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Factors Influencing the Decisions of SMEs to Purchase Software Package Upgrades

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Abstract

Despite the substantial contribution to the software industry by small and medium enterprises 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 multi-method approach explored these factors. Although the analysis demonstrated that innovativeness, and to a much lesser extent, potential relative advantage and complexity influenced the likelihood to upgrade software, the fit of the resultant model accounted for much less variation than expected. The inconclusive analysis has called into question the efficacy of diffusion of innovation theory to explain software upgrade behaviour.

Keywords

Diffusion of innovation, software package upgrades, SMEs.

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. Today, computers are widely used by all business entities and many rely on software packages for administrative and core business functions. When the suppliers of essential software provide frequent upgrades, it can lead to high costs and frustration for managers tasked with deciding if and when to purchase the software upgrades. Complaints have been reported that while managers find upgrades are costly to buy, learn and install, and provide little benefit, managers feel compelled to purchase upgrades in order to maintain compatibility with the rest of the world (Ellison & Fudenberg 2000).

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 especially labeled, 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) (Raghuathan 2000).

In Australia, it has been reported that 95 percent of small businesses (1-19 staff) and all medium business (20 to 199 staff) own a computer (Sensis 2005). These small and medium enterprises (SMEs) represent a significant and growing segment of the Australian software market: it is estimated that the 1.3 million small businesses and 78,000 medium businesses invested a total of AUD\$2,722 million in software in 2004 (Sensis 2005, ABS 2006). A recent survey in 2004 commissioned by Yellow Pages revealed that the major software applications purchased by SMEs were accounting packages (42%), followed by software for day to day business operations (10%), graphics and design packages (9%), and databases (9%) (Sensis 2005).

The organisation of this paper is as follows. After a brief review of the literature, the research questions are stated and a preliminary model presented. A preliminary study involving interviews is described with its

findings. Details of the survey formulation, execution and results, and a model based on the survey results are presented. The model is discussed in conjunction with the findings from the interviews and survey. As well as conclusions, the final section provides directions for future research.

LITERATURE REVIEW

Although there has been a concerted and fruitful research effort regarding information technology (IT) adoption and investment in IT, only a minor portion of research to date is specifically about the selection of software packages (Howcroft & Light 2006). After reviewing research related to software packages, Howcroft and Light conclude that adoption of packaged software is a largely underrepresented research area in mainstream information systems literature (Howcroft & Light 2006). In regards to research relating to software upgrade decisions, Ng also highlighted the lack of research as she could only find 'mostly anecdotal evidence of practitioners' experiences, pitfalls to avoid, and factors to consider prior to upgrading' (Ng 2001 p.432). Sahin and Zahedi (2001) highlight the phenomenal expansion of the software market, in particular the mass-marketed software packages, and bemoan the lack of interest shown by the academic community in issues relating to software warranty, maintenance and upgrades.

Many of the mass-marketed software packages are purchased by SMEs, but despite the large number of SMEs and their growing reliance on IT, there is surprisingly little research about IT adoption by SMEs, a recent exception being Cragg (2002). The findings from existing studies which focus on large organisations are unlikely to apply to SMEs due to various fundamental differences between large and small organisations (Thong & Yap 1996). As far as research relating to the selection of software packages by SMEs, to the authors' knowledge, the only empirical study to date is that of Chau in Hong Kong (1995). The issues relating to software upgrades for SMEs are even less researched; a review of the IS literature failed to identify a single study.

The lack of research attention to SMEs and software upgrades is problematic because research about large packages such as ERPs may not apply to small firms. ERP packages are very expensive and thus only affordable by large organisations. In order to bridge this gap, this research incorporates existing literature on diffusion of innovation, IT adoption and consumer behaviour to develop a model of factors influencing software upgrade decisions by SME managers.

This research is important for many reasons. SMEs rely on software to operate their business, and the myriad of small and medium firms make a worthwhile contribution to the national economy. As this research will contribute to better understanding the dynamics of their software upgrade decisions, it has the potential to improve the productivity of SMEs. To date, research on software packages has focussed on selection of new software packages, not on upgrades. In reality, most software purchases today are more likely to be upgrades of existing packages, rather than investment in new applications (Viard 2004). SMEs are largely ignored by academic researchers; consequently, much information systems research is biased towards large organisations and may not be relevant to small firms (Attewell & Rule 1991, Thong & Yap 1996). Therefore, this research makes an important contribution by raising awareness of the important and neglected issue of software upgrade decisions by managers of SMEs.

