test the conceptual models in section 6.7. Finally, conclusions are drawn in section 6.8.

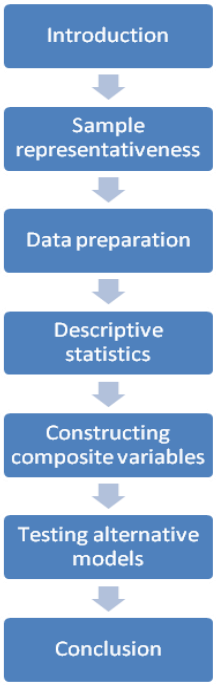

Figure 6.1 Outline of chapter 6.

Within section 6.5, the steps outlined in figure 6.2 are followed. These steps were undertaken to maximize the reliability of the constructs, which were composite variables constructed from the factors identified with the exploratory data and confirmed with the confirmatory data. Frequently,

researchers have computed the composite variables by simply adding the variables to be included into the composite, thereby ignoring the properties of the included variables and assuming all the variables contribute equally to the composite. The composites produced this way may have low validity (Holmes-Smith, 2001). To overcome these issues, exploratory factor analysis and one-factor congeneric model can be used to obtain a "manageable number of valid, reliable, composite variables" (Holmes-Smith, 2001) for use in the structural equation models.

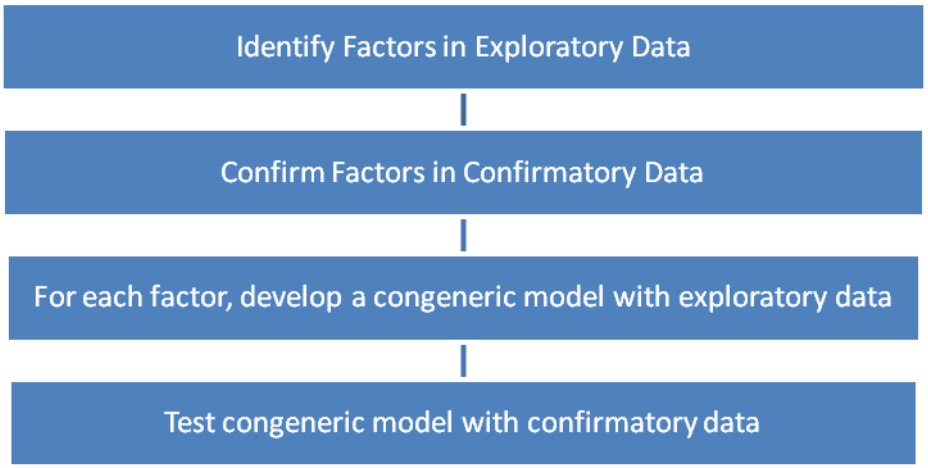

Figure 6.2 Process followed within the exploratory and confirmatory analysis

The composite variables were then incorporated into the models to be tested. Alternative models were tested on the exploratory data to determine which of the models had the best fit. These models were then tested with the confirmatory data. Thus, the model that explained the most variance in the likelihood to upgrade the most important software was determined.

6.2 Sample size

The primary data collection method used was a survey, which selected a sample from the Australian population. The aim was to take a representative sample so that results found from the sample could be generalised to the population. A sample was used was because of budget constraints. The random sample of Australian small and medium sized businesses was used for the full scale study.

The relevant target population for this study was all Australian small and medium businesses. For this study the definition for what constitutes a small and medium sized business is taken from the Australian bureau of statistics. A small and medium business includes micro businesses (less than 5 people), small business (employing less than 20 people) and medium business 20 or more but less than 200 people.

Based on the response rate from the pilot study of 15.5 percent and a desired sample size determined in the methodology chapter of 385 times 2, it was calculated that 4968 surveys were needed. A random sample of 5000 business names and addresses was selected from Dun and Bradstreet's

Australian Small Business database, and the questionnaires were mailed during November 2000. Responses were sight-checked for completeness, keyed into Excel, and transferred to SPSS to calculate frequencies and perform factor analysis.

6.3 Survey response and demographics

From the 5000 organizations to whom questionnaires were mailed, 67 were returned as undeliverable; therefore 4933 were received by organizations. Of these, 826 responded (766 complete, 60 incomplete), giving an effective response rate of 16.7 percent which is within the typical range of 10-20 percent for mail surveys to business establishments (Paxson 1992). A chi-square test ($\chi^2(7, N = 766) = 1.58, p > .05$) confirmed the distribution of sample responses from Australian States was consistent with the distribution of the population. Therefore it was a representative sample in terms of Australian geographic location. A further chi-squared test ($\chi^2(6, N = 766) = 0.17, p > .05$) also confirmed that the industry type of the businesses was not significantly different from the populations, indicating that it was also a representative sample in that aspect.

6.4 Non-response bias

To examine the possibility of non-response bias, the responses of the early responses was compared with the late responses. The underlying principle is that late respondents are most likely to have similar characteristics to non-respondents. The last quartile of respondents was compared with the first quartile of respondents. Chi-square revealed no significant differences at the 5% level for both the industry type ($\chi^2(7, N = 192) = 10.75, p > .05$) and the geographic location ($\chi^2(7, N = 192) = 9.40, p > .05$) of the variables in the study. It was therefore concluded that non-responses did not bias this sample.

6.5 Respondent characteristics

The most frequent position title selected by the respondents, as shown in Table 6.1, was as an owner/manager (44.1 percent) with 46.2 percent of them selecting that position description exclusively. Of the respondents who identified themselves as owner/managers, 24.3 percent also considered themselves to be directors. These two classifications accounted for the majority of the respondents.

Table 6.1 Position title

Owner/manager	44.1%
CEO	17.8%
Financial Controller	24.0%
Director	19.8%
CIO/MIS/IT management	14.4%
Other	10.1%

The respondents, as reported in Table 6.2, all reported that they participate in the decision to upgrade software. Of these, 75.2 percent provided final approvals and 41.3 percent of them also specified the requirements of the software upgrade. 31.6 percent make recommendations on the software upgrades.

Table 6.2 Purchasing role in software upgrades

Final approval	75.2%
Specify requirements	41.3%
Recommend	31.6%
No role	0%

In response to the question about their highest level of education, shown in table 6.3, over half of the respondents had either a degree or a higher degree, with a further 24.5 percent possessing a certificate or diploma.

Table 6.3 Highest level of education

High school	24.0%
Certificate/Diploma	24.5%
Degree	30.5%
Higher degree	20.6%

The level of computer experience of the respondents is shown below in table 6.4, was high with 93.7 percent of the respondents having personally used computers for more than 5 years.

Table 6.4 Years respondent has personally been using computers

<1 year	1.3%
1–4 years	5.0%
5 –9 years	18.0%
10-15 years	34.5%
>15 years	41.3%

The personal computer experience (shown above in table 6.4) was closely matched by the number of years the business had been using computers. Nearly 92 percent of the respondents claimed the business had been using computers for over 5 years.

Table 6.5 Number of years the business had computers

<1 year	1.0%
1–4 years	7.3%
5 –9 years	27.7%
10-15 years	42.8%
>15 years	21.1%

The high level of computer experience may partially explain why only a small percentage (26.9percent) of the businesses employed a computer specialist as a full time employee.

Table 6.6 Full time computer specialist employee

We employee a full time computer specialist	26.9%
We do not employee a full time computer specialist	73.1%

Table 6.7 Age of the business

Business age	
<1 year	0.5%
1–4 years	3.4%
5 –9 years	12.3%
10-15 years	20.1%
>15 years	63.7%

From Table 6.7, it was determined that most of the businesses (83.8 percent) have been operating for over ten years, and the data in table 6.8 indicate that 59.5 percent of the businesses have fewer than 20 employees.

Table 6.8 Number of full time employees

0	0.5%
1-2	8.9%
3-4	8.1%
5-9	15.7%
10-19	23.5%
20-100	34.7%
101-200	6.8%

As expected, the businesses covered the spectrum from local to international, highlighting the significance and spread of the business sector involved in this study.

Table 6.9 Scope of the business

Local only	12.3%
State wide	16.4%
Interstate	33.2%
Internationally	38.1%

Table 6.10 reveals the breakdown by percentage of the industries in the sample. Four groups (manufacturing, building/construction, wholesale/retail and business services) accounted for over 90 percent of the respondents. A chi-square test ($\chi^2(6, N = 766) = 0.17, p > .05$) revealed no significant difference at the 5 percent level between the sample and population. This item was included to determine the representativeness of the sample.

Table 6.10 Industry type

Manufacturing	30.3%
Building/Construction	16.2%
Wholesale/Retail	25.6%
Business Services	19.1%
Personal Services	2.6%
Transportation/Storage	1.8%
Education/training	1.8%
Agriculture	2.3%

The annual turnover of the businesses was widely distributed, with 23.3 percent of the businesses earning less than $1 million, and 24.5 percent earning more than $10 million, and the majority earning somewhere between $1 million and $10 million, as shown in table 6.11.

Table 6.11 Annual turnover

Less than $½ million	8.9%
$½ million to less than $1million	14.4%
$1million to less than $10 million	52.2%
More than $10 million	24.5%

6.6 Constructing composite variables for use in Structural Equation Models

Respondents were asked to respond on a seven point Likert scale. All of the items were developed specifically for this study. These items did not differ from those used in the pilot study, and an explanation of the process used to develop the items has been provided previously.

6.6.1 Splitting the dataset.

Before commencing any further analysis, the dataset was split into two components as suggested by Anderson and Gerbing (1988) so that a model can be developed with one half and validated with the other half. The entire dataset was first entered into a spreadsheet, and then split according to whether it was an odd or even row. This was considered preferable to simply taking the first half as one sample and the second half as the other sample. With a total of 766 complete responses in the entire dataset, each half now had 383 responses.

6.6.2 Determining the factors

To determine the structure of the scale, a principal component analysis with varimax rotation was applied. Principal Component extraction maximizes the variance of the factors. The larger the factor loading the more important the variable is in interpreting the factor matrix. With a sample size in excess of 350, a factor loading of 0.3 is considered a significant factor loading, while those with a loading of 0.5 or more are particularly significant (Hair et al, 1995). When performing principal component extraction it is common to find items which load onto more than one factor. Thus to derive the strongest factors only those items which loaded onto a single factor with an item loading of 0.5 or above were retained. After removing the items that cross loaded onto more than one factor, the scale reduction technique was repeated. A goal was to have at least three items loading on a factor.

The scree plot was examined in preference to using latent root criteria to determine the number of factors that should be extracted. Scree plots were used because the number of variables exceeded 50, in which case according to Hair et al (1995), “it is not uncommon for too many factors to be extracted” when using the latent root criteria. The most appropriate number of factors that adequately represent the constructs underlying the variables in the analysis is equal to the number of factors that come before the scree. From this scree plot it could be concluded that there were seven factors.

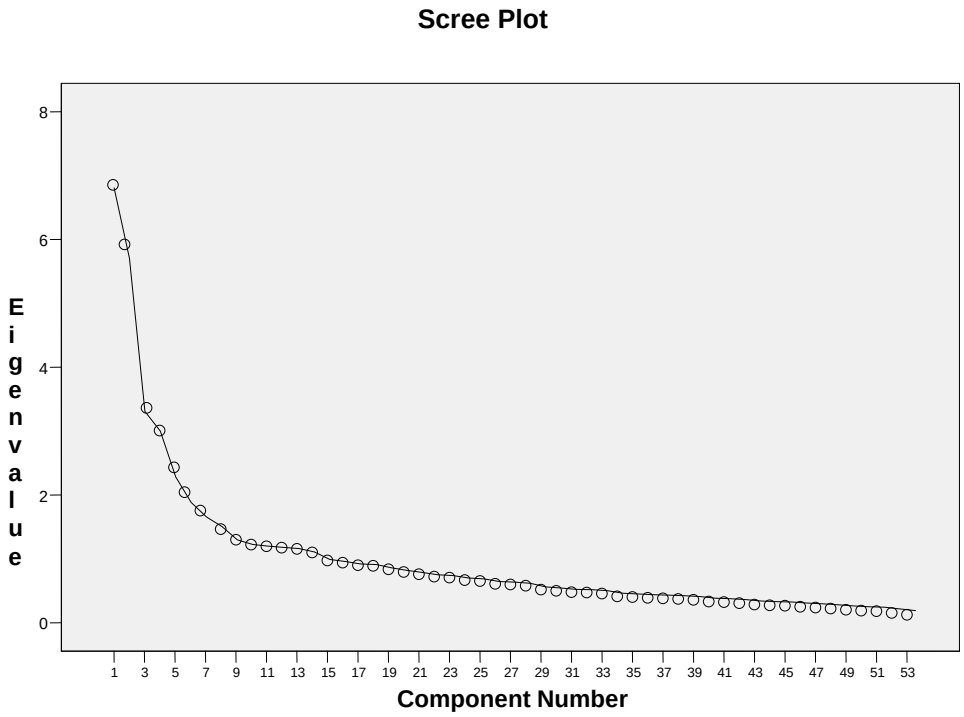

Figure 6.3 Scree Plot

In an orthogonal rotation the factor loadings represent the correlation between a factor and a variable. For clarity, only scores greater than 0.3 were reported.

The desired outcome in factor analysis is that the pattern of factor loadings show simple structure whereby each item correlates highly with only one factor and has a very small correlation on all other factors. The initial extraction using seven factors resulted in numerous variables loading on more than one factor. Because the loading scores on two factors were both greater than 0.3 the items could not be included. For example, I24 loads 0.579 on Factor 2 and 0.408 on Factor 4. This cross loading onto two factors is worrisome and is best solved by eliminating the item . “An iterative process of eliminating one item with significant cross-loading then re-testing” (Chang et al 2004, p581) was used to derive unidimensionality for each factor.

Table 6. 12 Rotated Component Matrix

	Component						
	1	2	3	4	5	6	7
d3	.758						
d5	.730						
d1	.705						
d10	.599						
d2	.588						
d6	.569						
d8	.524						
i2	-.499						

d9	.472						
d7	.308						
i16		.724					
i15		.721					
i23		.704					
i13		.618					
i22		.590			.392		
i24		.579		.408			
i25		.556		.343			
i21		.489			.383		
i35			.845				
i36			.814				
i37			.793				
i34			.778				
i33			.663				
i3			.368			-.300	
i4			.311				
i18			.303	-.628			
i1				.614			
i10				.538			
i5				.537			
i6				.519			
i27				.507		.300	
i14				.478			.309
i20				.427			
i17	-.309			.407			
i7				.385			
i19				.349			
i32					.711		
i30					.687		
i29					.681		
i28					.669		
i31					.601		
i26					.461		
d4							
f1							
i11						.703	
i12						.690	
i9						.686	
i8						.654	
f5							.752
f3							.720
f6							.572
f4							.563
f2							.387

Therefore, the variables that loaded onto more than one factor with a loading of more than 0.3 (Premkumar & Potter, 1995) were removed and the factor analysis repeated. With a smaller number of variables to be analysed, it was necessary to once again determine the appropriate number of factors. The second scree plot no longer suggested seven factors should be extracted, but six.

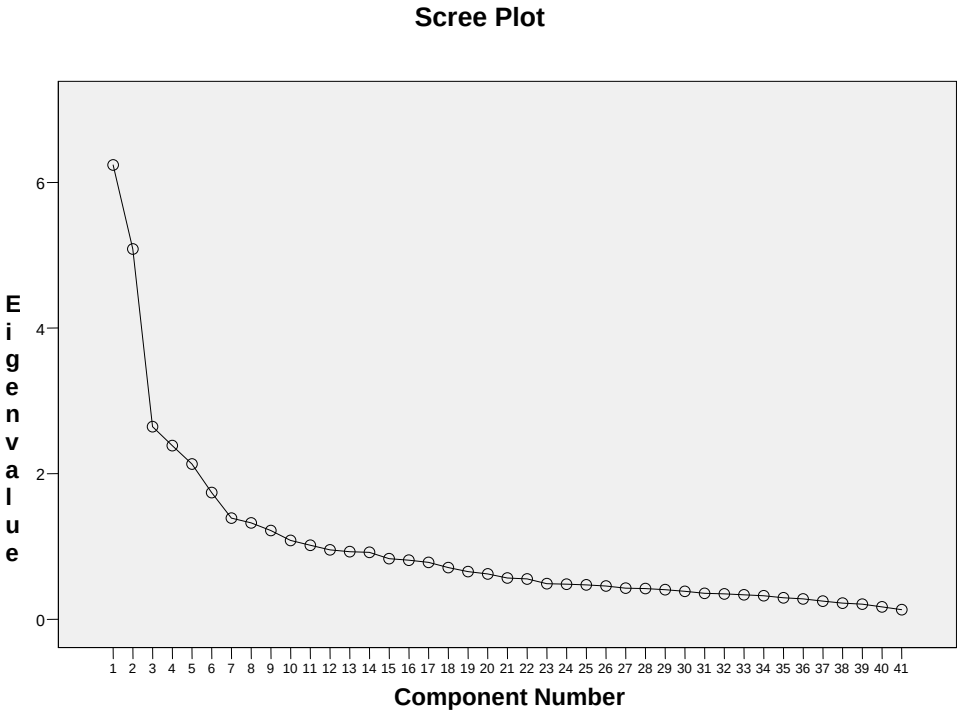

Figure 6.4 Scree plot after some items were removed

The analysis was repeated forcing six factors extraction, as was the case in the pilot study. Once again, some variables loaded onto more than one factor. These were removed and the analysis repeated until a result was achieved where the items loaded onto a single factor. The final rotated matrix with six factors and items loading onto single factors are shown in table 6.13. Item i2 has a negative loading, as a consequence of its negative wording.

Table 6.13 Rotated factor matrix after the removal of items loading onto more than one factor

	Component					
	1	2	3	4	5	6
i35	.874					
i36	.831					
i37	.818					
i34	.806					
i33	.671					
i11		.742				
i9		.735				
i8		.683				
i12		.675				
i10		.616				
i1		.592				
i6		.511				
i7		.472				
d3			.795			

d1			.766			
d5			.764			
d2			.608			
i2			-.572			
d10			.563			
d8			.482			
i32				.731		
i30				.729		
i29				.715		
i28				.648		
i31				.591		
i26				.502		
i15					.842	
i16					.827	
i13					.753	
i23					.599	
f5						.808
f3						.731
f4						.645
f6						.638
f2						.414

This process was then replicated with the second half of the data, the confirmatory data. Once again using principal components analysis to identify factors, six factors were extracted. With the confirmatory data, item i2 loaded onto more than one factor so this was removed and the analysis repeated. The final rotated factor loadings matrix for the confirmatory data is shown in table 6.14.

Table 6.14 Rotated factor loadings with the confirmatory data i2 removed

	Component					
	1	2	3	4	5	6
i35	.857					
i36	.846					
i34	.834					
i37	.816					
i33	.717					
i11		.754				
i9		.735				
i8		.681				
i12		.652				
i7		.565				
i10		.537				
i6		.524				
i1		.522				
i29			.744			
i30			.721			
i32			.685			
i28			.666			
i31			.618			
i26			.561			
d3				.741		

d1				.717		
d5				.632		
d8				.604		
d2				.602		
f2				.499		
d10				.385		
i15					.852	
i16					.824	
i13					.765	
i23					.497	
f5						.817
f3						.768
f4						.609
f6						.448

Comparing the matrices produced from the data reduction of both the exploratory and confirmatory data sets revealed some differences between the variables loading onto the factors in the two data sets. Only those variables which were common to the factors from both data sets were utilized for the factors. This process would automatically result in more reliable factors, since the same factors were identified in two data sets. Thus, a replicated set of factors was produced.

Consequently, the criteria used to determine the variables to be included in the factors were:

- The variables had to load on the same factor in both the exploratory and confirmatory data to produce a replicated set of factors,
- The variables had to have a loading of at least 0.5 on the factors in both data sets (Ives et al 1983),
- The variables could not load onto a second factor with a loading greater than 0.3 (Costello & Osborne 2005), and
- Each factor had to have at least three variables to enable congeneric factors to be developed (Byrne 2001; Rowe & Holmes-Smith 1994)

Based on these criteria variables i2, i7, i23, d8, d10, f2 and f6, the non-highlighted items in table 6.15, were eliminated.

Table 6.15 Factors extracted in the Exploratory and Confirmatory data

Exploratory							Confirmatory						
	Component							Component					
	1	2	3	4	5	6		1	2	3	4	5	6
i35	0.874						i35	0.857					
i36	0.831						i36	0.846					
i37	0.818						i34	0.834					
i34	0.806						i37	0.816					
i33	0.671						i33	0.717					
i11		0.742					i11		0.754				
i9		0.735					i9		0.735				
i8		0.683					i8		0.681				
i12		0.675					i12		0.652				
i10		0.616					i7		0.565				
i1		0.592					i10		0.537				
i6		0.511					i6		0.524				
i7		0.472					i1		0.522				
d3			0.795				i29			0.744			
d1			0.766				i30			0.721			
d5			0.764				i32			0.685			
d2			0.608				i28			0.666			
i2			-0.57				i31			0.618			
d10			0.563				i26			0.561			
d8			0.482				d3				0.741		
i32				0.731			d1				0.717		
i30				0.729			d5				0.632		
i29				0.715			d8				0.604		
i28				0.648			d2				0.602		
i31				0.591			f2				0.499		
i26				0.502			d10				0.385		
i15					0.842		i15					0.852	
i16					0.827		i16					0.824	
i13					0.753		i13					0.765	
i23					0.599		i23					0.497	
f5						0.808	f5						0.817
f3						0.731	f3						0.768
f4						0.645	f4						0.609
f6						0.638	f6						0.448
f2						0.414							

The result was six common factors were extracted from the exploratory data and the confirmatory data. The items that form these factors are listed in table 6.15. Those that fit the criteria have been highlighted in colour. The items identified in the table 6.15, together with its factor number, are listed below.

