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Exploring the Factors of Innovation Rejection

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Abstract

Computer systems cannot improve organisational performance if they aren't adopted. There has been much research into why and how systems are adopted by organisations and individuals, however the area is still unable to explain the adoption phenomenon completely. At the same time, innovation rejection, as a topic, has been largely ignored in the research literature. This paper aims to develop a list of factors which affect innovation rejection and documents an initial attempt to develop a research model that describes technology rejection. This section of the study explores the research literature for factors that affect rejection. The results show rejection factors at the environment, the organisation, the workgroup and the system levels. However, there is very little evidence of factors at the adoption process level. This could be an interesting area for further research.

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Introduction

Many businesses have found information technology to be important, if not essential, to their business practices. Businesses and individuals ostensibly perceive some value in this technology acquisition and innovation is held to be a driver of organisational success (Frambach and Schillewaert 2002) and "white collar" performance (Davis 1989:319). Accordingly, the topic of organisational technology adoption remains popular in the IS research literature. Many authors in the literature have attempted to develop research models that might explain the adoption of technology in organisations. Among these are Davis' Technology Acceptance Model, based on the Theory of Reasoned Action.

Farbey et al. (1995) attempt to unify the existing theories of adoption reasons by developing a "benefits evaluation ladder", which asserts that businesses adopt technology because of competitive pressure, technological necessity, regulation or government legislation. While these theories have received some support (Prescott and Conger 1995), Brynjolfsson et al. (1994) and Baskerville and Smithson (1995) assert that such a complex issue cannot yet be addressed given the immature nature of the area. In this respect, the research in the area is promising and valuable, but complete explanations remain, to some extent, largely elusive.

However, technology adoption is not a foregone conclusion, and there is no guarantee that firms will adopt technology. Despite the extensive prior research into innovation, researchers are still unable to fully explain technology adoption in every operational context. Accordingly, the research literature needs new approaches to the adoption problem. In the words of Gallivan (2001:52),

> *"rather than fitting the conditions under which traditional models of innovation adoption and diffusion…or technology acceptance…were created, the reality of innovation adoption and implementation within organizational settings may require modifications to these frameworks - or entirely new ones - to explain implementation."*

Coincidentally, research appears to have largely neglected the concept of technology rejection as an alternative to technology adoption. While Davis et al. (1989:982) argue that, "understanding why people accept *or reject computers* has proven to be one of the most challenging issues in information systems (IS) research" [emphasis added], there is very little published work. This is unfortunate, as it would seem that the technology rejection should be as useful in scholarly terms as technology adoption. Just as some firms seek to make use of technology, it would make sense that some firms reject technology in their operations. Additionally, there is argument in the literature that rejection is not simply “the mirror image of adoption” (Gatignon and Robertson 1989:47).

Curiously, there is good evidence in the IS literature that conventional acceptance-based adoption models such as TAM appear to explain only 40 – 50% of the adoption variance (Yang 2005, Sun and Zhang 2004, Gardner and Amoroso 2004, Legris et al. 2003, Hu et al. 1999, Lucas and Spitler 1999, Szajna 1996). Venkatesh and Davis (2000) were able to explain 60% of their adoption model variance using an updated version of the Technology Acceptance Model (TAM2).

If the TAM model has proven valuable to researchers, then it would be of benefit to attempt to develop a model along similar lines to explain technology *rejection*. The prospect that at least some of the adoption process could be explain in this capacity is certainly attractive. The aim of this paper is to develop a list of factors which affect technology rejection at different levels. In this regard, the paper follows in the tradition of Bailey and Pearson (1983) and Cheney et al. (1986).

This research benefits a number of groups. First, it would benefit researchers by providing an alternative perspective to adoption. The research may assist in explaining the technology rejection process in a variety of contexts and hopes to address the calls for research in this regard from authors such as Frambach and Schillewaert (2002), Chircu and Kauffman (2000), Martinsons et al. (1999) and Gable et al. (1997). The research would also be of value to practitioners by helping them to predict client barriers to technology uptake and hence predict management concerns regarding new technology. Third, the research should benefit managers themselves by allowing them to understand the barriers to technology adoption at different levels of their organisation, and to understand that these barriers are not solely attributable to the information technology itself.

The competing theories behind the reasons for technology adoption invite more fundamental analysis of the subject. This paper adopts the suggestions of Cerveny and Sanders (1986) and Franz and Robey (1986), who argue that this analysis should take the form of an examination of the implementation of systems in business. These authors argue that the analysis of business technology adoption will increase the understanding of business technology use.