Research questions

There are two research questions addressed in this study: what factors influence SMEs in their decision to upgrade software packages, and to what extent do the identified factors influence the likelihood to upgrade software? In this exploratory research, the literature on diffusion of innovations, organisational buyer behaviour and adoption of information technology in small business is examined to find factors that influence the adoption of software upgrades in SMEs. From the literature review, six candidate factors are identified: characteristics of the business and manager, innovativeness of manager, relative advantage, external influences, complexity of purchase decision, and compatibility. Each of these factors is now discussed in turn.

Characteristics of business and decision-maker

Numerous studies have considered business size and sector influence on IT usage (Kagan & Lau 1990) 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).

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).

Innovativeness of 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.

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).

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.

Complexity of purchase decision

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* decision, 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.

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).

PRELIMINARY STUDY

Research approach

It has been noted that survey and fieldwork approaches are complementary for information technology research, as traditional survey work is strong in areas where field methods are weak (Gable 1994, Attewell & Rule 1991). The use of in-depth interviews and surveys enables both a detailed picture of a few companies as well as a broad view of SMEs. This research meets the criteria of mixed methods research defined by Gallivan (1997) as it is empirical research using two different methods for collecting data; one of the data collection methods is qualitative (interviews) and the other is quantitative (survey); both qualitative and quantitative data are presented and analysed; and the researchers address a theoretical question rather than providing description only. The qualitative data collected through the interviews enable the researchers to explore the topic with participants at sites (Creswell 1998). The issues identified from the interviews are explored further by surveying a large representative sample to determine common factors that influence the decision to upgrade software. Preliminary in-depth unstructured interviews were conducted with managers of small businesses to facilitate the development of a questionnaire for a survey. In-depth interviews are especially helpful for developing survey instruments and eight to ten interviews were considered appropriate to identify topical areas and appropriate language.

Interviews

For convenience, managers of businesses in the local area were selected based on the personal contacts of one of the researchers. Early in the year 2000, the managers involved in making the decision on software purchases from ten businesses were interviewed by one of the researchers; each interview lasted for approximately one hour. The notes from the interviews were analysed by the authors to discern themes and issues. Pertinent quotations from interviewees are reproduced to illustrate discussion points and are shown enclosed in quotes.

Business manager characteristics

A profile of the ten businesses involved in the interviews is shown in table 1. All businesses use industry specific software that they consider to be their key software as well as office and accounting software. Most use e-mail and many also use point-of-sale systems, payroll and electronic banking.

	<i>Business</i>									
	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>
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. Sector: W=State-wide, N=National, L=Local. na=not available										

Table 1 Profile of businesses participating in the interviews

While the final research will concentrate on SMEs, some large businesses were included at this preliminary stage, to highlight any differences that exist between the small and larger business. Also, the findings from the interviews are not considered to represent the views of all Australian businesses; they are appropriate for the purposes of identifying key issues from which the survey instrument could be developed.

Innovativeness of manager

One manager considered himself to be innovative, with his firm used as a 'test-bed' for software and a leader within its industry in terms of its business practices. However when it came to actually purchasing software, he expressed caution and confessed to never buying the first version of any newly released package. Another business, also from the service sector behaved in a similar fashion. That manager kept up to date with hardware but was willing to wait when it came to purchasing software. When this anomaly was expressed in the interview, his response was, 'the second mouse gets the cheese!' So while these managers would be classified as innovative in some ways they were cautious later adopters with software upgrades. Reasons for this reluctance to upgrade may have been related to the type of software. For example, for a word processor 'you can only type a letter so many ways and don't need a powerful word processor to do it' and for the industry specific software the preference was to skip a version, 'when they came out with a new version for Windows, ... I kept using my DOS version. When it was upgraded for the Y2K issue – as I knew it would have to be – I checked it out again and decided to upgrade then'.

Relative advantage

Only two of the ten businesses conducted a formal cost benefit analysis for software upgrades. These two large firms employed dedicated IT staff. Most of the smaller businesses did not conduct a formal cost benefit analysis for software upgrades. Some owners claimed they do a quick 'mental' calculation, but conducting a full analysis was 'not worth the effort'. An alternative view expressed by one of the more cautious owners was, 'will it inhibit us if we don't upgrade our software?'