Table 6.16 Factor 1

The software upgrade results in productivity gains. (i35)
The software upgrade makes the software more useful. (i36)
The software upgrade increases the benefits of the software. (i37)
The software upgrade increases the speed of service. (i34)
A software upgrade improves your customers' satisfaction. (i33)

Table 6.17 Factor 2

Software upgrades are released too often.(i11)
Software upgrades are only a way of making money for software companies.(i9)
I am expected to upgrade software too often.(i12)
New versions of software have too many functions.(i8)
I do not always buy a software upgrade. (i10)
I don't upgrade my software if it is working. (i1)
I upgrade my software only when it is necessary. (i6)

Table 6.18 Factor 3

The decision to upgrade software is very time consuming.(d3)
The decision to upgrade software is very complex.(d1)
The decision to upgrade software is risky.(d5)
A software upgrade is a strategic decision.(d2)

Table 6.19 Factor 4

I determine how my current software will be affected before I upgrade software.(i30)
I determine what new hardware will be required before I upgrade software.(i29)
I determine how the business will be affected before I upgrade software.(i32)
I include the cost of staff retraining into the cost of the software upgrade.(i31)
I check that the software upgrade will not require new hardware. (i26)
I determine whether the software upgrade will necessitate staff retraining.(i28)

Table 6.20 Factor 5

I will upgrade my software if it is more efficient.(i15)
I will upgrade my software if it is easier to use.(i16)
I will upgrade my software if it means I can do my work faster.(i13)

Table 6.21 Factor 6

I check magazines before I buy a software upgrade.(f5)
I check information on the Internet before I buy a software upgrade.(f3)
I buy a software upgrade only after seeing it at a conference, seminar, or trade show.(f6)

At this stage according to Hair et al (1995) the analyst attempts to assign some meaning to the factors identified. The items with the highest loadings are more strongly aligned with the factor, and should therefore be more closely scrutinized for the meaning of the factor.

In the first factor, the expressions 'productive gains', 'being more useful', 'benefits', 'increased speed', 'improved customer satisfaction' are all associated with the '**gains'** the business will derive from a software upgrade.

The second factor has items about the 'frequent release of upgrades', 'only making money', having to 'upgrade too often', the software having 'too many functions' which seems to be concerned with the **'Control'** the business has over the software upgrade.

The third factor deals with the 'complexity of the upgrade decision', the 'decision being a 'time consuming', a 'risky' decision, a 'strategic' decision suggesting that this factor should be identified as the '**complexity'** of the decision to upgrade software.

Factor four deals with the **'impact'** that the software upgrade would have on the business; such as how the other software, hardware and staff training will be impacted upon.

Factor five involves the terms 'more efficient', 'easier to use' and 'work faster'. These are all about the efficiencies to be realized with the software upgrade, consequently this factor should be identified as '**efficiency'**..

The final factor has items identifying how information about the software upgrade can be obtained, so factor six is concerned with the being **'informed'** about the software upgrade.

6.6.3 Modeling the factors

Complex latent variables such as ***Gains, Control, Complexity, Impact, Efficiency*** *and* ***Informed*** are not directly measured. To use these variables in traditional regression analysis it would be necessary to combine the scores of the component variables to derive a measure of the unobserved variable. A typical approach is to simply add the scores of the component variables. This approach is problematic (Joreskog, 1971; Werts et al., 1978; Browne, 1989) for a number of reasons. Firstly, the simple addition of the variables is actually assigning an equal unit weight to each of the variables to the composite variable. That removes the likelihood that one variable actually might contribute more to the composite variable than the other

variables. The second issue is that the simple addition also assumes that the error variances are equal.

Structural equation modeling can reduce these problems. By using Analysis of Moment Structures (AMOS) and following the process suggested by Bagozzi (1981) and Rowe and Holmes-Smith (1994) the error associated with the measurement of the indicator variables can be determined. Then the indicator variables are assigned factor weight score to appropriately allocate their contribution to the latent variables. The unidimensionality of the composite variables can be tested for their goodness of fit.

Having determined the items that load onto the factors, the next process was to model each of these factors using Structural Equation Modeling (SEM) with AMOS. The first composite model, shown in figure 6.5, is the measurement model for Gains with the indicator variables I33, I34, I35, I36 and I37. The error associated with each of the indicator variables is also shown.

6.6.4 Desired fit statistics

AMOS reports a number of goodness of fit statistics which are used to determine whether a model is accepted or rejected. AMOS produces 25 statistics and it is a matter of debate as to which values should be recorded (Jaccard & Wan (1996), Kline (1998), Garson (2008). A cross section of different measures have been used in this research.

Some researchers believe that with a sample size greater than 200 the chi-square test is prone to error. The chi-square fit index divided by degrees of freedom (AMOS reports this as CMIN/DF) is used in an attempt to make it less dependent on sample size. Kline (1998) suggests values less than 3 are acceptable. Goodness-of-fit index (GFI) varies from 0 to 1, and is the percent of observed covariances explained by the implied covariances in the model. Schumacker and Lomax (2004) recommend that this value should be greater than 0.95. Adjusted-goodness-of-fit (AGFI) uses the degrees of freedom to adjust the GFI. Schumacker and Lomax (2004) suggest using 0.95 as the cutoff. Comparative-fit-index (CFI) and Root-mean-square-of-approximation (RMSEA) are less affected by sample size (Fan et al 1999). Hu and Bentler (1999) recommend a cutoff of 0.95 for CFI. For RMSEA, Browne and Cudeck (1993) and Hu and Bentler (1999) suggest values less than 0.05 indicate a good fit. These figures are summarized in table 6.22.

Table 6.22 desired fit statistics

Fit statistic	Desired value
Probability level =	>0.05
CMIN/DF =	<3
RMR =	<0.05
GFI =	>0.95
AGFI =	>0.95
TLI =	>0.95
CFI =	>0.95
RMSEA =	<0.05

All of the congeneric models developed were reflective measurement models where the observed variables were assumed to be caused by the latent variables (Churchill, 1979). Jarvis et al. (2003) state that "Reflective indicators are typical of classical test theory and factor analysis models" (p. 200) wherin "the measures are expected to be correlated and should possess internal consistency reliability" p.201. The models that were not shown to have acceptable reliabilities were rejected.

6.6.5 The congeneric models for Gains:

The initial model shown below in figure 6.5 was formulated using the exploratory data. When the model was examined using AMOS, the fit statistics indicate the fit was not particularly good.

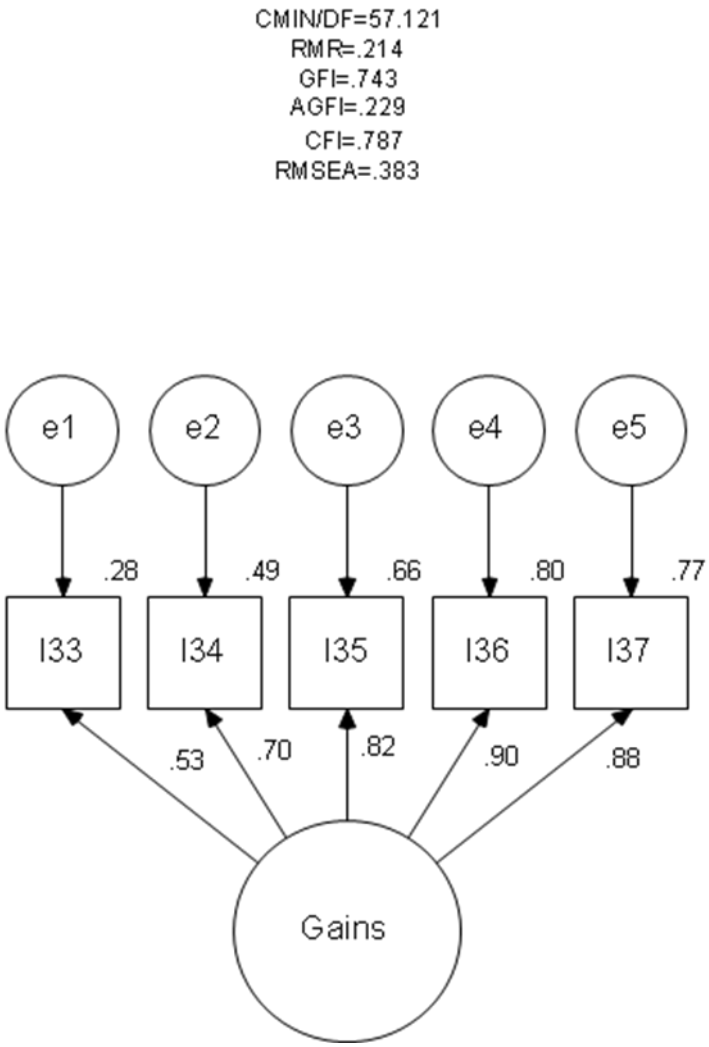

Figure 6.5 Gains congeneric model

CMIN/DF at 57.121 was much larger than the upper limit of 3. RMR and RMSEA were also much larger than the recommended 0.05 level, while the GFI, AGFI and CFI were all less than the 0.095 recommended levels.

Before discarding this model it was examined for possible changes to determine if imposing extra parameters would improve the fit. AMOS suggested possible modifications in a table of modification indices. Only the most significant and meaningful modifications within the modification indices were considered. When contemplating such modifications, they should only be made if they make substantive sense. The modifications suggested by AMOS proposed correlations exist between the errors e1, e2 and e3. In other words, there was a correlation in the errors in measuring I33, I34 and I35.

The error terms between these were allowed to covary, and the goodness of fit other statistics were calculated with the revised model. CMIN/DF =0.798,

RMR=0.009, GFI=0.998, AGFI=0.988, CFI=1.000, and RMSEA=0.000. The data fitted the improved model, as shown in figure 6.6.

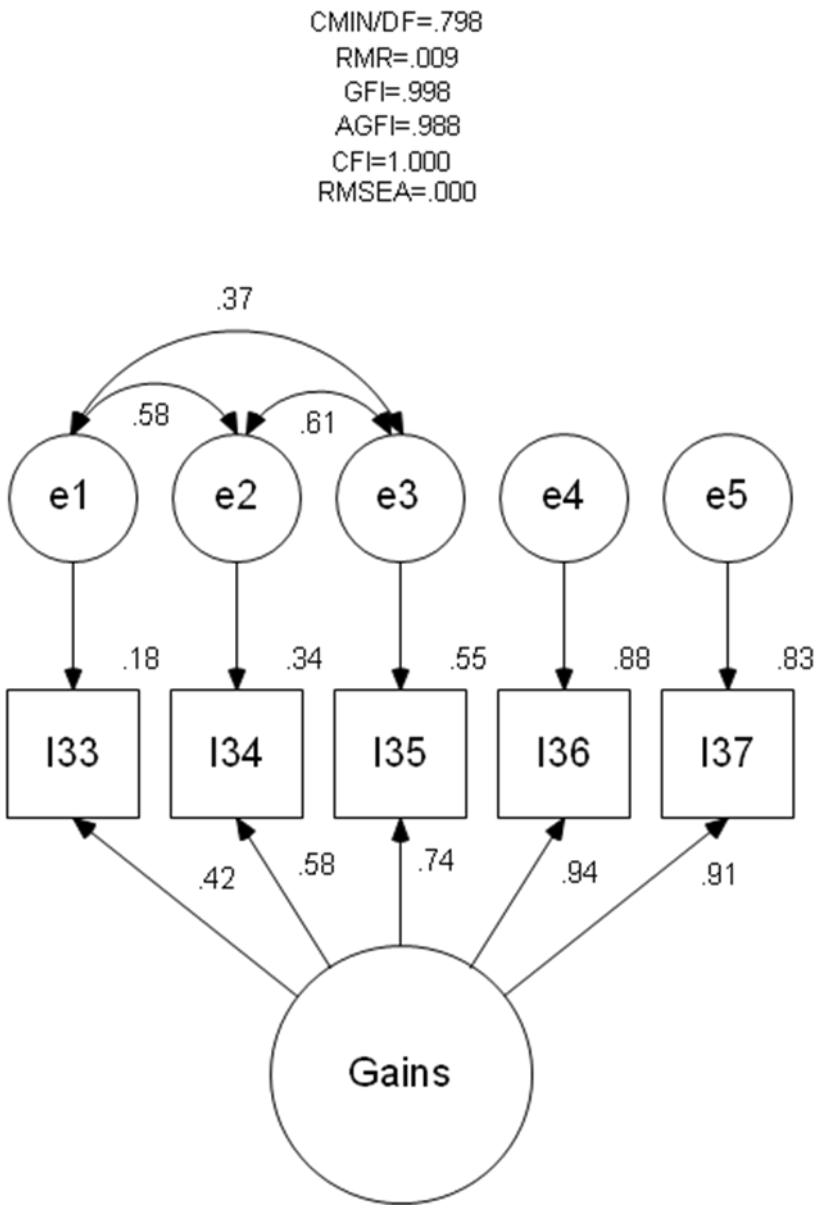

Figure 6.6 Revised Gains Congeneric Mode 1

After determining a model for Gains, the reliability of the composite variable was calculated.

Cronbach's alpha is not the best estimate of a composite variable's reliability Werts, Rock, Linn and Joreskog (1978), Raykov (1998). Graham (2006) demonstrated how the Cronbach alpha values can underestimate some reliability scores and over estimate other reliability scores, making Cronbach alpha an inaccurate measure of reliability for composite variables. Even

though an alternative to Cronbach alpha was used to measure the reliability, the conventional cutoff of 0.7 was retained.

An alternative to Cronbach alpha, Raykov's reliability rho, is output by EQS and Raykov (1997) lists code for computing composite reliability with LISREL. Unfortunately AMOS does not provide this and it was necessary to refer to Werts, Rock, Linn & Joreskog (1978) who provide the following formula to calculate the composite reliability (r_c) for a congeneric model:

$$r_c = \frac{\omega (\Sigma - \Theta_\delta) \acute{\omega}}{\omega \Sigma \acute{\omega}}$$

where
Σ is the estimated covariance matrix
Θ_δ is the matrix of variances and covariances amongst the error terms
ω is a row vector of factor score regression weights

Once the reliability has been determined it is necessary to determine the regression coefficient (λ) and the measurement error variances (θ) associated with each composite variable. Munck (1979) provides the following formulae for these:

$$\lambda = \sigma(x)\sqrt{r}$$

and

$$\theta = \sigma^2(x)(1-r)$$

σ(x) is the standard deviation of the composite variable,
σ²(x) is the variance of the composite variable,
r is the composite reliability of the composite variable.

The formulae above were used with the output provided by AMOS, using a script written in SPSS to determine the reliabilities (r_c), loading (λ) and error (θ). The script used to determine Gains reliability (r_c), loading (λ) and error (θ) is shown in appendix 6.1. The values for these are reported in table 6.23.

Table 6.23 Gains reliability (r_c), loading (λ) and error (θ)

r_c	λ_c	θ_c
0.929	0.964	0.071

The factor score regression weights provided by AMOS in the analysis of the Gains construct, shown below in Table 6.24, were used in SPSS to construct a new variable called Gains. This allowed some indicators such as I36 "to contribute more to the measurement of the composite than others" (Rowe, 2002) such as I33.

Table 6.24 Factor score weights for Gains

I37	I36	I35	I34	I33

0.372361	0.522073	0.097889	0.003839	0.003839

The new variable Gains was used in the conceptual models later in the analysis.

A similar analysis for each of the congeneric models was undertaken. The preliminary and revised models are shown for all of them in the appendices. A discussion of the development and outcomes for each of the models follows.

6.6.6 The congeneric model for Control

The initial version of this model did not fit the data well so the modification indices were examined. Covariance's between error terms of I1 and I6, I1 and I10, I6 and I10 and I11 and I12 were suggested. These covariances seemed acceptable when these items were scrutinized. For example, the frequency of the software upgrades is a common feature between I11 and I12.

> Software upgrades are released too often (i11) and
> I am expected to upgrade software too often (i12).

It was therefore acceptable to assume these would share a common error in their measurement. Hence the covariances suggested by AMOS were incorporated into the model and the analysis of the revised model was performed. The revised model did fit the data well. (CMIN/DF =2.03, GFI=0.985, RMSEA = 0.052).

6.6.7 The congeneric model for Complexity

While the GFI (0.991), AGFI (0.955) and CFI (0.991) were acceptable the CMIN/DF (3.431), RMR (0.055) and RMSEA (0.080) values were unacceptable. The modification indices suggested an improvement would be made if the errors for d2 and d5 were permitted to covary.

> The decision to upgrade software is risky.(d5)
> A software upgrade is a strategic decision.(d2)

In many instances it would be reasonable to associate risk with strategic decisions. Consequently, the model was modified as suggested and the revised version shows an improvement in all of the fit statistics. (RMR = 0.024, RMSEA = 0.042, CMIN/DF =1.6)

6.6.8 The congeneric model for Impact

All of the fit statistics for the initial model for Imapct were unaccpetable. (CMIN/DF=8.961, RMR= 0.141, GFI=0.928,AGFI=0.831, CFI=0.885, RMSEA=0.144) The modification indices suggested the error terms for I26, I28, I26 and I29, I26 and I30 and I29 and I30 shared some covariance. Clearly an aspect of item I26 was common to all of these. These modifications were made and the revised models statistics, while improved were still unacceptable.

It was decided to eliminate I26 from the analysis for three reasons. Firstly, in the factor analysis it had a factor loading of 0.502, just satisfying the criteria for inclusion. Secondly, in the revised model above it has a loading of only 0.26. And thirdly, three of the modifications suggested by AMOS would be eliminated with its removal. Removing this item would produce a more parsimonious model. The revised model with I26 removed was examined next. The fit statistics for the revised model were acceptable. (CMIN/DF=2.011, RMR=0.046, GFI=0.994, AGFI=0.970, CFI=0.994, RMSEA=0.051)

6.6.9 The congeneric model for Efficiency

This model was different from the previous models in that it had only three items. This means that the model possessed zero degrees of freedom, and the model could not be tested without adding a further constraint. Byrne (2001) provides a method that can be used to add an extra constraint. The output file from AMOS contains critical ratios of differences among the parameters. The absolute value of the critical ratio of the difference between the errors for I15 and I16 was 0.730. Since this was less than 1.96, the hypothesis that the two residual variances were equal in the population cannot be rejected. It therefore seemed reasonable to constrain the variances on the two parameters e2 (the error for I15) and e3 (the error for I16) to be equal (Byrne, p.128). The data fit the constrained model. (CMIN/DF=0.534, RMR=0.009, GFI=0.999, AGFI=0.994, CFI=1.00, RMSEA=0.000)

6.6.10 The congeneric model for Informed

This model also had only three items and so it also required the addition of a further constraint. The absolute value of the difference between the error for F3, and the error for F6 was 0.725, which is less than 1.96, the value at which the hypothesis that these two residual variances were equal in the population cannot be rejected. It was therefore reasonable, according to Byrne (2001) to constrain these variances to be equal. The fit statistics (CMIN/DF=0.517, RMR=0.030, GFI=0.999, AGFI=0.0995, CFI=1.00, RMSEA=0.000) are acceptable indicating this model fits the data.

6.6.11 The congeneric model for Innovate

In terms of innovativeness, respondents were requested to self-select their adopter type in regards to purchasing a hardware upgrade, a software upgrade for their most important software and a software upgrade for their word processor. The results for the hardware upgrade are shown in table 6.25.

Table 6.25: Innovate (hardware)

Adopter type when purchasing a hardware upgrade	*Frequency*	*Percent*
Enthusiastic, innovator, first to buy, risk taker, evaluator	**14**	**3.7**
Visionary, early adopter, leader in your industry, others ask your opinion	**75**	**19.6**
Pragmatic, cautious, not the first nor the last to buy, ask others what to buy	**265**	**69.2**
Conservative, late adopter, not confident, follower, doubtful	**19**	**5.0**
Sceptical, last to purchase, have to be absolutely certain	**10**	**2.6**
Total	**383**	**100.0%**

The responses indicate that most consider themselves to be in the early majority category, with small numbers willing to characterize themselves as late adopters or last to purchase.

The responses for the most important software upgrade are shown in table 6.26, and these indicate the majority chose the third category (equating to Rogers's early majority class).

Table 6.26: Innovate (most important software)

Adopter type when purchasing the software upgrade for most important software	*Frequency*	*Percent*
Enthusiastic, innovator, first to buy, risk taker, evaluator	**24**	**6.3**
Visionary, early adopter, leader in your industry, others ask your opinion	**120**	**31.3**
Pragmatic, cautious, not the first nor the last to buy, ask others what to buy	**206**	**53.8**
Conservative, late adopter, not confident, follower, doubtful	**23**	**6.0**
Sceptical, last to purchase, have to be absolutely certain	**10**	**2.6**
Total	**383**	**100.0%**

The response to the upgrade to the word processor item had an even higher percentage in the early majority classification, but more in the late majority and laggards classifications.

Table 6.27: Innovate (word processor)

Adopter type when purchasing the software upgrade for your word processor	*Frequency*	*Percent*
Enthusiastic, innovator, first to buy, risk taker, evaluator	**8**	**2.1**
Visionary, early adopter, leader in your industry, others ask your opinion	**43**	**11.2**
Pragmatic, cautious, not the first nor the last to buy, ask others what to buy	**257**	**67.1**
Conservative, late adopter, not confident, follower, doubtful	**50**	**13.1**
Sceptical, last to purchase, have to be absolutely certain	**25**	**6.5**
Total	**383**	**100.0%**

This model also had only three items and so it also required the addition of a further constraint. The absolute value of the difference between the error for S8, and the error for M3 was 0.522. Since this is less than 1.96, these two residual variances were constrained to be equal, which is reasonable according to Byrne (2001). The fit statistics (CMIN/DF=0.71, RMR=0.004, GFI=1.000, AGFI=0.997, CFI=1.00, RMSEA=0.000) are acceptable indicating this model fits the data.

6.6.12 Summary of exploratory constructs

Table 6.28 below summarizes the constructs, the items that make up that construct, the loadings of those items on the construct, and the construct reliability (r_c), the factor loading (λ_c) and the construct error (θ_c)of the constructs.

Table 6.28 Construct items, loadings, reliability, and error for the exploratory data.

Construct	Items – factor score weights							r_c	λ_c	θ_c
Gains	I37	I36	I35	I34	I33			0.929	0.964	0.071
	0.372	0.522	0.098	0.004	0.004					
Complexity	D5	D3	D2	D1				0.867	0.931	0.133
	0.176	0.352	0.162	0.309						
Efficiency	I16	I15	I13					0.869	0.932	0.131
	0.452	0.428	0.120							
Impact	I32	I31	I30	I29	I28			0.810	0.900	0.190
	0.315	0.142	0.258	0.063	0.222					
Control	I12	I11	I10	I9	I8	I6	I1	0.779	0.883	0.221
	0.103	0.195	0.092	0.386	0.224	0.027	0.049			
Informed	F6	F5	F3					0.788	0.888	0.212
	0.152	0.613	0.235							
Innovate	M3	S8	H1					0.698	0.835	0.302
	0.288	0.268	0.444							

The reliabilities for the composites ranged from 0.779 to 0.929. All were above the commonly used threshold value of 0.7, except Innovate, which at 0.698 could be rounded to 0.7.