The paper draws on several literature bases for foundation. First, the paper adopts advice from the Technology Acceptance Model (TAM) literature as guidance. The paper contextualises this with extant literature on technology inhibitors and barriers to organisational adoption. Finally, the paper also makes use of the literature on system use and adoption. Note that this study focuses on barriers to adoption and uptake: it is not designed to explain technology use *per se*, though it may contribute in that area also.

The rest of this paper is structured as follows. The next section provides an overview of some prior research into innovation and adoption, with a view to providing directions and lessons for the work at hand. The following section discusses the method used to search the literature for rejection factors. The results are then detailed. Finally, conclusions and areas for further research are provided.

Innovation

Before researching non-adoption, Abrahamson (1991:589) argues that theorists should first examine how the "dominant theoretical perspectives in the innovation diffusion literature contain assumptions that reinforce pro-innovation biases". Accordingly, the next section discusses perspectives on innovation from the research literature, followed by models of innovation and adoption.

Perspectives on Innovation

Some authors have noticed trends in the analysis of innovation. For instance, Oliva (1991) argues that the literature on technology adoption can be split into the supply side (where technology is available to the firm for the solution of problems) and the demand side (where a problem requires a solution and the organization has a need for a particular piece of technology). This follows argument and evidence from Solow (1957), Jensen (1982) and McCardle (1985), among others.

Others have divided innovation into three broad perspectives of the prediction of innovation in organisations, being individualist, structuralist and interactive perspectives. This trichotomous categorisation was originally proposed by Pierce and Delbecq (1977), and has received affirmation in Pfeffer (1982), Chaffee (1985) and, more recently, Slappendel (1996).

The individualist perspective is the oldest perspective for examining the prediction of innovation. The primary assumption underlying this perspective is that individuals drive innovation in organisations. Under this perspective, innovation is generally seen as static and well defined: once the innovation has been specified, little variation occurs until the innovation has been adopted. As such, the innovation process is deemed to be largely linear.

The structuralist perspective has been in use for some time. Kimberly (1976) cites Weber (1946) as a defining influence on the perspective. The main assumption under this perspective is that innovation is driven by structural characteristics, such as organisational age, size, capacity or complexity, of which of which some say "size is the most telling indicator" (Lind et al. 1989). As with the individualist perspective, this perspective sees innovation as static. However in contrast to the individualist perspective, newer research using this perspective treats innovation as a more complex process than one that could be described as linear.

The interactive perspective is the newest of the three approaches to the analysis of innovation prediction. Organisations approach innovations based on the knowledge that they have accumulated up to the point at which the innovation decision is made. This knowledge may be based on experience gleaned from past adoptions, word of mouth from other implementations, organisational necessity, dissatisfaction with the current state of affairs or other reasons. If the acquisition of this experience is an ongoing process, then such knowledge should also be forthcoming while the adoption is in progress. As a result, innovations are always changing. This constant change results in a complex innovation process, and may result in a complex innovation. Studies based on this point of view typically analyse innovation from the perspective of both individuals and structural characteristics. The innovation process itself is seen as quite complex, with the innovation undergoing constant redefinition and change.

Models of Innovation and Diffusion

The examination of innovations receives considerable attention in a variety of scholarly literature areas. Commercial innovation, in particular, comprises a substantial part of the research literature. Both the popular and research literatures have keenly observed the fervency with which commercial entities have adopted new technologies in general and information technology in particular. A number of authors have noted the large amount of resources (both financial and otherwise) being devoted to this innovation, and a number of models exist for examining the innovation phenomenon.

Innovation Diffusion

Innovation Diffusion examines the way groups of a population adopt an innovation, and describes this acquisition on a macroscopic scale. Adopter groups are classified according to their date of adoption relative to the innovation's date of inception. Innovation Diffusion has its origins in the field of agricultural science (Rogers 1983), but has since been used in other disciplines. Ryan and Cross (1943) apply the technique to corn seed technology, Coleman et al. (1966) use the technique to examine the introduction of new medicine, and Brancheau and Wetherbe (1990) apply Innovation Diffusion to the adoption of spreadsheets. The age and breadth of application of this technique is attractive: they suggest Innovation Diffusion is suitable to the analysis of adoption in a range of environments.

However, Innovation Diffusion is inappropriate in certain circumstances. One weakness of Innovation Diffusion is that it does not focus on individual adopters. Rather, it deals with groups of adopters relative to a wider population. Innovation Diffusion follows a a repeating process of invention, innovation and diffusion (King et al. 1984).