All of the businesses were asked how much they actually relied on their computers. With the larger businesses the computers are 'mission' critical. All the other businesses use them as much as possible. Typical comments were 'we couldn't do it without them' or 'I would hate to do it manually' or 'we're totally dependent on computers'. Given this dependence on computers, the managers were asked what they looked for in upgrades. All managers felt the software must be easy to use and cost effective.

Clearly, if the software has to be checked for ease of use it must be evaluated. The larger organisations look to computer journals or the Internet for information, while the smaller organisations tend to seek advice from 'gurus'. These can be the accountant 'he is a switched on guy', the hardware vendors 'but I don't understand them', or they wait until they can discuss the upgrades at a conference or trade seminar with 'the good guys – the ones who know what they are doing'.

The range of software used by the businesses was diverse, consistent with the findings of the Sensis research. During the interviews, the managers were most interested in discussing their industry specific software. Two businesses most reliant on computers used custom software. However, when asked what the value of their computers were to their organisations, neither provided a detailed answer except to say 'computers are essential'.

External influences

Most of the businesses are connected to the Internet, and some businesses found their Internet Service Provider had forced them to upgrade their web browser 'more than once' or some other software they used. Others mentioned the banks now required them to do their banking electronically, necessitating forced software upgrades. Every business has made changes because of Y2K and the Australian government GST legislation. Most acted on the advice of their accountants or software providers in this decision.

Complexity of purchase decision

Just where on the new-buy to straight re-buy continuum the decision to upgrade software lies is difficult to determine. Caution, cynicism and confusion about software upgrades are widespread. The risk involved in the decision seemed to vary not only by business, but also by software type. General office software such as word processors were either upgraded without question or not upgraded because there was no need, while the industry specific software required more consideration with some businesses taking in excess of one year to decide. Another said, 'We cannot afford to experiment with software. It has to be right.' Managers consider the upgrade question quite technical and seek advice mainly from 'gurus', friends, accountants, and suppliers.

Compatibility

Some owners felt they were 'forced to upgrade'. A large financial business that made extensive use of e-mail found that 'compatibility' problems were forcing the issue. They were happy with their current system as it does everything they require, however if they wish to use some of the new applications available then they must upgrade their current operating system. A number of the managers complained about problems experienced with

software which was not backward compatible, the need to change their systems to match the new software, and being forced to upgrade software when new hardware was purchased.

Summary of interview findings

The content analysis of the interview records confirmed that the factors identified in the literature affected the behaviour of the managers in regards their decision to purchase software upgrades. It seems that the likelihood of upgrading software is higher for managers who consider themselves to be more innovative, and is shaped by external influences such as requirements from government agencies and financial institutions. Although formal cost benefit analysis is not usually undertaken for upgrades, managers are under competitive pressure and are interested in any advantage provided by upgrades. The decision to upgrade administrative software is considered less complex than decisions involving core business package upgrades, but for both classes of software, compatibility with previous versions, other packages and hardware are considered by managers.

SURVEY

After completing the interviews, the second stage of the research project involved a survey of SMEs 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 which were directly measured by single questions: *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.

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 of 6000 records, 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.

Survey response and demographics

From the 1000 organisations to whom 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 is consistent with the distribution of the sample. Therefore it is a valid sample in terms of Australian geographic location.

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%).

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 2). Almost 21 percent of respondent recorded that they were certain to purchase the new version.

<i>Likelihood of purchase upgrade to most important software</i>	<i>Frequency</i>	<i>Percent</i>
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%

Table 2: Likelihood of software upgrade

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 3, indicate the majority chose the third category (equating to Rogers's early majority class).

<i>Adopter type when purchasing the software upgrade for most important software</i>	<i>Frequency</i>	<i>Percent</i>
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%

Table 3: Innovativeness in regards purchase of software upgrade for most important software

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.

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 0.689 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. Variables that loaded by more than 0.3 on more than one factor were removed and the analysis repeated. Principal component analysis identified six factors which accounted for 58.9 percent of the variance.

The factor analysis produced two factors related to perceived relative advantage. Examination of the items grouped for each factor revealed one factor concerned the possible *potential* for software upgrades to provide relative advantage, whereas the other set of items related to *actual* advantage of software upgrades.

A new factor emerged related to accessibility of information relating to 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.

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 4.

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	.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

Table 4: Regression model

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/manager characteristics; compatibility; perceived actual relative advantage, and observability.