6.7 Hypotheses

After the data has been explored and variables derived from the literature review, qualitative study, and the quantitative analysis were identified, it was possible to posit the hypothesis to be tested.

1. *There is a relationship between the education level of the decision maker and the likelihood to upgrade software.*
2. *There is a relationship between the computer experience of the decision maker and the likelihood to upgrade software.*
3. *There is a relationship between the number of employees in the business and the likelihood to upgrade software.*
4. *There is a relationship between the annual turnover in the business and the likelihood to upgrade software.*
5. *There is a relationship between the number of years computers have been used in the business and the likelihood to upgrade software.*
6. *There is a relationship between the 'Gains' to be achieved and the likelihood to upgrade software.*

7. *There is a relationship between the 'Complexity' of the decision and the likelihood to upgrade software.*
8. *There is a relationship between the improved 'Efficiency' and the likelihood to upgrade software.*
9. *There is a relationship between the 'Impact' on the business and the likelihood to upgrade software.*
10. *There is a relationship between the 'Control' measure of the decision maker and the likelihood to upgrade software*
11. *There is a relationship between the 'Informed' measure of the decision maker and the likelihood to upgrade software.*
12. *There is a relationship between the 'Innovate' measure of the decision maker and the likelihood to upgrade software.*

6.8 Multiple regression analysis

A standard procedure of multiple linear regression analysis was used to allow all the composite variables, and demographic variables about the respondent and businesses to be examined against the dependent variable of likelihood to upgrade. A stepwise procedure which requires a case to variable ratio of 50 to 1 to validate the results according to Hair et al. (1995) was used. The results of the multiple regression analysis are in appendix 6.2 and the summary of results below in table 6.29.

The variables in this analysis included the seven composite variables identified through the exploratory data analysis, plus each of the following:-
Y2 (purchasing role in software upgrades), Y3 (highest level of education), Y4 (years of personal computer experience), B1 (sector business operates within), B2 (does the business have a full time computer specialist), B5 (years business has been operating), B6 (Number of full time employees), B7 (years the business had computers), and B8 (annual turnover).

Table 6.29 Multiple regression model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.310[a]	.096	.094	1.499	.096	40.447	1	381	.000
2	.399[b]	.159	.154	1.447	.063	28.431	1	380	.000
3	.452[c]	.204	.198	1.410	.045	21.530	1	379	.000
4	.482[d]	.232	.224	1.386	.028	13.870	1	378	.000
5	.506[e]	.256	.246	1.367	.024	12.108	1	377	.001

a. Predictors: (Constant), Innovate, b. Predictors: (Constant), Innovate, Gains, c. Predictors: (Constant), Innovate Gains, Impact

d. Predictors: (Constant), Innovate, Gains, Impact, Efficiency , e. Predictors: (Constant), Innovate, Gains, Impact, Efficiency, Complexity

The variables that were excluded were Control, Y2, Y3, Y4, B1, B2, B5, B6, B7 and B8. The stepwise regression is useful when trying to predict values in a dependent variable, "rather than trying to understand the relationship between the variables" (Francis, 2004, p.123).

Examination of the results of the multiple regression analysis indicates that the five variables explained 25.6 percent of the variance in the dependent

variable of likelihood to upgrade the most important software. All of these variables were found to be significant at the 0.05 level. The high tolerance levels shown in table 6.30 for these variables indicate that these variables are relatively independent (George & Mallery, 2003 p.204). To better understand the relationship between the variables, Innovate, Gains, Impact, Efficiency, Complexity were explored further in AMOS.

Table 6.30 Collinearity statistics for the latent variables

	Collinearity Statistics
	Tolerance
Innovate	.909
Gains	.917
Impact	.958
Efficiency	.893
Complexity	.981

6.9 Alternative models

6.9.1 Alternative model 1

The first model tested, shown in figure 6.7, was the simplest possible model that incorporated the five composite variables Innovate, Gains, Impact, Efficiency, and Complexity to determine their direct influence on the likelihood to upgrade the most important software variable (m2). The goodness of fit statistics CMIN/DF=6.890, RMR=0.112, GFI=0.943, AGFI=0.881, CFI=0.647 and RMSEA=0.124 all indicate that this model does not fit the data.

Perhaps surprisingly, both Gains and Efficiency were shown to be negatively related to the likelihood to upgrade the most important software.

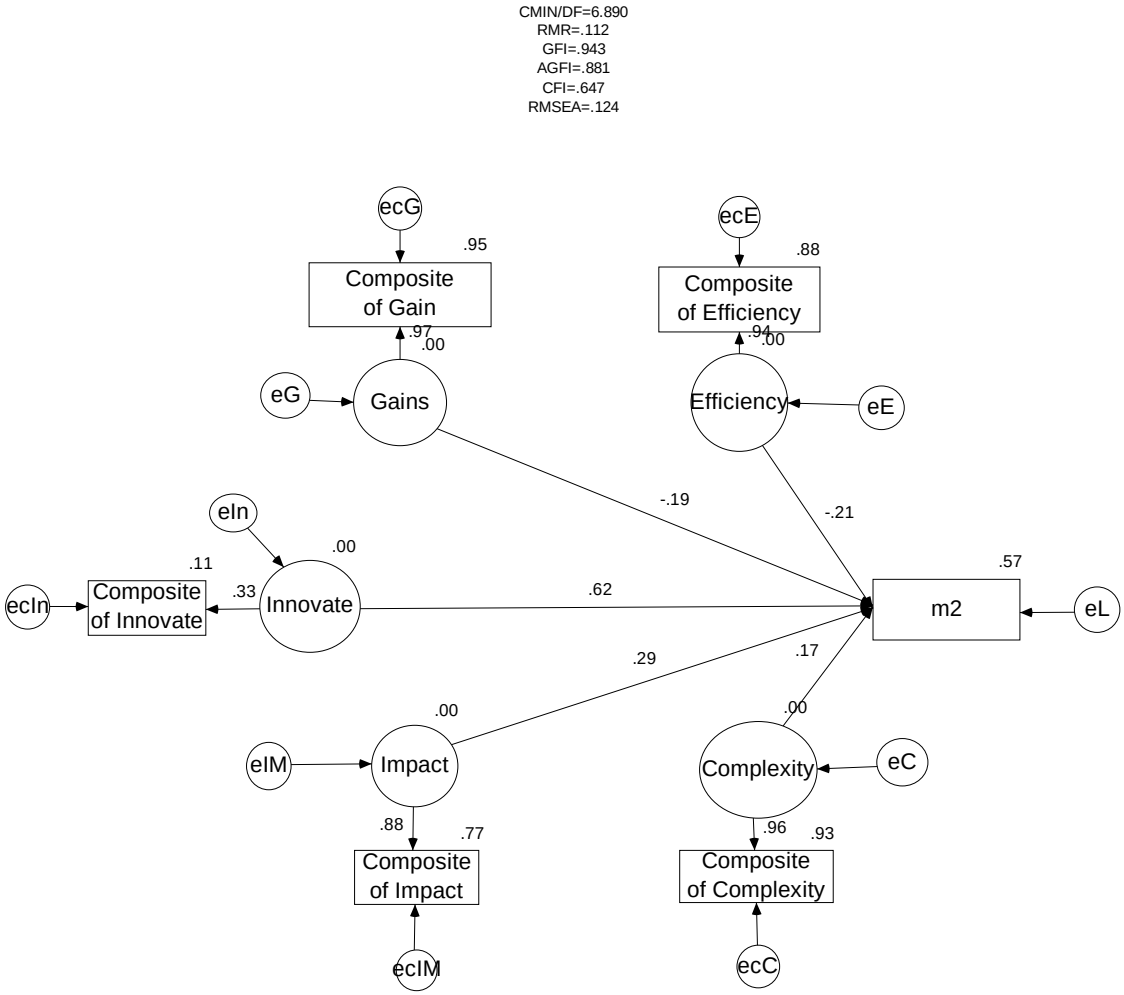

Figure 6.7 Model 1

6.9.2 Alternative model 2

An alternative model was considered, wherein the direct paths from Gains, Efficiency, Impact, and Complexity to the likelihood to upgrade the most important software variable (m2) were moved to Innovate. Innovate had the single direct path to the likelihood to upgrade the most important software variable (m2). It was reasoned that Innovate is the critical factor and that this factor is in turn influenced by factors such as Gains, Efficiency, Impact, and Complexity. The Innovate factor is measuring the willingness to adopt and upgrade, and this in turn is influenced by the complexity of the purchase decision, the impact the decision will have on the business, the gains and efficiencies to be made by the upgrade.

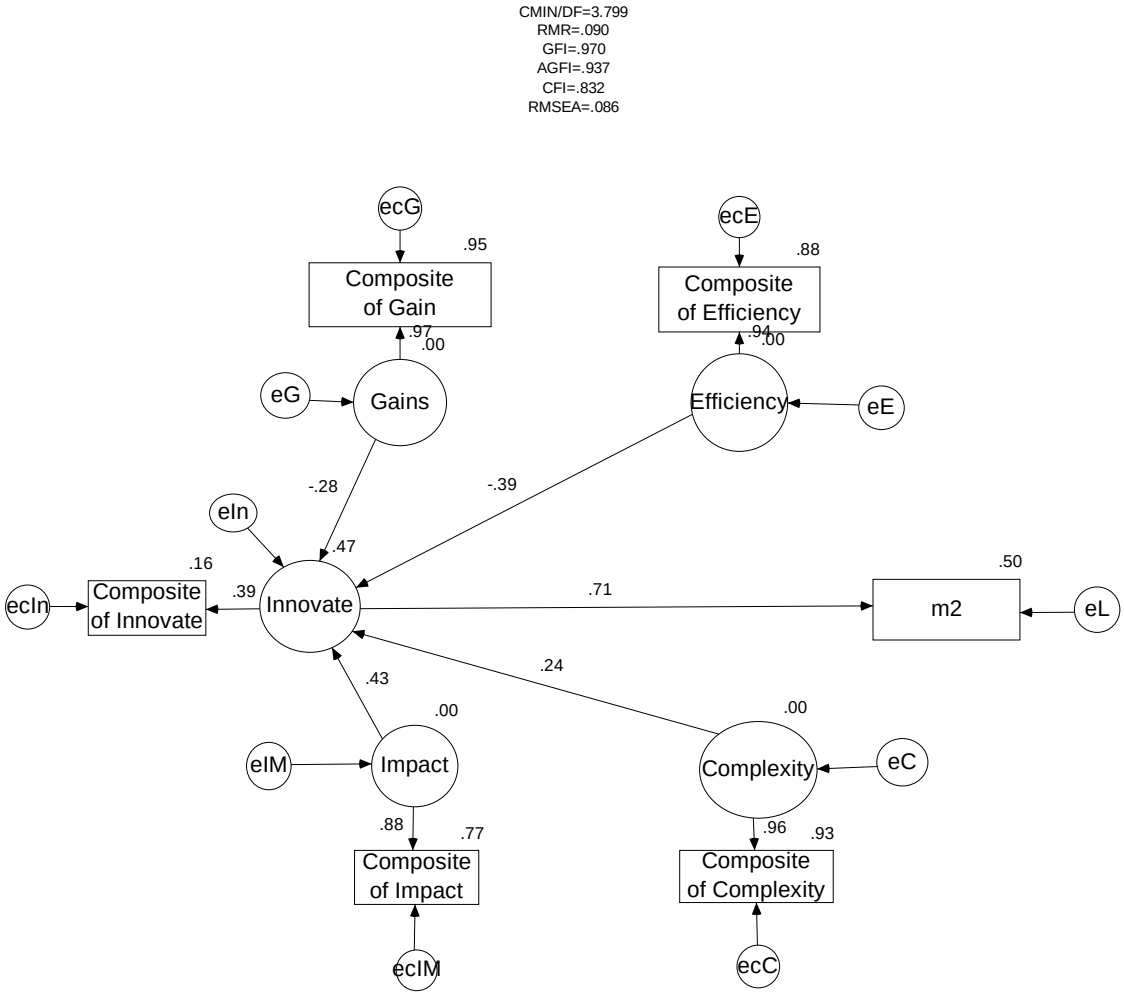

Figure 6.8 Model 2.

As can be seen, the goodness of fit statistics were an improvement on model 1, with CMIN/DF=3.799, RMR=0.090, GFI=0.970, AGFI=0.937, CFI=0.748 and RMSEA=0.086, but the RMSEA and AGFI, and CFI values are still unsatisfactory.

An even simpler model was considered as an alternative to both model 1 and model 2. It was decided to remove both Gains and Benefits as variables from the model, because they continue to have negative influence on the decision, indirectly through Innovate.

6.9.3 Alternative Model 3

This model, shown in figure 6.9, uses only three variables, Innovate, Impact, and Complexity, to determine their impact on the decision to upgrade the most important software (m2).

The goodness of fit statistics for this model were an improvement on model 2 and model 1. With CMIN/DF=.152, RMR=0.009, GFI=0.999, AGFI=0.998, CFI=1.000 and RMSEA=0.000, this model fits the exploratory data. All of the variables are contributing significantly to the Likelihood to upgrade the most

important software. The explanatory power of this model was also acceptable, explaining 74 percent of the variance in Likelihood to upgrade the most important software. All of the paths in this model were significant at the 0.05 percent level.

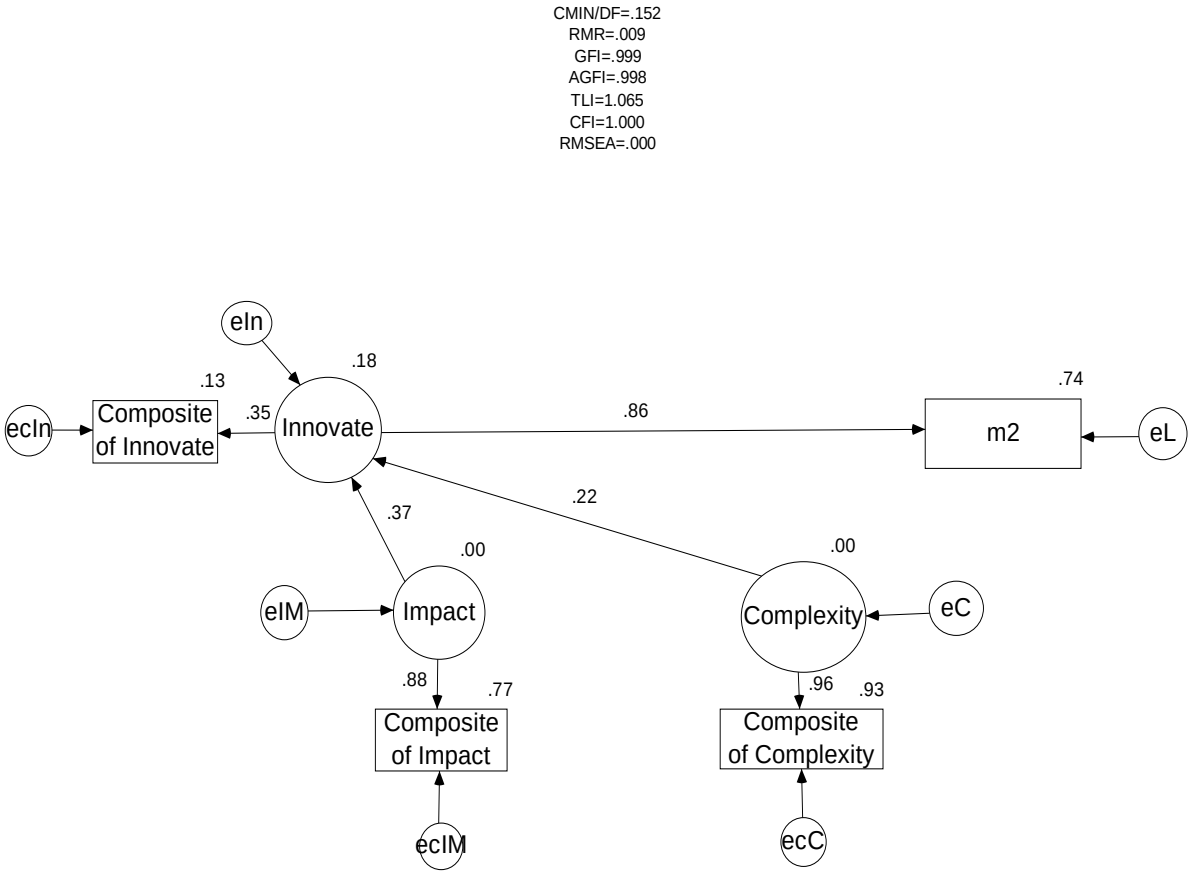

Figure 6.9 Model 3.

6.10 Analysis of the Confirmation models

Having developed a model that fits the exploratory data and explains a large percentage of the variance in the likelihood to upgrade, the next step was to repeat this analysis with the confirmatory data to test the model.

The final congeneric models developed in the exploratory data for each of the factors was tested with the confirmatory data. The diagrams associated with all of the confirmatory congeneric models are presented in the appendices, and only the statistics are reported here.

6.10.1 The confirmatory congeneric model for Gains

The CMIN/DF, RMR, GFI, AGFI figures were all acceptable for the congeneric model for Gains based on the confirmatory data. The Gains congeneric model fits both the exploratory data.

Table 6.31 Measures of fit for the Gains measurement model

	Initial and final measurement model
Chi-Square	0.499
df	2
p	0.779
CMIN/DF	0.250
RMR	0.004
GFI	0.999
AGFI	0.996
CFI	1.000
RMSEA	0.000

6.10.2 The confirmatory congeneric model for Complexity

The congeneric complexity model goodness of fit statistics, shown in table 6.32, were all well within the recommended levels and consequently fit the confirmatory data.

Table 6.32 Measures of fit for the Complexity measurement model

	Initial and final measurement model
Chi-Square	1.395
df	1
p	0.238
CMIN/DF	1.395
RMR	0.023
GFI	0.998
AGFI	0.982
CFI	0.999
RMSEA	0.032

6.10.3 The confirmatory congeneric model for Efficiency

Most of the goodness of fit statistics for the congeneric model for efficiency were within the recommended levels. The exception was the CMIN/DF value, which at 8.879 is considerably higher than the recommended cut-off of 3. According to Schumacker and Lomax (2004), values as high as 5 can be considered an adequate fit. Based on this, the congeneric model for efficiency would need to be adjusted. However, it has only 3 indicator variables, and no simple modifications are possible. In addition to this, the RMSEA value of 0.144 was well outside the acceptable level. Consequently, this variable would need to be dropped from any further analysis.

Table 6.33 Measures of fit for the Efficiency measurement model

	Initial and final measurement model
Chi-Square	8.879
df	1
p	0.003
CMIN/DF	8.879
RMR	0.031
GFI	0.985
AGFI	0.909
CFI	0.984
RMSEA	0.144

6.10.4 The confirmatory congeneric model for Impact

All of the fit statistics, shown in table 6.34, for the Impact model are well within the acceptable range with the exception of the RMSEA, which at 0.065 was greater than the desired 0.5 used elsewhere in this research. According the Schumacker and Lomax (2004) there is good model fit if RMSEA less than or equal to .05 and is and adequate fit if RMSEA is less than or equal to .08. Given that the other statistics are all acceptable and that this value is within the acceptable range this model was also deemed an acceptable model with the confirmatory data.

Table 6.34 Measures of fit for the Impact measurement model

	Initial and final measurement model
Chi-Square	7.904
df	3
p	0.048
CMIN/DF	2.635
RMR	0.049
GFI	0.992
AGFI	0.0961
CFI	0.990
RMSEA	0.065

6.10.5 The confirmatory congeneric model for Control

The fit statistics for the congeneric model for Control, shown in table 6.35, had two values that are above the recommend values. Once again a review of the literature reveals that the cut-off selected for this study is not universally accepted. As stated previously for Impact, an RMSEA at 0.065 may be considered acceptable. According to Garson (2009) it is possible to find multiple guidelines ranging from 0.01 up to 0.08 for RMR values. Consequently, this model is also accepted.

Table 6.35 Measures of fit for the Control measurement model

	Initial and final measurement model
Chi-square	26.109
df	10
p	0.004
CMIN/DF	2.611
RMR	0.080
GFI	0.981
AGFI	0.946
CFI	0.978
RMSEA	0.065

6.10.6 The confirmatory congeneric model for Informed

The confirmatory congeneric model for Informed has figures shown in table 6.36 which are all within the acceptable range. Consequently this model was accepted.

Table 6.36 Measures of fit for the Informed measurement model

	Initial and final measurement model
Chi-square	0.000
df	1
p	0.984
CMIN/DF	0.000
RMR	0.001
GFI	1.000
AGFI	1.000
CFI	1.000
RMSEA	0.000

6.10.7 The confirmatory congeneric model for Innovate

Two values, CMIN/DF and RMSEA in the fit statistics for innovate in table 6.37 below, were outside the acceptable range. CMIN/DF is well outside the desired upper limit of 3, and RMSEA at 0.114 is beyond the most generous values suggested in the literature. Consequently, this model could not be accepted in its present form. The constraint that was imposed, wherein the variance for the error terms for S8 and M3 were made equal was examined in this model. A constraint such as this would be necessary otherwise the model would have zero degrees of freedom and probability level could not be calculated. Reluctantly, this model must be rejected.

Table 6.37 Measures of fit for the Innovate measurement model

	Initial and final measurement model
Chi-square	5.962
df	1
p	0.015
CMIN/DF	5.962
RMR	0.018
GFI	0.990
AGFI	0.939
CFI	0.966
RMSEA	0.114

6.11 Reliabilities for the congeneric models

As with the exploratory data, the loadings (λ_c), reliabilities (r_c), and measurement error (θ_c) for each of the constructs were calculated and the values are presented in table 6.38 below. The reliability for Innovate was below the cut-off of 0.7, providing another justification for removing this construct from further analysis. All of the remaining reliabilities were above 0.7, including the efficiency construct but this construct has also been

removed from further analysis because its fit statistics were considered inadequate.

Table 6.38 Construct items, loadings, reliability, and error for the confirmatory data.