The cycle begins with the creation of a new product or modification to an existing product. A member of the population notices the innovation and implements it after a trial period (Oliva 1991). Diffusion occurs when other members of the population begin the process anew. Hence, the analysis of the diffusion centres around examining the behaviour of groups of adopters. For studies examining the characteristics and behaviour of individuals (such as employees, businesses or governments), Innovation Diffusion would be unsuitable.

The second possible weakness of Innovation Diffusion is that it assumes that all potential adopters will eventually adopt the innovation, and does not allow for the existence of potential adopters who assess the innovation and decide against adoption. Potential adopters assess the innovation and its associated risks as they receive information about it (Rogers 1983). Additional positive information about the product lowers the perceived risk, while additional negative information heightens the perceived risk. Adopters, for whom the benefits outweigh the risks, increase in number over time as more information about the innovation becomes available. Eventually the diffusion leaves only a small section of the population, known as laggards, yet to adopt. These laggards merely require more information about the innovation before they also adopt in time. Hence, Innovation Diffusion largely ignores the existence of non-adopters, a crucial element of this paper.

The third potential weakness of Innovation Diffusion is that it assumes rational behaviour on the part of population members. At any given point in the diffusion cycle, population members are rationally assessing adoption based on the information they possess. However, in some situations, the assumption of rational adoption behaviour cannot be made.

Abrahamson and Rosenkopf (1993) propose a "competitive bandwagon" effect, where people adopt or reject the innovation by mimicking others, and not because they have rationally weighed the costs and benefits. In circumstances where this bandwagon effect influences adoption, or where the assumption of rational behaviour cannot be made, Innovation Diffusion is unsuitable.

Business Characteristics and Technology Adoption

Business technology adoption can be analysed according to the business' physical characteristics. Given certain business characteristics, inferences can be made about how the business will adopt technology (Yap 1990). Ein-Dor and Segev (1978), identify 22 characteristics of businesses which have particular bearing on the success of information systems. Ginzberg (1980) recognised 12 factors which affected the implementation of an information system, while Lind et al. (1989) focused on just two factors.

Business characteristics analysis can focus on the individual business in addition to groups of businesses. Second, the technique can be applied with equal measures of success to businesses that have and have not adopted the technology. Third, the technique makes no assumptions about the degree of rational behaviour of the businesses.

The size of the business is held to be the most important characteristic in the analysis of technology adoption (Lind et al. 1989) and it has been found to apply equally well to large and small business groups (Raymond 1985). Older studies suggest that technology adopters tend to be larger than non-adopters (Montazemi 1989). Montazemi speculates that this may be because larger businesses can allocate greater financial and personnel resources to the adoption and use of new technology. Also, as a business increases in size, its task coordination may become more complex, and its reliance on the movement of information may also increase (Yap 1990). In contrast, some newer studies find adopters tend to be smaller than non-adopters (Grover 1993). Small businesses may be able to adopt technology because they are more flexible or can adapt to changing environments more quickly than larger businesses (Grover and Teng 1992).

The length of time for which the business has been in operation should have a direct effect on the way in which the business adopts technology. Earlier studies suggest that adopters of technology tend to be older than non-adopters (Franz and Robey 1986). Older businesses may be better able to adopt technology as they have greater experience with assimilating new processes into their operations (Evans 1987). An older business may also possess a greater reserve of funds to apply to the acquisition and maintenance of technology (Raymond 1985).

The industry of which the business is a member may influence the business' information processing requirements, which could affect the business's adoption of technology (Yap 1990). Service industries, which rely on the processing of information, depend on information systems. Retail industries, which rely on the transfer of goods, may have a greater dependence on point-of-sale systems (Premkumar and King 1994). Manufacturers would rely more on material requirements planning (MRP) and CAD/CAM systems (Ein-Dor and Segev 1993). Hence, certain industry types will adopt a given system if it suits their task requirements.

A technology support group will favourably influence business adoption of new technology (Ball et al. 1987). First, businesses with information technology support groups are well equipped to assimilate new technology into their operations (Grover 1993). Second, the members of the information technology support group may positively influence technology adoption by acting as advocates for the new technology (Jarvenpaa and Ives 1996). Third, the existence of a specific technology support group indicates a progressive attitude towards technology (Cohn 1980). These arguments suggest that the technology support unit positively affects technology adoption even when the technology is easy to implement and use.

Businesses with information technology budgets are likely to be technology adopters. First, the budget represents an enabling factor for the adoption of technology: unforeseen acquisition of technology may not require the realignment of other business expenditures (Barua et al. 1995). Second, the budget's existence indicates that the business considers information technology to be of importance to their operations (Grover and Teng 1992). These arguments, however, may only apply to the acquisition of larger or more complex systems, where substantial capital outlay is required.