DISCUSSION

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 leaves 61 percent of variance unaccounted for. There are at least four possible explanations as to why the likelihood to upgrade is not explained by the selected factors: the survey did not adequately measure the constructs, that is, problems with internal validity; the sample size was inadequate; the survey data is missing one, or more than one influential factor; and finally, the theoretical foundations were not appropriate.

Internal validity and sample size

Wherever possible, constructs were based on pre-existing instruments. For example, in their study of IT adoption by small firms, Thong and Yap (1996) used a single binary variable for *likelihood to adopt IT* based on whether the business was computerised or not. They found *likelihood to adopt IT* was significantly associated with CEO innovativeness, attitude toward IT adoption and IT knowledge. However, their measure of innovativeness was based on a pre-existing instrument of 32 items. It may be that the construct was not adequately measured by the single ordinal variable used in this study. In retrospect, the extent of external influence was not adequately explored in the perception items as questions about the influence of government, banks, suppliers and clients were not included. Furthermore, the survey contained 53 perception items and received 153 useable responses, less than the prescribed minimum ratio of five subjects per variable. Consequently, if a broader range of items were included, and more responses received then stronger factors may have emerged in the factor analysis which may have resulted in a model that explains more of the variance.

Missing factors

In considering additional factors not included in the study, diffusion of innovation and technology acceptance model (TAM) do not seem to offer any candidates. Although trialability was not explicitly identified in the literature or interviews, there were items in the survey to measure aspects of trialability. These items did not cluster to produce a factor for trialability. There were also items relating to ease of use and usefulness but these items loaded with perceived relative advantage or were eliminated by the factor analysis.

One area not thoroughly investigated in this research is the important relationship between software suppliers and their clients and the exercise of power by both parties (Howcroft & Light 2006). If the manager is involved in an effective user group for the core business software, then the new version may include requested enhancements and the business would be likely to upgrade. Some software development firms nurture a mutually beneficial relationship with their key clients and rely on them to beta test new versions. In this case, it is likely that the business would purchase the upgrade. This practice was mentioned by one of the managers in the interviews – they are often used as a ‘test-bed for software and often get it at a lower price’.

Some suppliers take a hard line with current clients and refuse to support previous versions of software, effectively forcing the client to upgrade or change to a new software package. This situation was reported in an interview: one of the managers said he ‘hates Microsoft but it is too much hassle to swap to other software’.

Another dimension of the supplier-client relationship relates to the pricing model in use. For example, since the survey was conducted, Microsoft (which has almost a monopoly in PC operating systems and office applications) changed its pricing policy from purchase to an annual licence. This practice named *software assurance* has resulted in user resentment and growing interest in alternatives such as open source software (Berger 2002). As a consequence of including upgrades in the annual license fee, the decision to upgrade software is no longer a direct cost decision, but still includes issues such as compatibility and training.

Theoretical considerations

Closer examination of Rogers's definition of innovation as *an idea, practice, or object that is perceived as new* (1995) raises the question: are software upgrades innovations? The majority of respondents to the survey (58%) considered the decision to upgrade software as a *re-buy* decision rather than *new purchase* (24%). This provides strong support for use of consumer behaviour theory rather than diffusion of innovation theory. Changes to the upgrade policies of software suppliers affects the balance of power in the client-supplier relationship (Howcroft & Light 2006, Raghunathan 2000). The analysis carried out Sahin and Zahedi (2001) showed that market volatility and technological obsolescence have a deciding impact on which warranty, maintenance and upgrade policies would be optimal for developers.

CONCLUSION AND FUTURE RESEARCH

Clearly, further research is needed to fully understand the factors influencing the decision of SMEs in upgrading software packages. Following on from this pilot study, it is intended to conduct another survey with a larger sample. Based on insights gained from this pilot study, the items will be refined and it is planned to use structural equation modelling to explore the relationships between the factors to better understand the software upgrade decision.

An important outcome from this study is the challenge to the accepted reliance on theories such as diffusion of innovation. Information systems researchers are urged to consider consumer behaviour theory to explore the re-buy decision of purchasers. To assess the impact of suppliers' upgrade policies on purchasers, it is suggested that theories from power relations, product development, and economics of information goods may help explain the behaviour of software purchasers. More research is required to closely examine these factors from the software purchaser's perspective generally, and for upgrades in particular.

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