Construct	Items							r_c	λ_c	θ_c
Gains	I37	I36	I35	I34	I33			0.940	0.970	0.060
	0.863	0.960	0.730	0.639	0.496					
Complexity	D1	D2	D3	D5				0.836	0.915	0.164
	0.809	0.589	0.822	0.566						
Efficiency	I13	I15	I16					0.873	0.934	0.127
	0.653	0.854	0.881							
Impact	I28	I29	I30	I31	I32			0.917	0.957	0.083
	0.710	0.654	0.782	0.549	0.687					
Control	I1	I6	I8	I9	I10	I11	I12	0.752	0.867	0.248
	0.362	0.346	0.639	0.746	0.368	0.695	0.591			
Informed	F3	F5	F6					0.941	0.970	0.059
	0.584	0.969	0.323							
Innovate	M3	S8	H1					0.654	0.809	0.346
	0.366	0.251	0.383							

6.11.1 Reject alternative model 3

The constructs that have acceptable fit statistics and reliabilities were Gains, Complexity, Impact, Control and Informed with both the exploratory data and confirmed data. Clearly, the models previously considered that utilized Innovate could not be considered further.

6.11.2 Other possibilities

However, because the innovate construct was a pivotal component in model 3, an alternative model involving the variables S8 (Innovate - regards purchase of software upgrade for your word processor), M3 (Innovate when purchasing the software upgrade for most important software) and H1 (Adopter type when purchasing a hardware upgrade) was investigated.

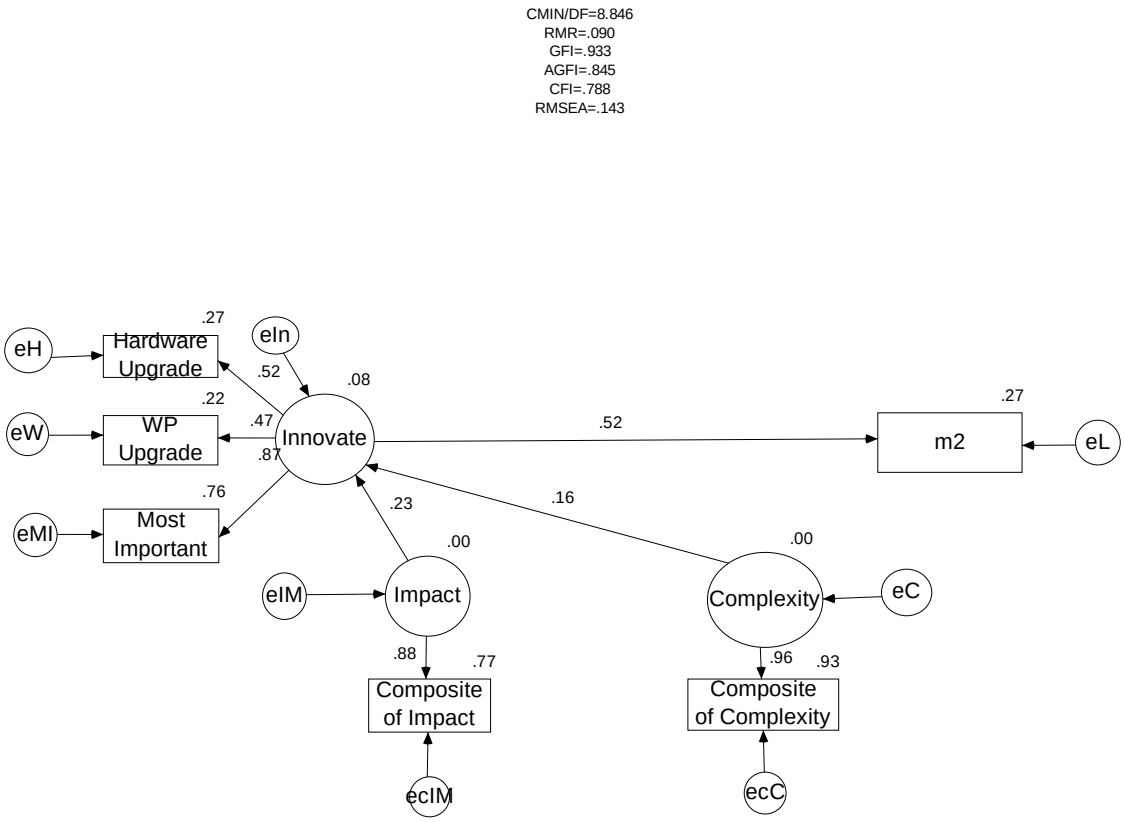

Figure 6.10 Model 4 – a revised Model 3 (Using Exploratory data)

The simple model, shown in figure 6.10, using a replacement of the Composite of Innovate with the observed variables from which it was formed, did not provide the simple solution. The fit statistics for this model were unacceptable. Even when a modification suggested to covary the errors of the Word processor variable and Hardware variable was applied the fit statistics were unacceptable, as can be seen in figure 6.11, after modification below.

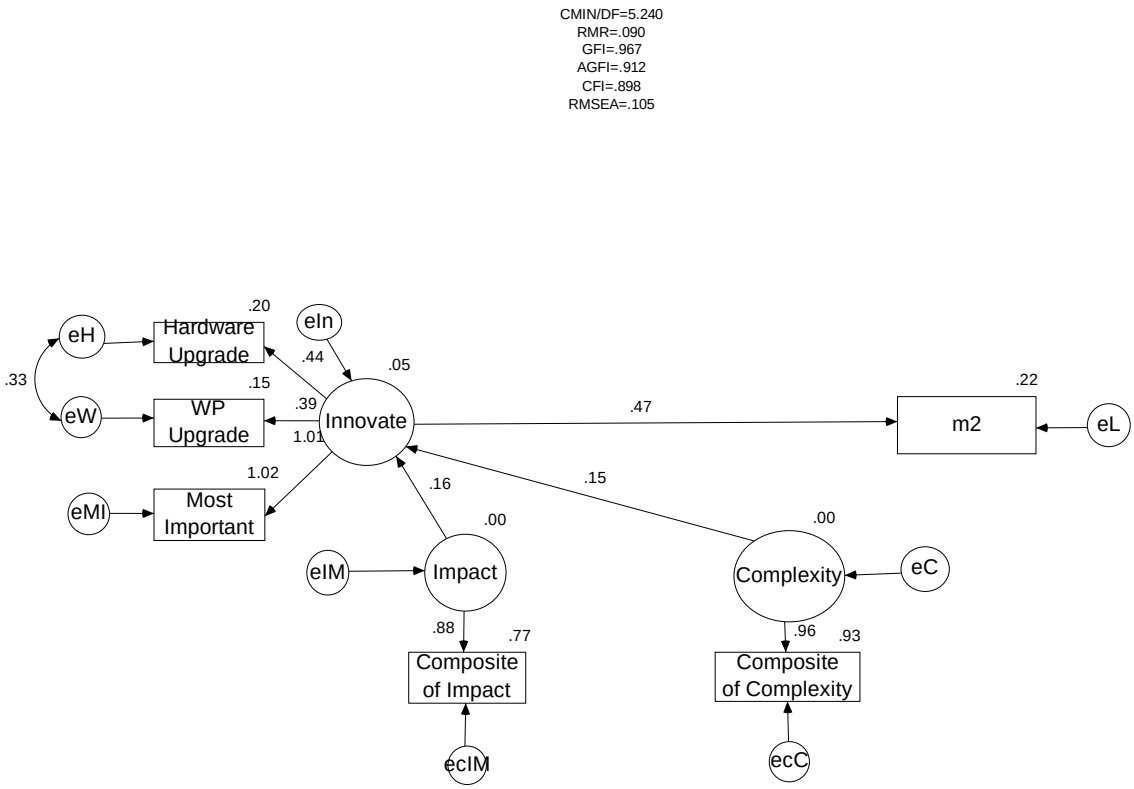

Figure 6.11 Model 5 – a modification to model 4

6.12 A new model

At this stage the other models using Gains, Complexity, Impact, Control, Informed, and the form of Innovate used in Model 4, were explored. The simplest model which incorporated all of the constructs with direct paths to M2 was examined, however the fit statistics fall well short of acceptable levels. The modifications suggested by AMOS were rejected and this model was not pursued any further.

Models with indirect paths to M2 via Innovate were considered more appropriate, since a decision maker's willingness to be innovative would be influenced by other factors.

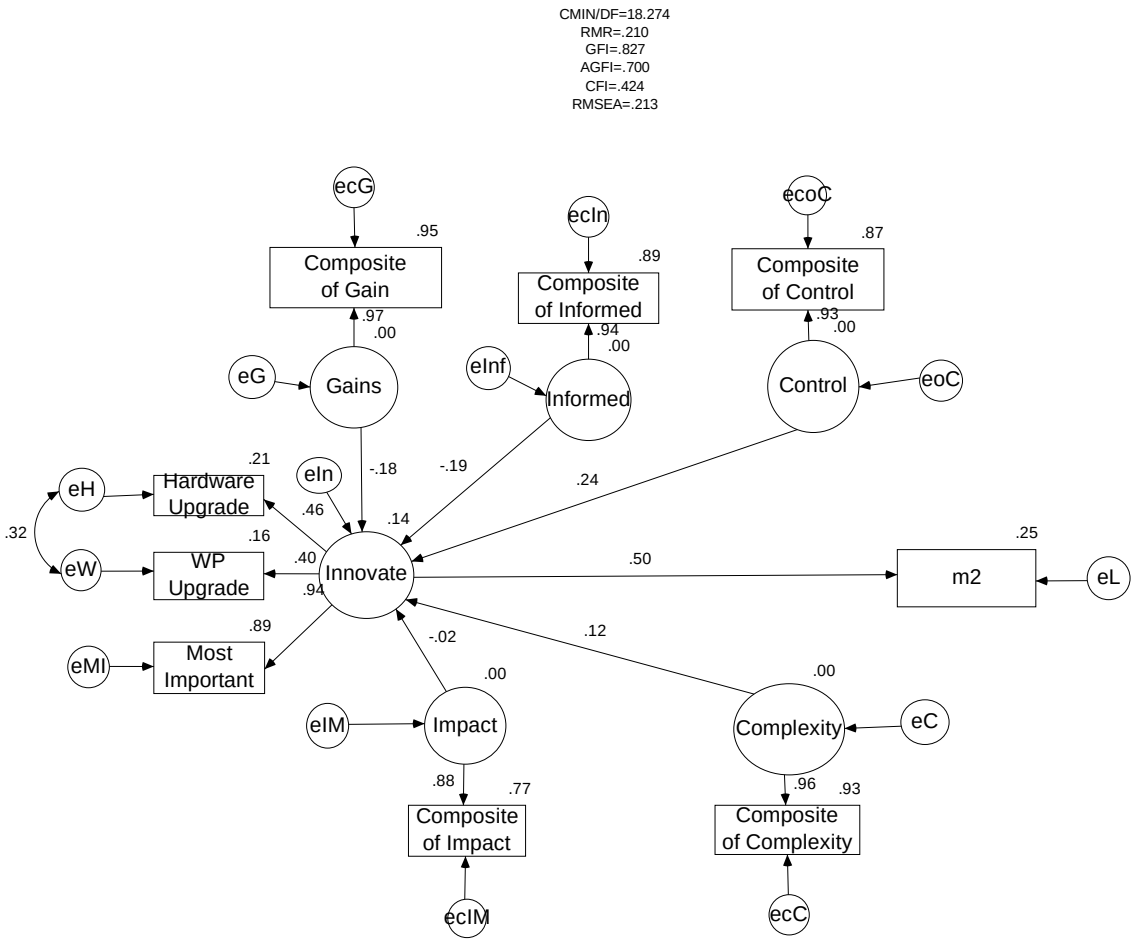

Figure 6.12 Model 6 using 3 observed variables for Innovate

This model retains all of the factors identified with the exploratory data and validated with confirmed data, plus the Innovate, which has three observed variables, innovate for hardware upgrade, innovate for a word processor upgrade and innovate for the most important software upgrade. The modification indices suggested two of these variables had a shared covariance. It seemed plausible that the innovate trait for upgrading hardware would share the same error in measurement as the innovate trait for upgrading a word processor, since both items are commonly associated together – a new word processor is often bundled with a new computer. While this model did not have acceptable fit statistics, it did form the basis for further refinements. Because the removal of the Gains factor had been considered in previous models, it was decided to examine the removal of constructs from this model as a means to arrive at a more parsimonious solution. It was also decided that the inclusion of all three observed variables as indicators for Innovate should be re-examined. Since the innovate for hardware and innovate for word processing seemed to have a shared trait, the third innovate for the most important software was removed.

Adopting a process of continually simplifying the models for assessment, a structural model with three interacting variables, Innovate, Control and Complexity was found. This model, shown below in figure 6.13, has direct paths from Innovate, Control and Complexity to likelihood to upgrade the

most important software variable (m2), but Complexity was shown to have an influence on Control, which also had an influence on Innovate. All of the paths shown are significant at the 0.05 percent level, and the models fit statistics are all acceptable.

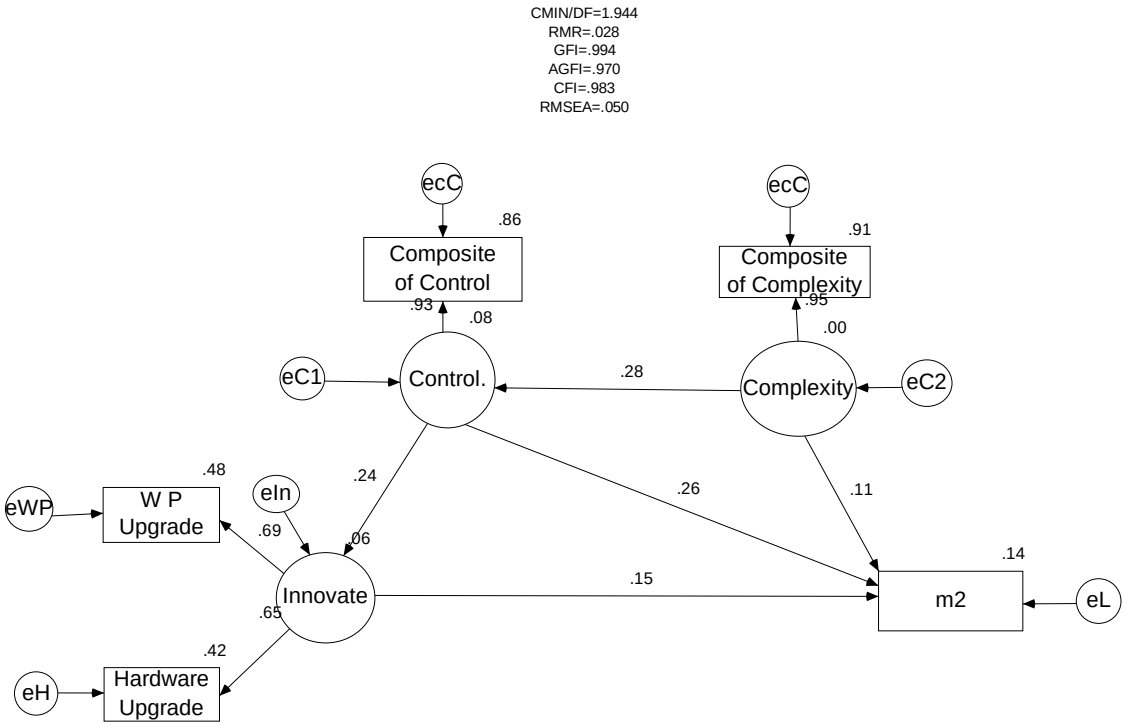

Figure 6.13 Model 7 with the exploratory data

Since the congeneric models for Control and Complexity had already been shown to fit the confirmatory data, this model was next tested with the confirmatory data.

The statistics CMIN/DF=1.118 was well below 3, RMR=0.037 was less than 0.05, GFI=0.997, AGFI=0.983, and CFI=0.998 were all well above 0.95 and RMSEA=0.018 was below 0.05, so all of the fit statistics were acceptable. The model fitted the confirmatory data.

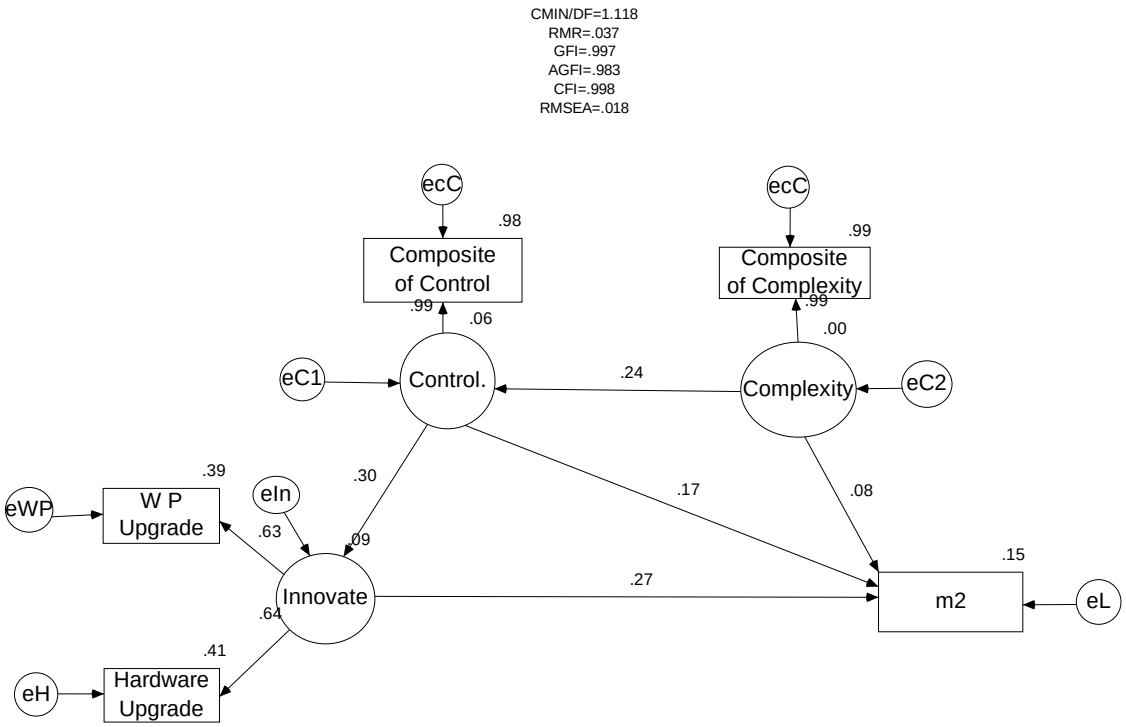

Figure 6.14 Model 7 with the confirmatory data

The paths were all significant at the 0.05 percent level. This model fitted both the exploratory and confirmatory data, and was therefore an acceptable model.

This model accounts for only a relatively small percentage (14 percent with the exploratory data and 15 percent with the confirmatory data) of the measurement of the likelihood to upgrade the most important software. Thus, while the model was statistically significant, its explanatory power was small.

This model did confirm that innovate, Control and complexity were all significant direct influences on the likelihood to upgrade the most important software, as hypothesized. Complexity also indirectly influences the likelihood to upgrade the most important software via Control, which also indirectly influences likelihood to upgrade via innovate.

This model did not confirm that gains, efficiency, impact or informed to be statistically significant influences on the likelihood to upgrade the most important software. Since alternative models may exist that do confirm these constructs as statistically significant influences on the likelihood to upgrade the most important software, the hypotheses associated with these constructs cannot be supported.

6.13 Comments from survey respondents

Seven percent of the respondents elected to provide comments. The full list of the comments is presented in appendix F in Table F.1.

The comments are consistent with the views expressed by the interviewees in the qualitative phase of the study. This may be because the survey prompted thinking about the items contained within the survey and therefore provoked some respondents to make comments that were aligned with the issues included in the survey.

The comments supported existing information rather than providing additional information beyond that already gathered from the interviews. The views confirmed that businesses think differently about general office packages and their most important software (R14, R30, R36, R40, R50 & R53).

A few comments (R18, R27, R35, R41 & R45) mentioned that upgrades were part of the maintenance or leasing agreement, while another (R42) referred to their software being custom built and therefore any upgrade was at their request.

Some respondents (R25, R30, R33, R37 & R39) expressed the view the software upgrade is a difficult, painful, risky, strategic decision, requiring a considerable amount of time being spent on the decision and a cost benefit analysis being performed to justify the upgrade. One comment (R8) stated, “IT issues overly dominate much of the core business.”

The cost of the software upgrade was raised (R26 & R30), with some proclaiming this was just revenue gathering where the customer pays for the software industry stuff ups (R21). “Most software companies have become very money hungry” (R6). Upgrading is hard to justify (R3) and sometimes requires hardware upgrades (R5). There can be an added expense of upgrading home computers when the work computer is upgraded (R49). However, the software upgrade is “cheaper than purchasing new software” (R6).

Businesses feel ‘locked in’ (R9 & R16) to some software. Microsoft came in for mention and was specifically criticized by a few (R12, R13 & R57). There was a suggestion (R52) that alternatives cannot be used because their clients use Microsoft.

Two people (R23 & R24) claimed claim the version of the software they use is determined for them by the organisations with which they work. Another person (R52) needs to have the latest software to work with their clients. It was claimed (R52) some manufactures force them to purchase each upgrade.

The frequency of the upgrades was a concern expressed by some (R19) with some stating their preference to wait (R42, R45) for the bugs to be fixed.

Some respondents (R4, R11 & R26) suggest the decision to upgrade is time consuming and risky (R12 & R30) and businesses would like independent, unbiased advice(33). One commented (R32) that upgrades are only performed "when it becomes imperative" and they "prefer not to upgrade." Unfortunately, the IT industry received a number of criticisms from respondents (R6, R11, R21, R33 & R39) who suggested it is not meeting the requirements of the businesses. A respondent (R25) provided a mixed message, indicating we are "all for the development of new and exciting technology instead of a different coat of paint," portraying the perception that some upgrades have made only cosmetic changes.

6.14 Conclusion

The final model developed was a parsimonious model that was significantly acceptable. Exhaustive exploration of alternative possible models failed to identify any further models with acceptable fit statistics. The comments provided by some respondents on the complexity of the decision, the control they perceive they have in the upgrade decision and their willingness to adopt software upgrades were aligned with the model. Discussion on the limitations of this study and conclusions will be provided in the next chapter, together with recommendations for further research.