Technology adopters exhibit higher levels of technological experience than non-adopters. Businesses that have a more diverse background in information technology adopt newer technology before businesses that have been reticent about technology adoption in the past (Grover and Teng 1992). Systems implementation also tends to be more successful amongst experienced businesses (Sanders and Courtney 1985).

Other characteristics in addition to those outlined above are identified in the literature, however their relationship to technology adoption has been inconsistent. Such discrepant characteristics include the presence of a systems analyst (Yap et al. 1992), management support (Cale and Eriksen 1994), management structure (Sanders and Courtney 1985), remoteness of business location (Raymond 1985), and customer requirements (Yap 1990).

The Technology Acceptance Model

The Technology Acceptance Model (TAM) (Davis 1989, Davis et al. 1989), is another approach to exploring adoption and the use of innovations. The model, based on the Theory of Reasoned Action (TRA) uses the innovation's perceived usefulness, perceived ease of use, personal attitude and behavioural intention to predict innovation adoption and use.

TAM is popular in the IS literature as a model of intention to use. Despite this popularity, the model is based on determinants of consciously intended behaviours (Davis et al. 1989, Ajzen and Fishbein 1980). The model may be less useful in situations where the subject does not consciously intend to reject an innovation, or is not given the chance to consciously reject the innovation. For instance, governmental legislation may preclude a given user from being able to form the intention to accept or reject the innovation. Such circumstances may occur when an innovation can have perceived value but is deemed not to be in the public's or government's best interest. Similarly, organisational preference for one processing platform or vendor may mean that employees are not exposed to alternative platforms and hence lack the information required to form an intention to accept an innovation. This situation could be exacerbated in cases where the subject has limited resources (such as time) to distribute among competing tasks: there may exist an "economy of accomplishment", whereby the innovation is not an end, but rather a means to satisfying the demand of another task.

In these circumstances, the personal intention to adopt may be very low, but the innovation is accepted because it allows the subject to complete another task.

In terms of the underlying TRA theory, the user may have little or no motivation to adopt the innovation itself, however they may be interested in the benefits resulting from using the innovation, or being *seen* to be using the innovation (echoing similar argument regarding the Abrahamson's (1991) discussion regarding the effect of "fashions" on innovation). Davis et al. (1989:986) acknowledge that "enhanced performance is instrumental to achieving various rewards that are *extrinsic to the content of the work itself*, such as pay increases and promotions" [emphasis added] however it should also be recognised that this benefit may also be wholly extrinsic to the *innovation*. Further, while Davis et al. (1989:986) do argue that "in some cases, people may use a system in order to comply with mandates from their superiors, rather than due to their own feelings and beliefs about using it", it should be noted that the system may not be mandated, yet the resulting output is.

Ad-Hoc Models of Adoption

For some time it was assumed that businesses were purely rational with regard to technology adoption (Lientz and Chen 1981), their adoption reasons based on judicious cost/benefit analysis. Huff and Munro (1985) and Earl (1987) refuted this rational approach, proposing instead that business could be compelled to adopt technology in their drive to be efficient, effective and competitive. Such research may not accurately reflect reality (Gallivan 2001), and may focus on wider organisational aspects at the expense of individual issues (Orlikowski 1993, Fichman and Kemerer 1997).

Accordingly, in addition to the specialised models of innovation and adoption discussed above, various authors have developed more ad hoc models for individual technologies. For instance, Goode and Stevens (2000) constructed a business factor model of website adoption based on a review of the IS literature. Brancheau and Wetherbe (1990) explored spreadsheet software adoption. Moore (1987) examined end user computing and office automation. Ein-Dor and Segev (1978) investigate the characteristics that contribute to general technology adoption.

Similarly, contingency theory analysis incorporates aspects such as task uncertainty, firm size, business strategy and operating environment (Donaldson 1995). Teo et al. (1998) developed a contingency model to investigate Internet adoption in firms, using factors such as the degree of managerial support, technology policy, the degree of technology compatibility, and relative advantage of the innovation.

However, Meyer and Goes (1988:900) caution the use of too many factors in such adoption models, and that these may "lead researchers to conclude erroneously that an 'effect' may have arisen from any one of many possible causes. This situation…can be remedied by carefully discriminating between subtle differences in effects".

Lessons

The previous section discussed models for analysing innovation adoption. This discussion presents a number of important lessons for further work in the area of rejection.