7 Conclusions and Limitations

7.1 Introduction

This chapter is organized into five sections as shown in Figure 7.1. The outline of the thesis is presented in section 7.2. This is followed by section 7.3 in which the conclusions of the findings are presented. Limitations of this research are recognized and presented in section 7.4, and recommendations for further research are suggested in the final section 7.5.

Figure 7.1 Structure of chapter seven

7.2 The outline of this thesis

As described in chapter one, this thesis reports on the research into the adoption of software upgrades by small and medium sized businesses in Australia. The purpose of this research is to identify the factors which influence the decision to upgrade software in small and medium sized Australian businesses.

In chapter two, previous research into the diffusion of innovations, the adoption of technology and organisational buying behaviour was reviewed. Nine possible factors were identified; innovativeness, business impact, personal characteristics, organisational characteristics, innovation characteristics, past behaviour, information, complexity, and risk. However, these characteristics deal with the adoption of new technologies, not with upgrades to existing technologies. No previous studies dealing with the adoption of software upgrades could be located. Consequently, it was necessary to undertake an exploratory study to identify the factors which influence the decision by small and medium sized firms in Australia to upgrade their software.

The research methodology adopted for this research was detailed in chapter three. A mixture of both qualitative and quantitative methods was utilized in this research. Because no previous studies on the decision to upgrade software could be located it was necessary to develop a questionnaire for this investigation. Both the findings

from the literature review and the interviews were incorporated into the questionnaire. The questionnaire design process used to develop the survey was provided. Justification was also provided on the techniques which were used to analyse the collected data.

Chapter four reported on the qualitative study stage. It involved a series of in depth interviews conducted with key personnel in ten local businesses to ascertain the views of small and medium sized businesses on the issue of upgrading software. An analysis of the responses from the interviews was performed and common issues were revealed. The language used by the interviewees was built into the survey instrument.

The survey instrument was previewed by a panel of software experts from the department of information systems to determine face validity of the items. A number of minor changes were made and then a pilot study was used to trial the survey. Chapter five reported on the pilot study, in which a sample of 1000 small to medium enterprises in Australia was surveyed. Analysis of the pilot study data was conducted with SPSS v15.0, but the size of the data set was insufficient to utilize analysis with AMOS v16.0, so the analysis of this data was somewhat restricted. An exploratory factor analysis was conducted and this identified a number of possible factors. Following this a stepwise regression analysis was performed with the identified factors to determine which of the factors could explain the likelihood to upgrade the software. The pilot study concluded that three factors, innovativeness, perceived potential relative advantage, and complexity of purchase decision, had an influence on the likelihood to upgrade the most important software. While this produced some useful insights, the size of the data was too small to attain results which could be generalized. The response rate from the pilot study allowed a reasonably accurate calculation to determine the sample size needed for the full scale study.

The analysis and discussion of full scale study is presented in chapter six. Analysis was performed using SPSS and AMOS. The sample size was large enough to enable the data set to be split into two. This enabled exploratory analysis to be performed on the first half sample, and confirmatory analysis to be performed on the second half sample. Seven factors were identified from an exploratory factor analysis using SPSS. The factor analysis was repeated with the confirmatory data, and seven factors common to both the exploratory and confirmatory data (Gains, Impact, Informed, Complexity, Efficiency, Innovativeness and Control) were extracted. Congeneric models for all these factors were developed firstly using the exploratory data and then tested with confirmatory data.

Gains, Impact and Informed all had reliabilities over 0.9, while Complexity, Efficiency are both between 0.8 and 0.9. Innovativeness and Control had weaker reliability values of 0.65 and 0.75 respectively.

Only the congeneric models that had acceptable fit statistics with both the exploratory and confirmatory data were suitable for use in the models explored to determine which factors influenced the decision to upgrade software.

A number of alternative models using these composite models were examined. These models made substantive sense but again only those models that had acceptable fit statistics with both the exploratory and confirmatory data could be considered. A model using Control, Complexity and a revised version of the Innovativeness was identified and found to influence the likelihood to upgrade the most important software.

7.3 Conclusions

This research examined the unexplored area of software upgrades in Australian small and medium sized businesses. The findings found that there are important factors that influence the decision to upgrade the most important software. Three factors, Innovativeness, Control, and Complexity, were shown to influence the likelihood to upgrade the software.

Innovativeness is a one factor model measured by two observed variables, the hardware adopter type, and the word processor adopter type. The adopter type was measured on a five point scale aligned to Roger's (1995) five adopter categories.

Control is a one factor congeneric model measured by seven observed variables all of which are concerned with the ability to manage the decision to upgrade the software. Complexity is also a one factor congeneric model measured by four observed variables that deal with the difficulties in making the decision to upgrade the software.

Complexity was found to have both a direct influence on the likelihood to upgrade the most important software, and to also have an effect on Control. Control had a direct influence on the likelihood to upgrade the most important software, and also an effect on Innovativeness. Innovativeness was found to have a direct effect on the likelihood to upgrade the most important software.

The study did not find a relationship between the educational level of the decision maker in the business, the computer experience of the decision maker, the number of employees in the business, the annual turnover in the business, or the number of years computers have been used in the business had an influence on the likelihood to upgrade the software. No support could be found for the demographic variables collected in this research having a bearing on the software upgrade decision.

A relationship between the likelihood to upgrade the most important software and the one factor congeneric models for Gains, Efficiency, Impact, and Informed were not supported. The comments from the interviews suggested these were important considerations, but the support for these were not evident within the survey data. These results indicate a difference exists between the adoption of new technology and the adoption of a software upgrade.

Innovativeness, Control, and Complexity only account for 14 percent the variation in the likelihood to upgrade the most important software, so the vast majority of the variation in the likelihood to upgrade is unaccounted for by these factors.

An examination of the comments provided by the survey respondents does not present an obvious alternative factor. The survey comments were similar to the statements provided by the interviewees, thus validating the findings of the interviews.

Clearly the identification of other factors is needed to explain more, and perhaps further development of the innovativeness, control and complexity measures may provide more than the 14 percent found in this study.

It was surprising that the factors such as gains, benefits, efficiency, and impact were not found to influence the likelihood to upgrade software. Perhaps it is because all of these factors are things that the business can or should manage and therefore they have less influence on the decision maker. The factors that seem to be beyond the direct influence of the business decision maker, their adopter type (you cannot change the type of person you are), the complexity of the decision, or the degree of control of the upgrade, seem to have a bigger influence on the decision maker.

7.4 Limitations

There are a number of limitations to the current research. While the response rate was similar to other studies it could be improved, and perhaps an alternative means of collecting the data survey to achieve a higher response rate could be employed. One influence on the response rate is the size of the survey instrument. A shorter survey instrument should be developed to encourage a higher response rate.

It is possible that the wording of the items may have biased the respondents, although every effort was made to eliminate this.

Other ways of measuring Innovativeness should be considered. The initial drafts of the survey not published here, included dozens of items on innovativeness. This made the potential survey extremely long, and a method to reduce the size had to be found. Significant reductions were made by developing the scales used to measure the innovativeness construct, but the poor explanatory power of the final model may be improved by a better measurement of innovativeness of the decision maker.

It is feasible that a person's innovativeness changes with time. The model does not allow for the possibility that the respondent might change. For example, if they were once an early adopter, would they always be an early adopter, or can it change? Alternative ways of measuring innovativeness need to be explored. Given the importance of the innovativeness construct in final model it warrants a revision.

The Control construct has reliability less than 0.8. Many studies report and use scales with even lower reliabilities, but an improvement in this would be desirable.

A number of demographic variables were collected and tested, but the measures used may not be the most appropriate. For example, the respondent was asked how many years of computer experience they possessed. This has at least two weaknesses. Firstly, there is a weakness of the recall. People may not clearly remember when they started using computers. Secondly, the number of years of

experience does not reflect the knowledge or ability of the respondent. The implication that someone with more experience possesses more knowledge or ability may not be true. A measure of knowledge would be more appropriate.

The annual turnover of the business is another example. Businesses should know the annual turnover, but there may be a reluctance to accurately report this information, even though confidentiality was assured. Perhaps anonymity should have been promised as well. The annual turnover of the business did not appear to impact on the decision to upgrade the software. The categories used for this were used in other studies, but may have been too broad for this study. More than half of the respondents indicated their business annual turnover was between $1million and $10million dollars. With more categories it is possible that this may have been revealed as an influential factor.

Careful scrutiny of the other demographic measures used would possibly reveal further weaknesses. Demographic measures were included because previous studies suggested they had an impact on the adoption of technology. A revised version of this study might eliminate some of those from consideration thus reducing the size of the survey instrument.

The respondents were asked to think of their most important software and respond to questions with that software in mind. Respondents were therefore not all responding about the same software, or even the same type of software.

The relationship between likelihood to upgrade and actual behaviour was not measured. Measures of actual behaviour on upgrading software need to be found and improvements to the measurement of likelihood to upgrade should be made.

The amount of variance explained by the models was only 14 percent in the final model. This was disappointing low.

7.5 Recommendations for further work

Further work could be done in developing all of the factors identified in the full scale study, but in particular attention should be given to improving the measurement of the innovativeness, control, and complexity factors. Because so much is unexplained, this topic remains open for further exploration to identify other key factors that influence the Australian small to medium businesses' decision to upgrade their software.

Further research might restrict the selection to the upgrade to one specific piece of software. This would impact on the sample size, but it would make comparisons more direct and perhaps more meaningful. The research could then be replicated with other types of software.

The interviewees and respondents found the decision to upgrade time consuming and complex. Clearly this is a significant and important issue. The size of the software industry, both in Australia and worldwide, combined with the fact that an

ever increasing number of people will be upgrading their software should make research into software upgrades a priority.

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Appendix A

Interview notes

Table A.1 Important issues

The most important issues considered when upgrading software	
INTERVIEWEE 1	Put it off as long as possible; Ability to transfer data from existing software to new software; Cost benefit analysis; Never buy first version, wait until bugs are fixed; new features – do we need them?
INTERVIEWEE 2	Only if current software no longer does what we require, new software offers enhanced features, user friendliness, cost effective, cost of upgrade, is help provided
INTERVIEWEE 3	Avoid it. When we changed the hardware so we had to change software – new software is not as good as old software; cost of upgrade
INTERVIEWEE 4	Cost, features. Don't look to upgrade.
INTERVIEWEE 5	forced by external factors such as GST, otherwise would never have upgraded; never buy version 1 - "we wait for the bugs to be ironed out," cost of upgrade
INTERVIEWEE 6	Cost
INTERVIEWEE 7	service is provided with upgrade; cost of upgrade
INTERVIEWEE 8	cost of upgrade, don't use the existing software to the full extent, so why would we upgrade?
INTERVIEWEE 9	tripped over a copy of new software otherwise I would never have upgraded; if it ain't broke don't fix it - the second mouse gets the cheese; cost of upgrade; ISPs keep upgrading thus forcing us to upgrade internet browser; Never buy first version
INTERVIEWEE 10	Cost of upgrade, forced by external factors (new government regulations), features

Table A.2 Decision

Making the decision to upgrade; processes/policies	
INTERVIEWEE 1	Must identify a need for the upgrade before you purchase it.
INTERVIEWEE 2	Determine if it is easier to use than the current software.
INTERVIEWEE 3	No policy; continue on with what we are doing – don't take light the changes to the system. If you jump into an upgrade it becomes too expensive.
INTERVIEWEE 4	The software upgrade "must be easy to use and cost effective".
INTERVIEWEE 5	Cannot easily see the benefits of new software – they are not that clear. Competition is becoming more competitive.
INTERVIEWEE 6	Check the software with a close friend whose opinion is supremely important. Other software is upgraded because of "special agreements with our parent company".
INTERVIEWEE 7	Original purchase agreement included a "monthly payment that entitles us to upgrades."
INTERVIEWEE 8	
INTERVIEWEE 9	"The office must be needs driven. Can see no benefit in upgrading word processor for example, since the current version does everything that is required – there are only so many features you need to write a letter."
INTERVIEWEE 10	Frightened of data conversion if we decide to jump to a new system.

Table A.3 Justification

Justification for the software upgrade	
INTERVIEWEE 1	Yes, cost to change – cost to convert reports currently used into new system.
INTERVIEWEE 2	Upgrade for Microsoft Access was a major thing – it cut down on the manual processes involved in transferring data from the database to the word processor and spreadsheet.
INTERVIEWEE 3	Not as such, work out staff time and savings involved in new processes.
INTERVIEWEE 4	I look at the cost and if it I find it will work I'll buy it.
INTERVIEWEE 5	"A quick mental calculation, and used my gut instincts".
INTERVIEWEE 6	I will check with my neighbor first and with the guys in the head office to make sure it won't upset any of the existing stuff on the computer.
INTERVIEWEE 7	By in large, if it is a good program I'll have a look at it.
INTERVIEWEE 8	No, ring hardware supplier for advice – don't know.
INTERVIEWEE 9	"No, not a formal cost benefit analysis. Mentally only, ask what will it add, and how will it produce a better letter or make the spreadsheet better."
INTERVIEWEE 10	It's remarkable, for the upgrade for the industry specific software I had to do a lot of work to justify (cost benefit analysis) the upgrade to hardware and software, but for the Microsoft office software that the CEO and others used I was given the go ahead without any justification. "I know the cost was considerably different but by the time you consider the number of copies of Microsoft office needed it was considerable."

Table A.4 Decision maker

Who has to be convinced about the software upgrade?	
INTERVIEWEE 1	I do. Everything has to follow company procedures.
INTERVIEWEE 2	Me – I have a reputation of being through, so if I am convinced then everyone is happy to go along with my decision.
INTERVIEWEE 3	Me and brothers.
INTERVIEWEE 4	Myself. I work with the other main user and we convince each other.
INTERVIEWEE 5	Me and partners. I saw a demo that convinced me.
INTERVIEWEE 6	Me and franchise.
INTERVIEWEE 7	The software supplier has to convince me.
INTERVIEWEE 8	Me.
INTERVIEWEE 9	Me.
INTERVIEWEE 10	CEO (who is very computer literate).

Table A.5 Negatives

Negatives with upgrading software	
INTERVIEWEE 1	The cost of the time devoted to getting up to speed with the new software.
INTERVIEWEE 2	Often version 1 is slow and inefficient. You lose real time, because while you are waiting for the machine to catch up you lose concentration, you lose our train of thought and you become very inefficient.
INTERVIEWEE 3	Things don't always work. Our software was written specifically for our business (manufacturer) and we used a company that we had used before because they had delivered for us in the past. However, this time they had some new staff and what they produced was not what we wanted. This cost a lot of money and we were not pleased. We have a long association with this company and this time they did not deliver.
INTERVIEWEE 4	No negatives.
INTERVIEWEE 5	
INTERVIEWEE 6	None except it costs money.
INTERVIEWEE 7	
INTERVIEWEE 8	The fear it will stuff everything up.
INTERVIEWEE 9	Software is not always backward compatible.
INTERVIEWEE 10	Learning curve – myself first then the other users and of course the cost of the any new hardware and software itself.

Table A.6 Managing the upgrade

Managing the upgrades – is everyone upgraded at the same time	
INTERVIEWEE 1	Everyone is upgraded at the same time; it is done across the network so it is all at the same time.
INTERVIEWEE 2	One package forced on us by external party, this was more trouble than other upgrades.
INTERVIEWEE 3	Because the system is integrated – HR depends on finance etc. everyone is upgraded together
INTERVIEWEE 4	Yes, when RP Data went from disk to online everyone complained- it placed time restrictions on them that did not exist on the previous version. (RP Data is the head office for this organisation).
INTERVIEWEE 5	Key people are trained then the others are done in-house.
INTERVIEWEE 6	There is only the one computer here, but all the computers in the franchise are online and the head office upgrades us all at the same time.
INTERVIEWEE 7	Yes
INTERVIEWEE 8	Yes
INTERVIEWEE 9	Depends on the compatibility – one to start with.
INTERVIEWEE 10	Yes everyone is upgraded at same time; always please.

Table A.7 Information sources

Information sources	
INTERVIEWEE 1	Industry magazines and conferences (IT professional).
INTERVIEWEE 2	No comment
INTERVIEWEE 3	No comment
INTERVIEWEE 4	Accountant. Friends and business associates.
INTERVIEWEE 5	the good guys who are with it
INTERVIEWEE 6	Friend-next door neighbour, the guys at head office (franchise)
INTERVIEWEE 7	We talk to people who have installed version 1.
INTERVIEWEE 8	No, it's too hard. Who would we ask? We ask the people who provide our hardware, but I don't understand their responses. For example, when we put in new computers they installed the older version of Windows. We asked them why, because we really wanted the newer version. I didn't understand why.
INTERVIEWEE 9	"I have one guru I always check with. I used to work with him. He was a friend in technical support and knows mainly about hardware, but I always run things by him. Lots of people turn to me for advice, but I have him to turn to."
INTERVIEWEE 10	Industry magazines and conferences (IT professional). Other sites.

Table A.8 Test before buy?

Test the software before purchasing it?	
INTERVIEWEE 1	Yes, we did some tests with our data. Yes, track down someone who is using it and check it out on their machine.
INTERVIEWEE 2	We know it has been working before we buy it.
INTERVIEWEE 3	Saw a demonstration first – while the individual parts worked it did not work properly when it was all put together. We tested it, but a glitch showed up!
INTERVIEWEE 4	Yes, we trailed software before we bought it because it had a money back guarantee. Saw it at a seminar – trailed another.
INTERVIEWEE 5	Yes, we are often used as a 'test-bed' for software and we often get it at a lower price.
INTERVIEWEE 6	No. (Franchise – he has bought software that he has abandoned).
INTERVIEWEE 7	No, the person writing the software will have tested it on a business similar to ours and make sure it works before releasing it.
INTERVIEWEE 8	No idea about this, you just have to try it out.
INTERVIEWEE 9	For software like Microsoft Office, no. For our specialist software like CRAFT yes. I need to see it first.
INTERVIEWEE 10	The final decision took over a year. We asked other users. Cost was a big influence.

Table A.9 Adopter type

Innovativeness –Do you like to try new things	
INTERVIEWEE 1	Yes, try before buy. It depends on the benefits. Will it inhibit us if we don't?
INTERVIEWEE 2	Yes
INTERVIEWEE 3	"No we have deadlines and we cannot afford to experiment with software. Everything must be done at set times or it will have a domino effect – invoices must be done at set times. The software must do what we want, when we want it, how we want it."
INTERVIEWEE 4	Yes, we love computers, they are great. We try Picture Ware, Photo Share. But we would not put on brand new software.
INTERVIEWEE 5	Yes, "we are considered an innovative business in our industry. The Qld office of our industry group seeks our advice on how we do things."
INTERVIEWEE 6	You have to try new things- should not be frightened of computers.
INTERVIEWEE 7	Yes
INTERVIEWEE 8	No
INTERVIEWEE 9	Yes.
INTERVIEWEE 10	Yes

Table A.10 Training

Training	
INTERVIEWEE 1	Key staff are trained
INTERVIEWEE 2	No training is provided; I learn it and then provide the training in-house.
INTERVIEWEE 3	I learn it as we go. I learn it first then teach the others. I am a very curious person. We share what we find. Some training was provided with the new software.
INTERVIEWEE 4	My assistant and I are the adventurous ones – we have never been taught. If we cannot do something we get a friend or colleague to help.
INTERVIEWEE 5	Key staff member will be trained – then they train the others. It costs too much to send them away for training. Cannot afford to have them away from the office. When we upgrade the cost of training is considered in the decision.. Small businesses must contain costs, “I’ve seen small business get carried away with technology and it eventually ruined them!”
INTERVIEWEE 6	No training is provided for the in-house franchise software- It is very user friendly. If I have any questions I just ring them and they talk me through it. There are some franchises that are completely computer illiterate and step-by-step instructions are provided. You cannot go wrong.
INTERVIEWEE 7	This is considered in the cost of the software- we have a trainer from our provider do some one on one training.
INTERVIEWEE 8	No comment
INTERVIEWEE 9	No, this is not a big issue for us because we are not heavy users. We got training for some software (CRAFT) but not for other software like Office where I taught myself, and I teach the others later.
INTERVIEWEE 10	Training for the new software costs $520 per day. The number of days needed are recommended. We would send 2 people if we could, but it is too expensive to send them and have them away from the office.

Table A.11 Value of IT

The value of IT to the organisation	
INTERVIEWEE 1	It has a really high value. I could not put a figure on it, but I know we could not operate without it. It is essential to our business.
INTERVIEWEE 2	The CEO might have an answer to this.
INTERVIEWEE 3	I do not really know, but we are totally dependent on them. We do everything here from woe-to-go. From the raw goods to the customer. Not too many businesses can say that.
INTERVIEWEE 4	I never thought about it. I would have no idea how to work out such a thing. Our company has said every entry into the database is worth $100, but I don't know how they worked that out. I suppose they did some calculations based on the best office. But we have a never-ending battle to convince the sales staff about the value of the IT. We have put on one extra staff member to allow my assistant to work on the computers full time.
INTERVIEWEE 5	Measured in man hours – secretary hours and considering only the essentials it is worth $300 per week. I know how long it would take to do manually.
INTERVIEWEE 6	I haven't thought about it – just told we have to have it by the head office. It saves time, it will soon do stock control & ordering and that will be very beneficial. It is much better than doing it manually, doing invoices for the wholesalers. When you don't have one it is not too bad, but once you have had one you wonder how you ever did without it.
INTERVIEWEE 7	I know what they cost us but that's not what you mean. We do things differently now. Goods used to come in and were placed directly on shelves and we would do the paper work after. Now, we have better stock control, we can tell a customer if something is in stock, but we have to record it when it is received. It is all different, but I suppose the customer is happier and so it is a better system.
INTERVIEWEE 8	They are "very valuable –I would hate to do it manually". We just have to "transfer a file to a floppy disc to give to the government". That would "take ages to do manually".
INTERVIEWEE 9	"It's an economy of scale thing – we manage more stuff with the same level of staff so there are definite cost savings. I think it would cost an extra person at least at $25000"
INTERVIEWEE 10	It is "essential" to our business.

Table A.12 Utilization

Utilization	
INTERVIEWEE 1	“We set about to use all of it.”
INTERVIEWEE 2	“Yes, especially Access, we really push it to the limit.”
INTERVIEWEE 3	“Most of the [industry based] software is fully used except the home deliveries.”
INTERVIEWEE 4	“Yes, after talking to others I know we use it a lot more than most; they never look at what else it can do.”
INTERVIEWEE 5	“We would be up there ahead of most other offices in our industry. The office that won the award would do more, but we would be in the top 10%”
INTERVIEWEE 6	“The older software that we have used for sometime is utilized more than the new software because we are still learning what is capable of doing.”
INTERVIEWEE 7	“Everyone in the office uses it the same. We would have very limited use of some software”.
INTERVIEWEE 8	No comment
INTERVIEWEE 9	“Not really, but we certainly are clever with the macros we use.”
INTERVIEWEE 10	WP a lot by everyone and finance uses Excel a lot, but the use of Access, outlook and PowerPoint is limited.

Table A.13 Dealing with upgrade problems

Solving problems with the upgrade	
INTERVIEWEE 1	We work it out.
INTERVIEWEE 2	I try to work it out myself.
INTERVIEWEE 3	Ring the hardware supplier after trying help first; I would try to work it out myself.
INTERVIEWEE 4	Ask a colleague first, or our accountants or even go to head office.
INTERVIEWEE 5	Ring for help.
INTERVIEWEE 6	Depends on how bad – ring the IT at head office in Sydney. They have a 24 hr help line and they help us through it.
INTERVIEWEE 7	I contact the provider and write down the error message.
INTERVIEWEE 8	Someone changed the screen saver on me – I had no idea how they did that. I am frightened I will stuff it up.
INTERVIEWEE 9	Ring someone, put a lot of time into it. You have to know the right question to ask!
INTERVIEWEE 10	I like to think it out for myself; I've tinkered with computers for many years.

Table A.14 Excessive features

Software with more features than you can use	
INTERVIEWEE 1	The latest packages are ‘overkill’
INTERVIEWEE 2	The time factor is why we do not use features more.
INTERVIEWEE 3	It does not frustrate me if that is what you mean.
INTERVIEWEE 4	Sign of the times – you cannot design a package to suite everyone –cannot just have the basic functions – only know how to use 60% of our industry package.
INTERVIEWEE 5	Everyone tends to buy more than they want in case they need it, especially hardware.
INTERVIEWEE 6	Doesn’t worry me, if there are things in there that I can use I am happy, the fact that there are other things there that I don’t use are not a worry for me.
INTERVIEWEE 7	It raises the question “do we adapt it to us or do we adapt to it? We have revamped our systems to match the software.”
INTERVIEWEE 8	Only bought it as a package (hardware came with software supplied). It is available if you need it – you grow into it.
INTERVIEWEE 9	“This is why I cannot justify an upgrade, the current software has everything I need. I ‘hate’ Microsoft but it is too much hassle to swap over to other software.”
INTERVIEWEE 10	No comment

Table A.15 Upgrade problems

What problems did you encounter when you upgraded?	
INTERVIEWEE 1	No problems; we just go through the steps.
INTERVIEWEE 2	“Once we lost half the Borland files- the program had to be re-installed. We use backups but they were not up to date.”
INTERVIEWEE 3	Things change and programmers forget to change things.
INTERVIEWEE 4	Minimal
INTERVIEWEE 5	Multiple people using a single monitor/computer is not effective – we found some people needed a bigger monitor and bigger font for those with poor eyesight, we had problems with some software changing the printer settings and then the printer not working with other software. Because people share computers the settings do not suit everyone.
INTERVIEWEE 6	“No don’t usually have problems. If you did have problems then read help file. This is usually a lot easier than the books. If I am still in trouble then I call the big guys”.
INTERVIEWEE 7	Educate clients – new software did formatted the reports differently, which some complained about.
INTERVIEWEE 8	No comment
INTERVIEWEE 9	When I upgraded Windows I found the program was not backwards compatible. The same goes for the latest upgrade of the WP.
INTERVIEWEE 10	Normal problems – everything was planned so no new hardware was required.

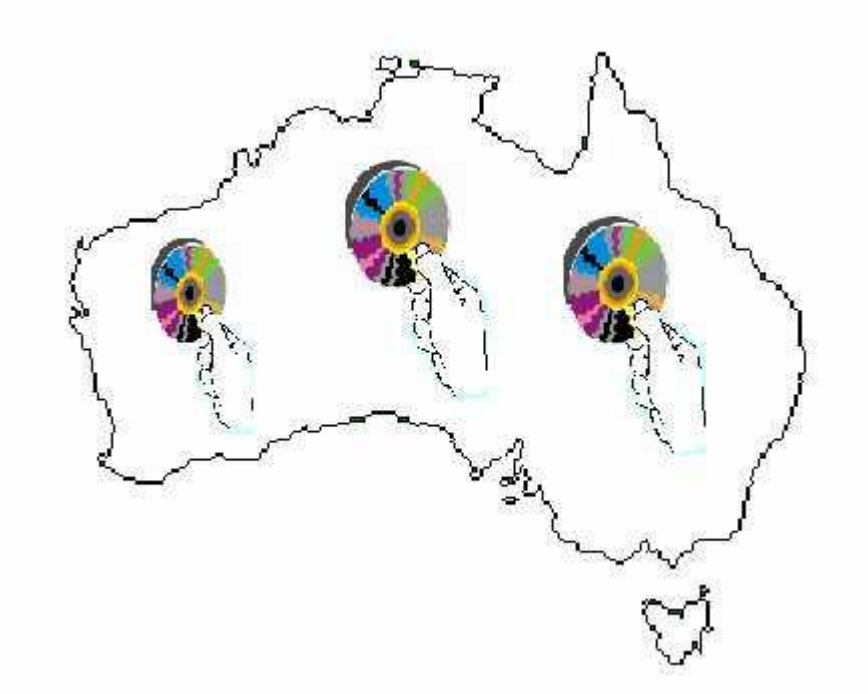
Table A.16 Other issues

Any other issues about software upgrades we haven't discussed	
INTERVIEWEE 1	I look forward to a common platform, something like JAVA, so that there is some standardization in the industry.
INTERVIEWEE 2	No comment
INTERVIEWEE 3	The new software written for us did not handle the end of year properly. The programmers did not listen to us.
INTERVIEWEE 4	We try to be positive about this. We think of software as very exciting.
INTERVIEWEE 5	We are often used as a test-bed by micro developers. This lets us plan our technology in advance. We are willing to be innovative with the software only if it is user friendly and cost efficient. We have to keep up to date. If it is a minor upgrade we take it on board.
INTERVIEWEE 6	I am not game to try new stuff on my own, but I don't like waiting to buy, I regret it two weeks later. I would not say I am innovative – that is too strong a word for me. I am cautious but adventurous and I am fascinated with computers. If my neighbor was not there I don't know that I would be so willing to have a go.
INTERVIEWEE 7	No comment
INTERVIEWEE 8	Have a modem, but it is not used. Not confident, and see no need at this stage.
INTERVIEWEE 9	"A major innovation is needed to justify an upgrade, just as it is with the hardware" ; they provide a "big improvement in speed".
INTERVIEWEE 10	With industry based software you need to keep staff as long as possible because you cannot get someone in cold to take over. We are now trying to have a second person proficient in every piece of software.

Appendix B

Software Upgrade Adoption Survey

Software Upgrade Adoption Survey



an Australian survey

The purpose of this survey is to understand the factors that influence a businesses decision to upgrade software. **Upgrades cost your business and ultimately the Australian economy a large amount of money** and hence the decision whether to upgrade software needs to be carefully examined and fully understood. Your reply is very important since your responses represent the views of businesses similar to yours. I therefore urge you to please complete the survey. You may be assured that the confidentiality of your responses will be respected. The survey takes about twenty minutes to complete. Thank you in advance.

This survey is sponsored by the
University of Southern Queensland.

Please return this survey using the reply paid envelope. If the envelope has been mislaid, please forward to:

Reply Paid 67736
Mr Dave Roberts
Department of Information Systems
Faculty of Business
University of Southern Queensland
Toowoomba QLD 4350

Instructions: The **person who makes the final decision to purchase software in your business should complete this survey**. The objective of this survey is to identify the important factors used by businesses in their decision to upgrade their existing software. **Please tick the response that reflects your views.**

A1. Which of the following best describes your business:

- ☐ It doesn't use computers
- ☐ It uses computers for only one or two basic things
- ☐ It uses computers for quite a few things
- ☐ It uses computers as much as possible

If your business does not use computers please skip directly to the questions **ABOUT YOU** and **ABOUT YOUR BUSINESS** near the end of the survey.

A2. Do you make the decision to purchase software for your business?

- ☐ Yes
- ☐ No - if your response is no, please pass this survey to the person who does make the decision to purchase software for your business.

Some questions about your COMPUTER HARDWARE

H1. Which of the following best describes you when it comes to **computer hardware**:

- ☐ Enthusiastic, innovator, first to buy, risk taker, evaluator
- ☐ Visionary, early adopter, leader in your industry, others ask your opinion
- ☐ Pragmatic, cautious, not the first nor the last to buy, ask others what to buy
- ☐ Conservative, late adopter, not confident, follower, doubtful
- ☐ Sceptical, last to purchase, have to be absolutely certain

H2. Did you upgrade your computer hardware because of the Y2K problem?

- ☐ Yes
- ☐ No

H3. Did you upgrade your computer hardware because of the GST?

- ☐ Yes
- ☐ No

Some questions about the COMPUTER use

C1. Does your business currently use the Internet?

- ☐ No
- ☐ Yes (Please specify how it is used eg E-Commerce or e-mail)

_____
_____
_____
_____
_____
_____

C2. How useful are computers to your business?

- ☐ Essential
- ☐ Valuable
- ☐ Some use
- ☐ Limited use

Some questions about your SOFTWARE

S1. Which software does your business currently use? *(Tick all that apply)*

- ☐ Word processor
- ☐ Spreadsheets
- ☐ Databases
- ☐ e-mail
- ☐ WEB browser
- ☐ e-banking
- ☐ Accounting
- ☐ Desk Top Publishing
- ☐ Graphics
- ☐ Games
- ☐ CAD/CAM or Design
- ☐ Industry specific

S2. Which software did your business upgrade because of the Y2K problem? *(Tick all that apply)*

- ☐ Word processor
- ☐ Spreadsheets
- ☐ Databases
- ☐ e-mail
- ☐ WEB browser
- ☐ e-banking
- ☐ Accounting
- ☐ Desk Top Publishing
- ☐ Graphics
- ☐ Games
- ☐ CAD/CAM or Design
- ☐ Industry specific

S3. Which software did your business upgrade because of the GST? *(Tick all that apply)*

- ☐ Word processor
- ☐ Spreadsheets
- ☐ Databases
- ☐ e-mail
- ☐ WEB browser
- ☐ e-banking
- ☐ Accounting
- ☐ Desk Top Publishing
- ☐ Graphics
- ☐ Games
- ☐ CAD/CAM or Design
- ☐ Industry specific

S4. Which brand and version of word processor does your business currently use?

Brand Name (eg Microsoft Word)_____

Version (eg Word 2000)_____

S5. Approximately when did you last upgrade your version of word processor?

(eg 1999) _____

S6. Why did you upgrade your word processor then?

_____

S7. The likelihood you would purchase an upgrade to your word processor if a new version were released today is:

- ☐ Certain
- ☐ Very likely
- ☐ Likely
- ☐ Neither likely nor unlikely
- ☐ Unlikely
- ☐ Very unlikely
- ☐ Definitely not

S8. Which of the following best describes you when it comes to purchasing a software upgrade for your **word processor**:

- ☐ Enthusiastic, innovator, first to buy, risk taker, evaluator
- ☐ Visionary, early adopter, leader in your industry, others ask your opinion
- ☐ Pragmatic, cautious, not the first nor the last to buy, ask others what to buy
- ☐ Conservative, late adopter, not confident, follower, doubtful
- ☐ Sceptical, last to purchase, have to be absolutely certain

S9. Are you compelled or encouraged to upgrade by other organizations?

- ☐ No
- ☐ Yes. If the answer was yes, please specify _____

S10. Where does the push to upgrade usually come from? (*Tick all that apply*)

- ☐ Self
- ☐ Friend
- ☐ Associate
- ☐ Magazine
- ☐ Software Company
- ☐ Internet
- ☐ Head Office
- ☐ Competitors
- ☐ Other (please specify)_____

Thank you in advance for your response *Individual responses will be kept confidential*

Now some questions about your MOST IMPORTANT SOFTWARE

M1. Which software is **the most important** to your business? (***Specify ONLY ONE***)

- ☐ Word processor
- ☐ Spreadsheets
- ☐ Databases
- ☐ e-mail
- ☐ WEB browser
- ☐ e-banking
- ☐ Accounting
- ☐ Desk Top Publishing
- ☐ Graphics
- ☐ Games
- ☐ CAD/CAM or Design
- ☐ Industry specific

M2. The likelihood you would purchase an upgrade to your **most important** software if a new version were released today is:

- ☐ Certain
- ☐ Very likely
- ☐ Likely
- ☐ Neither likely nor unlikely
- ☐ Unlikely
- ☐ Very unlikely
- ☐ Definitely not

M3. Which of the following best describes you when it comes to purchasing a software upgrade for your **most important** software:

- ☐ Enthusiastic, innovator, first to buy, risk taker, evaluator
- ☐ Visionary, early adopter, leader in your industry, others ask your opinion
- ☐ Pragmatic, cautious, not the first nor the last to buy, ask others what to buy
- ☐ Conservative, late adopter, not confident, follower, doubtful
- ☐ Sceptical, last to purchase, have to be absolutely certain

M4 Would the purchase of an upgrade to your **most important software** be more like a purchase of something you have not purchased before (new purchase) or something exactly the same as you have purchased before (repeat purchase) or somewhere between these?

New Purchase						Repeat Purchase
☐	☐	☐	☐	☐	☐	☐

Important note for the next questions.
Please think about the statement in column 1.
In **column 2**, rate how much you agree with the statement for **your MOST IMPORTANT software.**
For example:

Example statements	Your **Most Important** Software Strongly Disagree … Strongly Agree 1 2 3 4 5 6 7
There is little risk involved in upgrading this software.	☐ ☐ ☐ ☐ ☐ ☐ ☑
I look forward to upgrading this software.	☐ ☐ ☑ ☐ ☐ ☐ ☐

Statements about Investment in Upgrades	Your **Most Important** Software Strongly Disagree … Strongly Agree 1 2 3 4 5 6 7
I1. I don't upgrade my software if it is working.	☐ ☐ ☐ ☐ ☐ ☐ ☐
I2. There is little risk involved in upgrading software.	☐ ☐ ☐ ☐ ☐ ☐ ☐
I3. The new versions of software are always easier to use.	☐ ☐ ☐ ☐ ☐ ☐ ☐
I4. The new versions of software have functions I need.	☐ ☐ ☐ ☐ ☐ ☐ ☐
I5. I upgrade my software only when I upgrade my computer.	☐ ☐ ☐ ☐ ☐ ☐ ☐

Thank you in advance for your response *Individual responses will be kept confidential*

Statements about Investment in Upgrades	Your **Most Important** Software Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7
I6. I upgrade my software only when it is necessary.	☐	☐	☐	☐	☐	☐	☐
I7. I purposely don't buy some software upgrades.	☐	☐	☐	☐	☐	☐	☐
I8. New versions of software have too many functions.	☐	☐	☐	☐	☐	☐	☐
I9. Software upgrades are only a way of making money for software companies.	☐	☐	☐	☐	☐	☐	☐
I10. I do not always buy a software upgrade.	☐	☐	☐	☐	☐	☐	☐
I11. Software upgrades are released too often.	☐	☐	☐	☐	☐	☐	☐
I12. I am expected to upgrade software too often.	☐	☐	☐	☐	☐	☐	☐
I13. I will upgrade my software if it means I can do my work faster.	☐	☐	☐	☐	☐	☐	☐
I14. I will only buy the next software upgrade if it is not too expensive.	☐	☐	☐	☐	☐	☐	☐
I15. I will upgrade my software if it is more efficient.	☐	☐	☐	☐	☐	☐	☐
I16. I will upgrade my software if it is easier to use.	☐	☐	☐	☐	☐	☐	☐
I17. My current software serves my needs.	☐	☐	☐	☐	☐	☐	☐
I18. I will buy the next software upgrade.	☐	☐	☐	☐	☐	☐	☐
I19. I will skip the next software upgrade and buy the upgrade that comes after it.	☐	☐	☐	☐	☐	☐	☐
I20. The price of a software upgrade is a major consideration.	☐	☐	☐	☐	☐	☐	☐
I21. The software upgrade must satisfy the businesses needs.	☐	☐	☐	☐	☐	☐	☐
I22. The software upgrade should keep the business competitive.	☐	☐	☐	☐	☐	☐	☐
I23. The software upgrade should keep the business up-to-date.	☐	☐	☐	☐	☐	☐	☐
I24. The software upgrade must be easier to use than the current version.	☐	☐	☐	☐	☐	☐	☐
I25. The software upgrade must work faster than the current version.	☐	☐	☐	☐	☐	☐	☐
I26. I check that the software upgrade will not require new hardware.	☐	☐	☐	☐	☐	☐	☐
I27. I prefer to upgrade my software only when I upgrade my hardware.	☐	☐	☐	☐	☐	☐	☐
I28. I determine whether the software upgrade will necessitate staff retraining.	☐	☐	☐	☐	☐	☐	☐
I29. I determine what new hardware will be required before I upgrade software.	☐	☐	☐	☐	☐	☐	☐
I30. I determine how my current software will be affected before I upgrade software.	☐	☐	☐	☐	☐	☐	☐
I31. I include the cost of staff retraining into the cost of the software upgrade.	☐	☐	☐	☐	☐	☐	☐

Thank you in advance for your response *Individual responses will be kept confidential*

Software Upgrade Adoption Survey

Statements about Investment in Upgrades	Your **Most Important** Software Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7
I32. I determine how the business will be affected before I upgrade software.	☐	☐	☐	☐	☐	☐	☐
I33. A software upgrade improves your customers' satisfaction.	☐	☐	☐	☐	☐	☐	☐
I34. The software upgrade increases the speed of service.	☐	☐	☐	☐	☐	☐	☐
I35. The software upgrade results in productivity gains.	☐	☐	☐	☐	☐	☐	☐
I36. The software upgrade makes the software more useful.	☐	☐	☐	☐	☐	☐	☐
I37. The software upgrade increases the benefits of the software.	☐	☐	☐	☐	☐	☐	☐

Statements about Influences on Upgrades	Your **Most Important** Software Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7
F1. I buy a software upgrade because I am loyal to the company that writes my software.	☐	☐	☐	☐	☐	☐	☐
F2. I buy a software upgrade after seeking the advice of a business associate.	☐	☐	☐	☐	☐	☐	☐
F3. I check information on the Internet before I buy a software upgrade.	☐	☐	☐	☐	☐	☐	☐
F4. I seek the advice of a friend or relative before I buy a software upgrade.	☐	☐	☐	☐	☐	☐	☐
F5. I check magazines before I buy a software upgrade.	☐	☐	☐	☐	☐	☐	☐
F6. I buy a software upgrade only after seeing it at a conference, seminar, or trade show.	☐	☐	☐	☐	☐	☐	☐

Statements about the Upgrade Decision	Your **Most Important** Software Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7
D1. The decision to upgrade software is very complex.	☐	☐	☐	☐	☐	☐	☐
D2. A software upgrade is a strategic decision.	☐	☐	☐	☐	☐	☐	☐
D3. The decision to upgrade software is very time consuming.	☐	☐	☐	☐	☐	☐	☐
D4. The decision to upgrade software is rational.	☐	☐	☐	☐	☐	☐	☐
D5. The decision to upgrade software is risky.	☐	☐	☐	☐	☐	☐	☐
D6. Upgrading software is a pressured decision.	☐	☐	☐	☐	☐	☐	☐
D7. Upgrading software is a technical decision.	☐	☐	☐	☐	☐	☐	☐
D8. I need specialist advice to make the decision to upgrade software.	☐	☐	☐	☐	☐	☐	☐
D9. When faced with a software upgrade I consider switching to another brand of software.	☐	☐	☐	☐	☐	☐	☐
D10. After I have upgraded I question whether I made the correct decision.	☐	☐	☐	☐	☐	☐	☐

Thank you in advance for your response *Individual responses will be kept confidential*

Now some questions ABOUT YOU

Y1. What is your position title? *(Tick all that apply)*

- ☐ Owner/manager
- ☐ CEO
- ☐ Financial Controller
- ☐ Director
- ☐ CIO/MIS/IT management
- ☐ Other (please specify)

_____

Y2. What is your purchasing role in software upgrades? *(Tick all that apply)*

- ☐ Final approval
- ☐ Specify requirements
- ☐ Recommend
- ☐ No role

Y3. What is your highest level of education?

- ☐ High school
- ☐ Certificate/Diploma
- ☐ Degree
- ☐ Higher degree

Y4. How many years have you personally been using computers?

- ☐ <1 year
- ☐ 1–4 years
- ☐ 5 –9 years
- ☐ 10-15 years
- ☐ >15 years

Now some questions ABOUT THE BUSINESS

B1. In what sector does your business operate?

- ☐ Local only
- ☐ State wide
- ☐ Interstate
- ☐ Internationally

B2. Does you business have a computer specialist as a full time employee?

- ☐ Yes
- ☐ No

B3. What is your Postcode? _____

B4. What industry is your business in? *(Please select only ONE)*

- ☐ Manufacturing
- ☐ Building/Construction
- ☐ Wholesale/Retail
- ☐ Business Services
- ☐ Personal Services
- ☐ Transportation/Storage
- ☐ Education/training
- ☐ Agriculture

B5. How many years has your business been operating?

- ☐ <1 year
- ☐ 1–4 years
- ☐ 5 –9 years
- ☐ 10-15 years
- ☐ >15 years

B6. How many full time employees are there within your business?

- ☐ 0
- ☐ 1-2
- ☐ 3-4
- ☐ 5-9
- ☐ 10-19
- ☐ 20-100
- ☐ 101-200

B7. How many years has your business had computers?

- ☐ <1 year
- ☐ 1–4 years
- ☐ 5 –9 years
- ☐ 10-15 years
- ☐ >15 years

B8. What is the approximate size of your business's annual turnover?

- ☐ Less than $½ million
- ☐ $½ million to less than $1million
- ☐ $1million to less than $10 million
- ☐ More than $10 million

Software Upgrade Adoption Survey

If you would like a copy of the findings of the survey please fill out your address details:

Title: _____
Business Name: _____
Address: _____
_____

Please return this survey using the reply paid envelope. If the envelope has been mislaid, please forward to:

Reply Paid 67736
Mr Dave Roberts
Department of Information Systems
Faculty of Business
University of Southern Queensland
Toowoomba QLD 4350

If you feel there are other comments concerning upgrades of software that you would like to make please feel free to write them below:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Thank you in advance for your response *Individual responses will be kept confidential*

Appendix C

Script to calculate reliability for congeneric models

```
*Reliability of  Factor.
MATRIX.
COMPUTE reliability=MAKE(1,1,0).

compute s={ 1,    0.829,       0.631,       0.552;
0.829,       1,     0.701,       0.613;
0.631,       0.701,       1,     0.76;
0.552,       0.613,       0.76, 1}.

compute td={ 0.254,     0,      0,      0;
0,      0.080,       0,      0;
0,      0,      0.467,       0.557;
0,      0,      0.557,       0.592}.

compute wfs={0.207880435, 0.698369565,      0.070652174,
        0.023097826}.

compute reliability=(wfs*(s-
td)*TRANSPOS(wfs))/(wfs*s*TRANSPOS(wfs)).
print reliability.
END MATRIX.
```

This is typical of the script used to calculate the reliability of a factor.

The derivation of the matrices S, td and wfs for each of the congeneric models is based on the notes provided by Holmes-Smith (2001).

Appendix D

Exploratory congeneric models

CMIN/DF=2.030
RMR=.083
GFI=.985
AGFI=.959
CFI=.987
RMSEA=.052

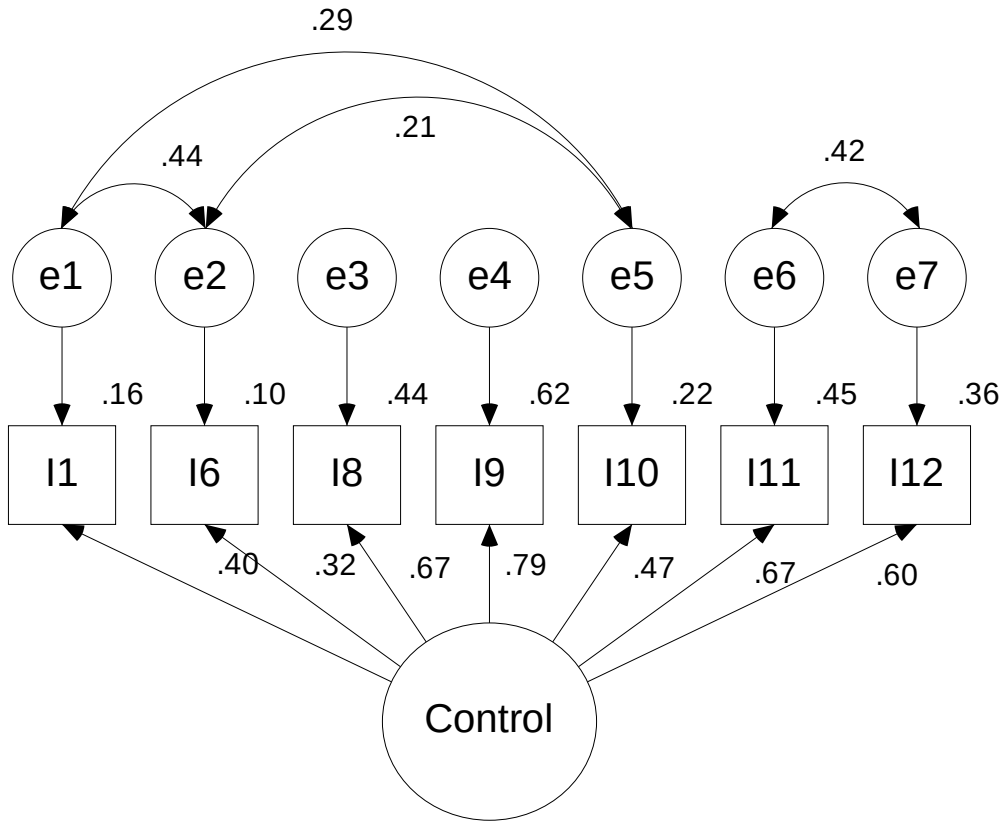


Figure D.1 Control congeneric model exploratory data

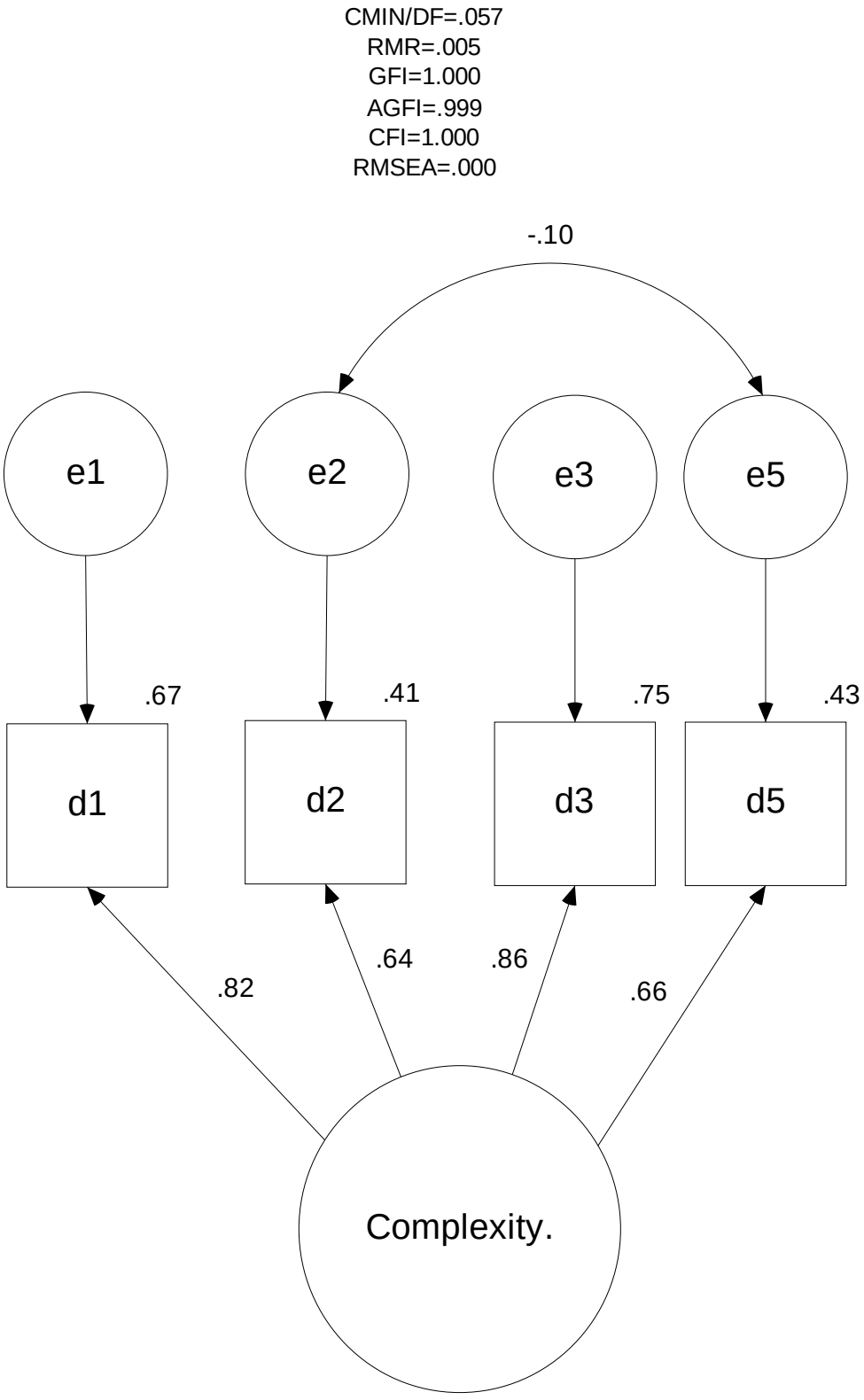


Figure D.2 Complexity congeneric model exploratory data

CMIN/DF=3.574
RMR=.070
GFI=.982
AGFI=.939
CFI=.975
RMSEA=.082

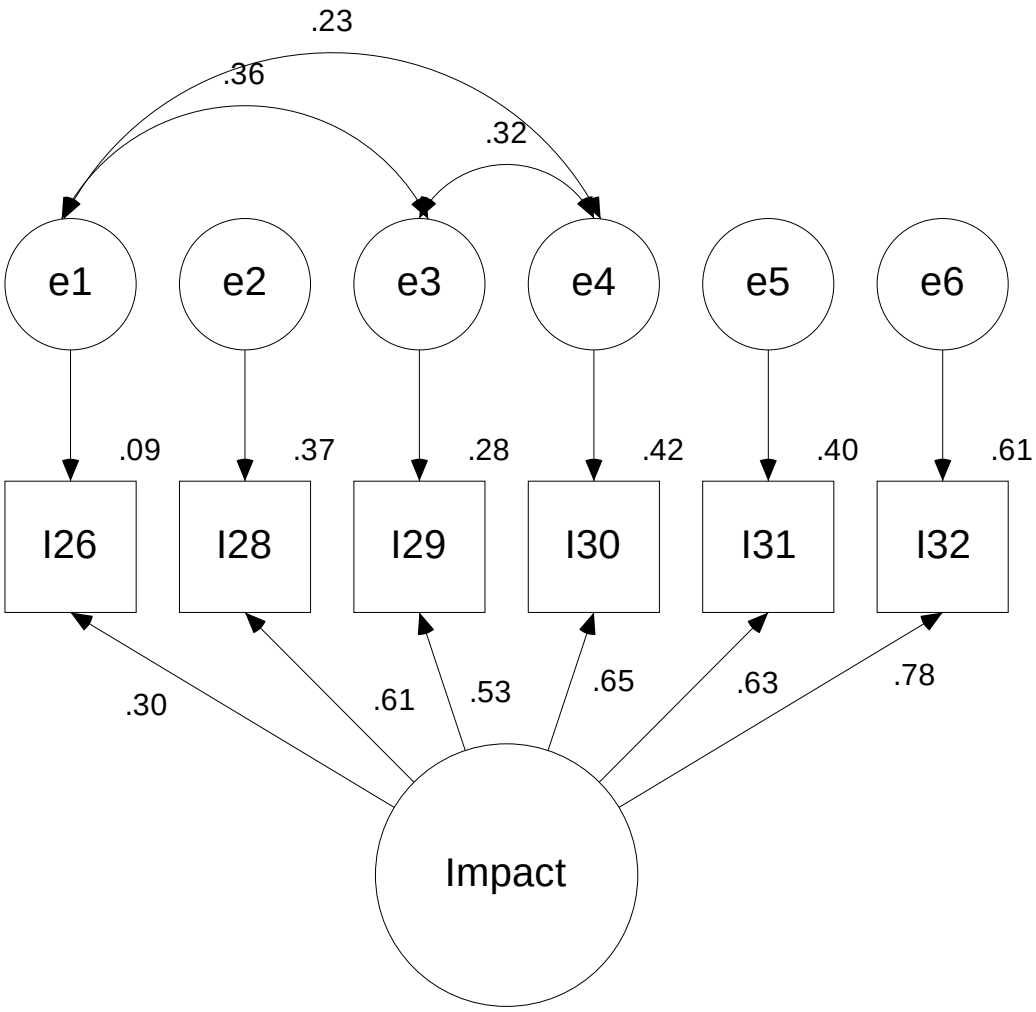


Figure D.3 Impact congeneric model exploratory data

CMIN/DF=3.041
RMR=.032
GFI=.986
AGFI=.917
CFI=.972
RMSEA=.074

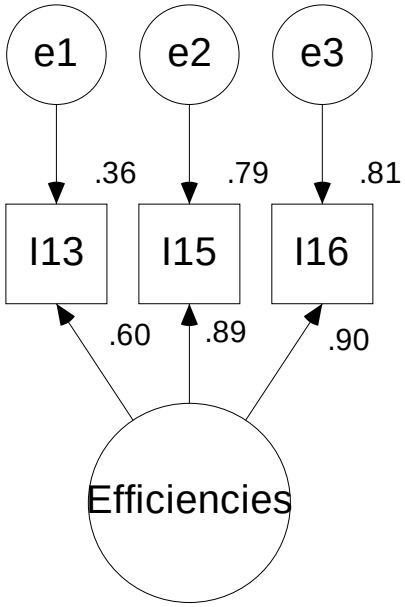


Figure D.4 Efficiencies congeneric model exploratory data

CMIN/DF=.196
RMR=.018
GFI=1.000
AGFI=.998
CFI=1.000
RMSEA=.000

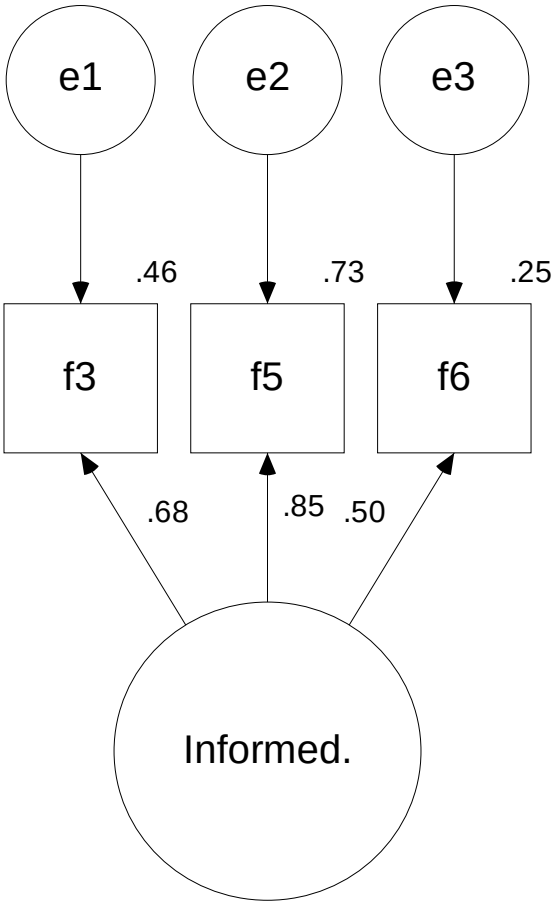


Figure D.5 Informed congeneric model exploratory data

CMIN/DF=.271
RMR=.004
GFI=1.000
AGFI=.997
CFI=1.000
RMSEA=.000

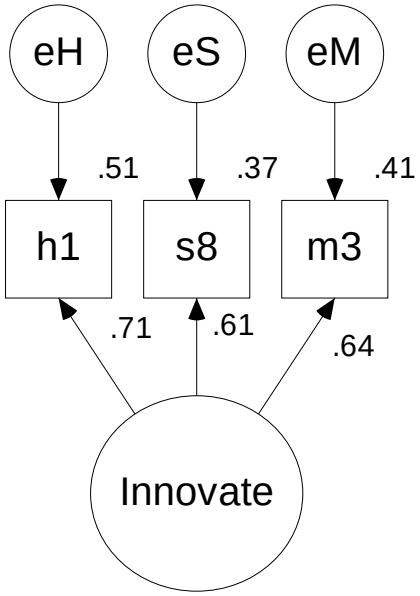


Figure D.6 Innovate congeneric model exploratory data

Appendix E

Confirmatory congeneric models

CMIN/DF=.798
RMR=.009
GFI=.998
AGFI=.988
CFI=1.000
RMSEA=.000

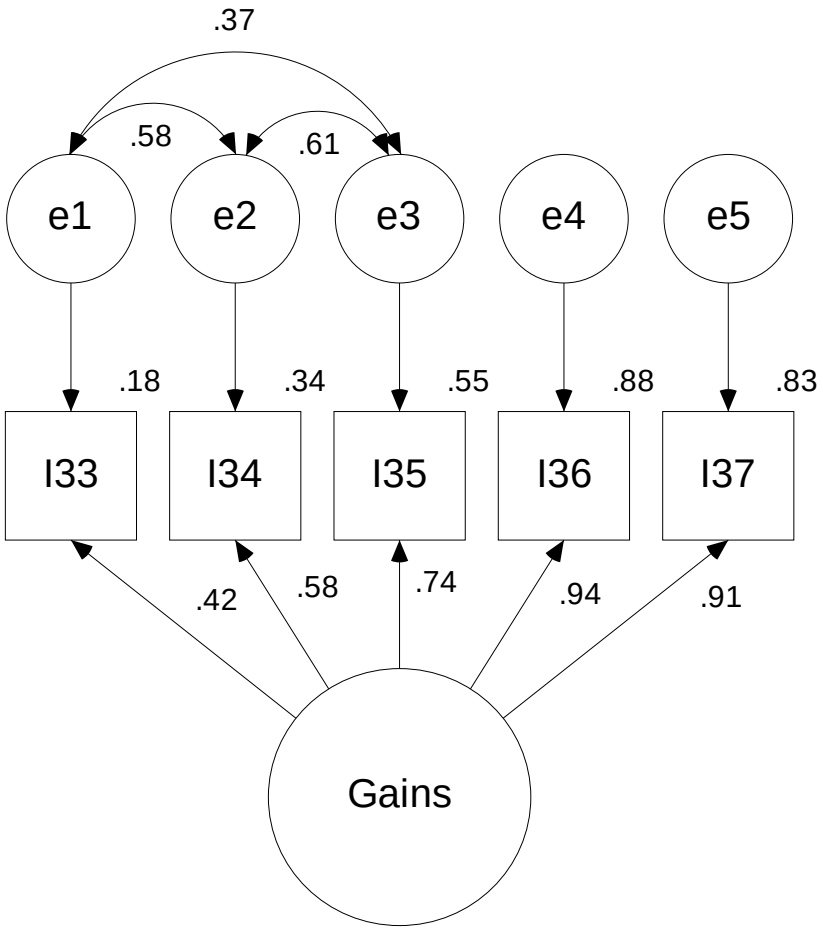


Figure E.1 Gains congeneric model confirmatory data

CMIN/DF=2.611
RMR=.080
GFI=.981
AGFI=.946
CFI=.978
RMSEA=.065

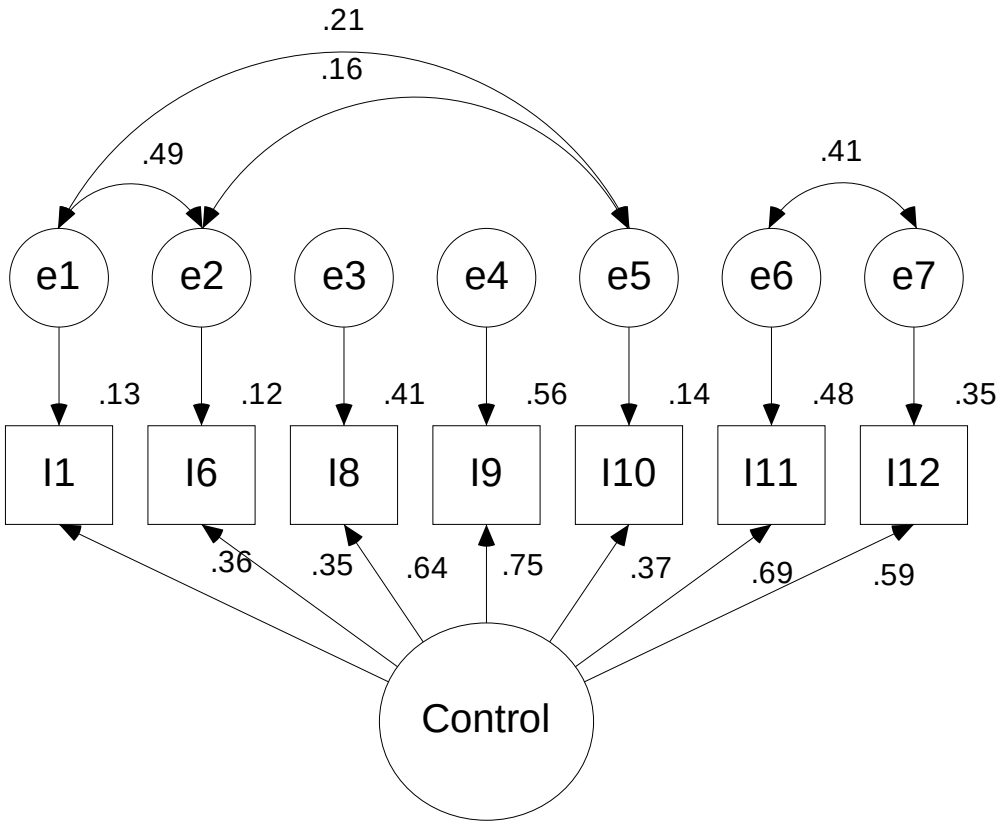


Figure E.2 Control congeneric model confirmatory data

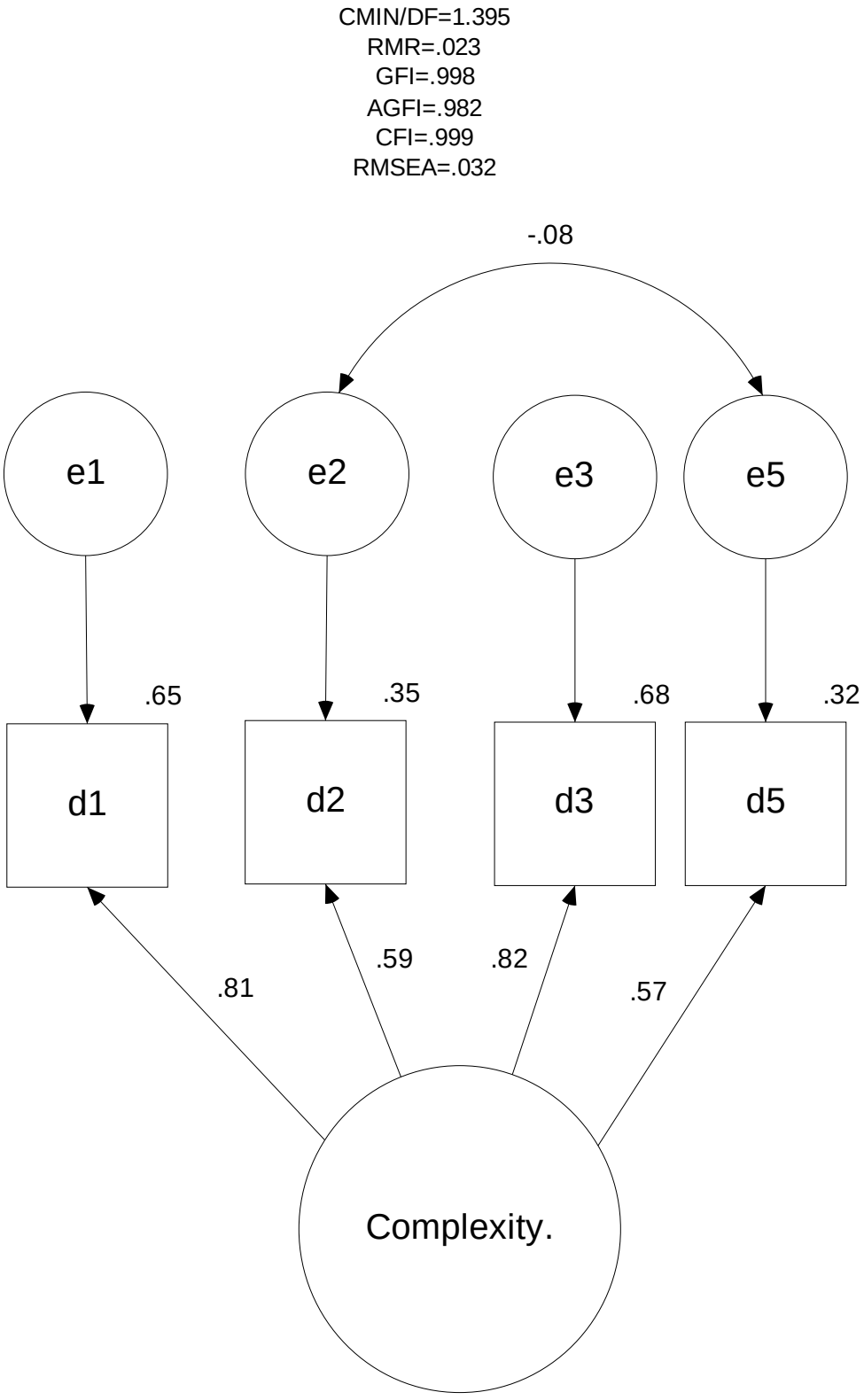


Figure E.3 Complexity congeneric model confirmatory data

CMIN/DF=1.374
RMR=.057
GFI=.992
AGFI=.959
CFI=.989
RMSEA=.031

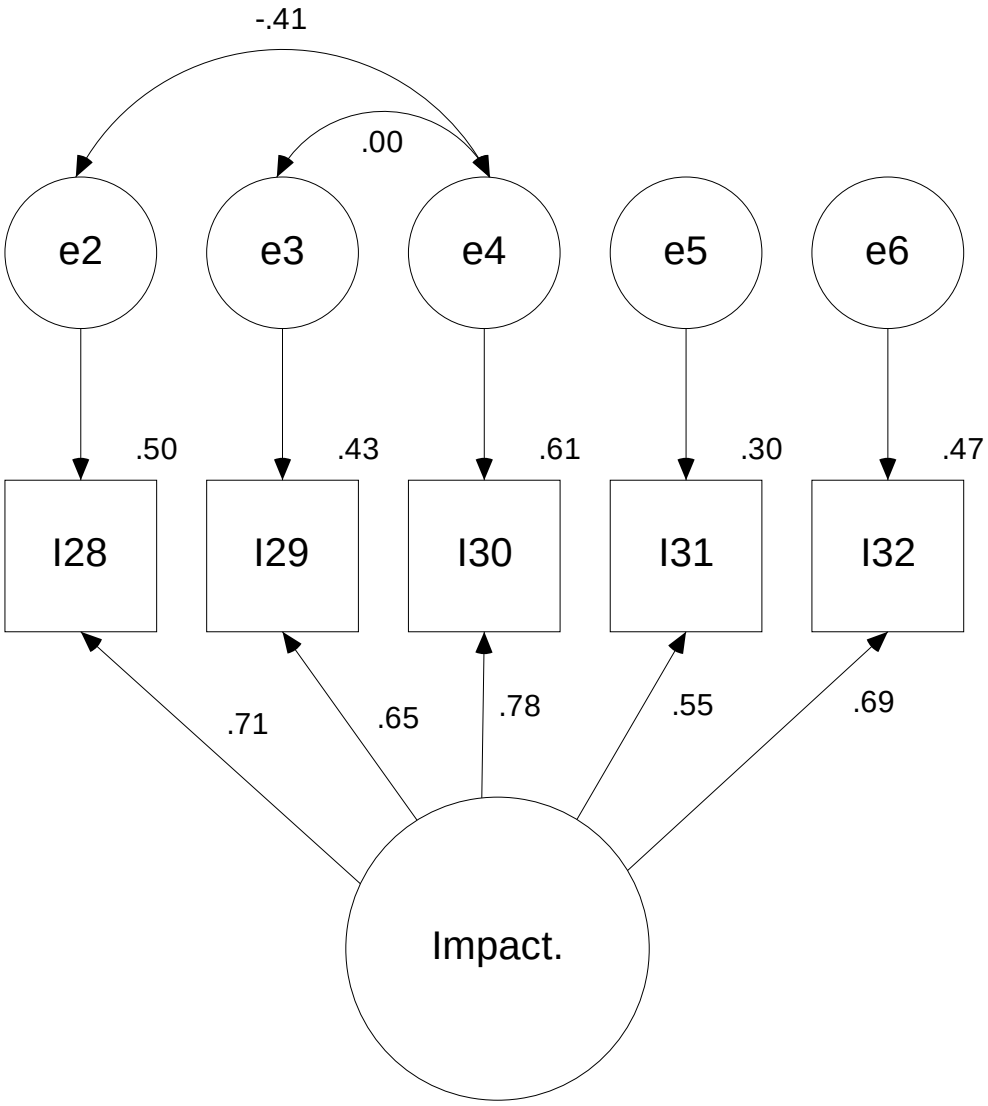


Figure E.4 Impact congeneric model confirmatory data

CMIN/DF=8.879
RMR=.031
GFI=.985
AGFI=.909
CFI=.984
RMSEA=.144

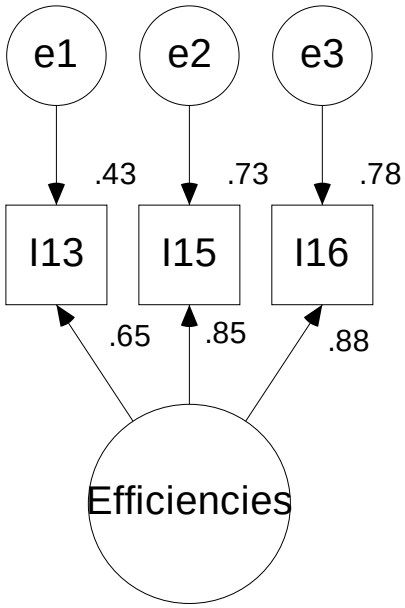


Figure E.5 Efficiencies congeneric model confirmatory data

CMIN/DF=.000
RMR=.001
GFI=1.000
AGFI=1.000
CFI=1.000
RMSEA=.000

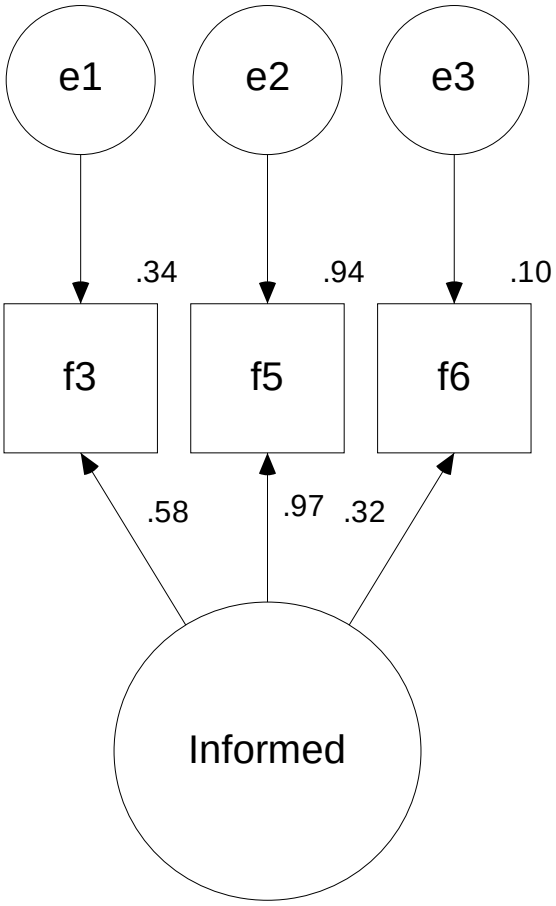


Figure E.6 Informed congeneric model confirmatory data

CMIN/DF=5.962
RMR=.018
GFI=.990
AGFI=.939
CFI=.966
RMSEA=.114

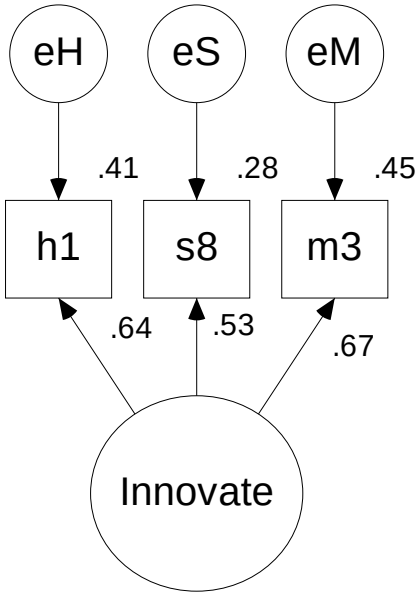


Figure E.7 Innovate congeneric model confirmatory data

Appendix F

Comments from survey respondents

R#	Comments from survey respondents
1	We only upgrade software in consultation with our computer support people if it will either make us more efficient of if we need to interact with other companies with whom we do business
2	I extensively use Microsoft development tools to develop in house programs and reports – ie. use Visual Basic 6.0, C++ and Microsoft Access. My biggest problem with any upgrades of these development tools or the office suite is incompatibilities between the myriad versions of files and libraries that Microsoft distributes. This phenomenon is commonly called “dll hell”. I have continuing problems with inconsistencies between machines where one will happily run an in house program and one will not. Upgrades invariably contribute to this problem.
3	Hard to justify continual upgrades at expense for minimal gain (unnecessary)
4	Our main business software (most important s/ware) has been modified to suit our requirements to such an extent that upgrades are mostly impossible. Our software suppliers have not modified their base software to encompass our changes so therefore when an upgrade becomes available it does not suit our modified version. This has happened over a period of about 15 years and as a result we are looking at new software to meet our future needs. The research required for a suitable software package is very time consuming and daunting but a necessary process.
5	Software upgrades in recent years has caused us to upgrade hardware. However the old hardware is fine except for the lack of backward compatibility with the new software to the old. That is, the old versions cannot open files generated in new versions. A future requirement of all new software is that it should have backward compatibility with the previous versions. It should be a capital offence to design software that is not compatible – we should be able to shoot programmers who design non-compatible software
6	I tend to upgrade when I notice recurring problems with my existing version, or if a new version has added functionality that I have been looking for. Upgrading to a new version of the same software is usually cheaper than buying new software. More importantly it does not require learning from scratch. Unfortunately most software companies have become very money hungry and distant from their customers. They take no notice of customers’ complaints/suggestions and want to charge a fee just to let a customer talk to them. (Even if it is to report a bug in their program). Worst case example =MYOB Australia Other bad ones = Microsoft, Symantec, Sausage software.

7	We purchase upgrades of accounting software mainly to implement government charges, eg. Tax sales, super contribution etc for payroll and new systems eg GST. The upgrades are automatic, because we have a “cover” subscription that includes on-line support. This together with on screen training reduces the need (to zero) for outside training.
8	IT issues overly dominate much of our core business. We are builders – a computer cannot yet build a building. Let’s get things into perspective
9	Once you have made an investment in software it had the affect of locking you in to that software. Upgrades usually come with a support contract, so happen automatically, and free of decision requirements.
10	Our most important software is our property management system running on Unix/Linux.
11	I took most of the questions to refer to upgrades of existing software rather than something totally new (except where the question showed otherwise). Each time I have bought new software, it has bought unexpected problems, enormous amount of time to select then transfer data etc and then learn to use the new system. My experience with consultants has been less than inspiring.
12	Software upgrades are risky not in a neurotic sense but as with office2000, packages are rushed onto the market and are automatically upgraded by business. However they have found several bugs on the programming. There is also not many new benefits in their package so we will be waiting until the glitches are ironed out and buy feedback from users before rushing into upgrading. No glitches no problem.
13	We made a strategic decision to use particular industry specific software 4.5 years and are able to suggest modifications through their QA system. Changes are incorporated in upgrades that, on average are provided about quarterly as part of our software maintenance agreement. This is in contrast to our experience with Microsoft products eg. MS Office, which we feel are of dubious reliability and subject to business practices RE upgrades which are clearly exploitive.

14	The special - most important – software is for 3D – resource modelling, planning, design scheduling – its expensive and there are many 'brands' – each with specific attributes and customers (mines and mining companies). Some use more than one brand and different combinations of sub-packages. Thankfully they are improving their data/model transfer capabilities. As consultants our choice is driven about entirely by our client's choices and reasons for purchase becomes, purely to get the job –short term licences sometimes available. The answers would be quite different for ordinary software.
15	Major reasons: 1. New hardware that requires more recent operating systems 2. new operating systems usually require newer software suites 3. e-mail attachments for files created by more recent software unable to be read by older software (other businesses send to us) 4. Change from 16 to 32 bit operating system. 5. New features that are required Last reason: New features that are not required
16	Once main software purchased, I feel "locked in" to the upgrades released and the support organizations pressure us into the upgrades and won't always support our site if we aren't on the latest upgrade.
17	Please note that the decisions about software and hardware are based on corporate international specifications. Most software is purchased under a corporate license. We are a software developer, so our own software is our most critical; therefore upgrading decisions are beyond the scope of the Aust offices.
18	Mot systems come with automatic upgrades for the yearly maintenance fees. Too many systems are designed by IT specialists who have limited practical business, and in particular small businesses experience.

19	Upgrades came out too frequently, at too high a price, with extra “features” that are not needed and usually before the bugs in the last release have been sorted out – then we get a whole new set of bugs to enjoy. Software clashes between packages are becoming more frequent as the software becomes more complicated. For the average user, Y2K was a load of hogwash – most people didn’t need to do anything. Some manufacturers require you to purchase each upgrade (i.e. financially penalise you if you try to slip one) thus lining their pocket at the expense of their customers – AutoCAD is a perfect example. Cost is so high there but there is no easy way out. Now Autodesk are considering “leasing” their software at 25% of purchase price every 3 months – what a bargain!! (I think not)
20	Note I am 72 years old and my children didn’t want to come into this business so I didn’t do anything about computerisation but now they are interested so I have to think “young” again. Hope to get e-mail and a website soon.
21	The day when software “manufacturers” are bought to account by the ACCC for their shonky business practices won’t come soon enough. Only this software (and perhaps medical) industry can charge the customer to fix their stuff-ups.
22	Question to M1 appear to be to narrow. Suggest using top 3 or top 4 most important software. All our software is equally important. If the software fails business stops
23	Regarding compilers and development tools, our choice of upgrade is almost always dictated by the requirements of the Australian Defence Department requirements and may even require us to maintain old versions of S/W for subsequent years of support. Regarding office S/W, we have to be compatible with clients for the exchange of documents charts et.
24	We are under the umbrella of a multi national publisher all major upgrades are bought at a higher level except for standalone software used by us eg. Macintosh website development.

25	Most important business software is related to Geographical interpretation. Upgrades are a pain we have to endure because clients expect the latest whiz bang presentation and the software companies keep upgrading as a revenue gathering exercise. All for the development of new and exciting technology instead of a different coat of paint
26	The cost of keeping up with computer technology is becoming prohibitive for small business. I would estimate that we would use1/2 person annually keeping our software and hardware operational. This time negates many of the cost savings gained using computers
27	For our most important software we are on an annual maintenance agreement which entitles us to phone support and all upgrades. Our upgrading is almost a certainty because of it. Like most companies we are basically held at ransom by this agreement, because if we do not maintain the service contract, we forfeit the right to upgrade
28	In the area of Word processing MS Word is the industry standard that makes transferring WP applications virtually impossible. The monopoly that Microsoft has is a very real problem
29	Our existing most important software is very much in-house developed. System upgrade is continual but not technically 'purchased'. We will however be scrapping the system in about 12 – 18 months and replacing it with a modern ERP system
30	Software upgrade is useful and expensive too. We upgrade only in the technical areas like graphics, design printing, accounts. But software used for office eg. MS Office we do not upgrade as it happens in the market, nor we do in terms of OS. Because charge/ upgrade in these area involves high expense and risk of failure, security, and compliancy (OS).
31	Routine (eg annual) upgrades of application software cause less disruption than the occasional major change
32	In general, we upgrade software when it becomes imperative. eg. If everyone starts supplying AutoCAD 2000 drawings to us, we will have to upgrade from AutoCAD R14. Left to ourselves, we would prefer not to upgrade as it is usually disruptive, and the benefits to us are minimal

33	Need for specialists to advice on application of both hardware and software in specific situations. Difficult to find independent specialists not biased to either hardware or software manufactures, who therefore have vested interest in promoting those products with which they are associated.
34	Our main reasons for upgrading software are as follows. To allow the software to continue working To enhance its performance = faster smarter better To provide additional functions To remain compatible with customers/suppliers The main concerns are The overall cost - $ and downtime Re-training if required Installation and implementation Can we afford to be left behind?
35	With regard to our most important software – we have a subscription with our software provider that includes all upgrades and support. We will continue with this subscription indefinitely
36	One of the major considerations is cost, however this is not the case for industry specific software
37	The company is an Internet Service Provider to other businesses and the public and also runs an internet café and so software is an integral part of the business. Decisions on what software to use and when to upgrade are critical to the operation of the business. The decisions are often strategic and always made on the basis of benefit vs cost. A considerable amount of our time is spent evaluating and trailing new software before it is installed in production/ business systems
38	Ongoing evaluation <u>after</u> upgrade is essential – its not a matter of doubt but rather a way to enhance a decision to enable a better process next time round
39	Software companies lack experienced staff to provide accurate advice and also to carry out tasks such as upgrades without major disruptions to the business. We have found a void in availability of experienced people in our software supplier. Also, the cost of upgrades is inflated by the cost of having what I consider standard software settings such as P, INV and Statement layouts re-done in the new version. Generally our view of software consultants is they charge a lot and deliver little

40	My most important piece of software is the accounting/stock control. It has been modified extensively to suite us as (and?) is modified on an ongoing basis. Purchasing an 'upgrade' is not as simple as buying the next version. Modifying the next version to suit us would take months
41	Word processing dose not constitute a large part of our computer use. We receive our accounting programmes as they are released from the Software Company as part of an extended support package at no additional cost
42	Generally wait for at least one service patch to come out for mainstream software. Our most important software is custom built, so upgrades are usually out our request or identification of a need
43	Software upgrades do not present problems for us. However the cost of service/maintenance does
44	Having felt the need to switch from an US based software to an Australian because of the GST we found that the 'upgrade' turned out to be a step back in basic areas and a step forward in GST handling and payroll. The cost associated with the switch over has been great whereas the overall benefit or productivity has not improved due to some major flaws in the software. Acquisition price for both softwares are (were) similar. To consider another software in accounting at this point in time is out of the question due to cost factors both in acquisition and human resources before and after purchase. Previously we were pretty happy with the software upgrades we did.
45	Our most important software product is industry specific (Surveycraft). We don't actually own the software but lease it from SPSS. Therefore all upgrades to the software are included in the leasing structure and there is no separate cost. For off – the – shelf products we upgrade almost all versions of software except Microsoft products (Office and Windows the reason being the upgrades are too expensive and often don't work until a second edition comes out (by then they are onto the next system).
46	We pay a yearly fee for upgrades to our Timberline accounting and job costing programmes
47	This company has not had the computer system installed all that long thus decisions and value of upgrades has not been experienced over a long enough period to really answer some of these questions

48	My accounting software is upgraded every time it is available as it is a requirement to maintain support and is included in the annual support cost
49	Please consider the pressure put on home computers to upgrade – hardware and software when there is an upgrade at work
50	We use software for Accounting, inventory control, manufacturing, costing, sales analysis etc. All aspects of our business are sourced and systemised by the software package. Access and Excel are used to supplement reports/information needs. The use of the internet is restricted for security purposes
51	We have an ongoing maintenance agreement for our accounting package for an annual fee
52	We often receive artwork from customers. If they use the latest we must have the latest version to open it. This means we must have the latest versions of illustrator, freehand and Corel. This is very expensive and otherwise unnecessary. We only use Illustrator and an old version would do.
53	I subscribe to (upgrade and support) only for critical applications like accounting complex interactions between s/w and operating systems is a major concern when upgrading I upgrade only when I have a business reason to do so and not at the 'suggestion' of a supplier. software companies that force many upgrades and do not support old versions are avoided and/or removed from computers
54	Although the choice of software is important its application is just as important if it is to deliver the anticipated efficiencies. A strategic plan must be developed involving HR functions associated with redundancy and training. If you cannot reduce staff or increase efficiency against measured criteria then you have to question why you are spending the money. Buying computer equipment and associated hardware should be a cold detached business decision and be no different than any other business decision
56	Software upgrades in my industry (printing) are generally cheaper if imported from the USA – conversion rate and freight included – Quark Xpress is the best example of a monopoly in the retail software market. $3600A $595US – ridiculous I' sure you'll agree

57	Often when deciding on a purchase of business operatives' software you choose one to grow into ie probably too large for your immediate needs but see a requirement for in the future. Upgrades available often far outweigh requirements for the next few years and as you are finally achieving the optimum form your software support is no longer available Word processing packages and spreadsheets upgrades are basically forced on you by Microsoft as though strategic decisions all must be taken Other packages that are better are not used because Microsoft does not produce them. Many packages are too smart.