The first lesson is that Innovation Diffusion has received considerable use in the literature but is unsuitable for research that focuses on individuals, rather than groups. Second, it assumes that all members of the population will eventually adopt. Third, it assumes adopters will always behave rationally. The second approach analyses the adoption of technology by examining the characteristics of adopter and non-adopters.

The focus on a single facet is unlikely to deliver a complete and useful theoretical model (Zmud 1982), which should at least incorporate organisational and task-focused aspects (Bretschneider 1990, Cooper and Zmud 1990). Tornatzky and Fleischer (1990) uses three levels, being external environment, the technology aspect and the organisational context. Thong (1999) extends this to include the group of organisational decision makers (although the characteristics of that group appeared to have little effect in terms of adoption). Importantly, technology rejection may occur at any or all of these levels (consistent with Swanson 1994 and Chau and Tam 1997).

In terms of the TAM, rejection does not appear to be the inverse of acceptance. Although some authors (such as Davis 1989) do discuss acceptance and rejection in similar terms, there are key differences. First, while acceptance under TAM may be based on intention, there may be no intention on the part of the subject to reject the innovation. Second, while acceptance under TAM is in the context of organisations and employees, rejection may occur at many levels, simultaneously or sequentially.

Research Method

Cook and Campbell (1978) argued that, where possible, a structured approach to research should be used. This is especially important in situations where *ex post facto* research is experimental or novel.

Approach

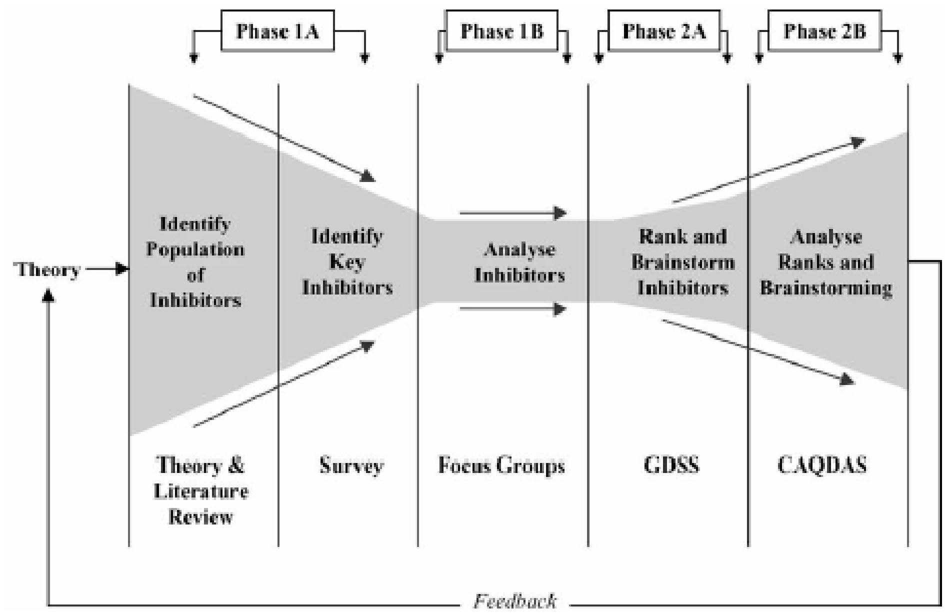
The study aims to develop a framework of the requirements for technology rejection. An analysis of the literature suggests a dearth of research into the existence or development of such a framework. Given the dearth of research in the area, this paper seeks to adopt an established method for research development. Accordingly, the paper adopts a similar approach to that of Delone and McLean (1992) in conducting a literature search to define the broader framework.

In the interests of developing a holistic assessment of rejection, the study was particularly cognizant of searching literature throughout the information systems spectrum. This search was to include journals from the "harder" area of systems development, including software engineering and formal methods, as well as the "softer" area of systems development, including user analysis, organisational behaviour and IT policy specification.

There is a paucity of research into inhibitors of technology adoption. This is unfortunate, as it would seem that the technology rejection should be as useful in scholarly terms as the concept of technology adoption. Frambach and Schillewaert (2002:172) write, "the [non-adoption] phenomenon is complex, because the reasons for non-adoption may lie at earlier stages of the adoption process", also citing the need for further research in the area of rejection. Further, one should not simply be treated as the inverse of the other (Gatignon and Robertson 1989). While studies such as Damanpour (1991) and Beatty and Gordon (1988) have discussed barriers to the adoption of particular technology products (general innovation and CAD/CAM adoption respectively), holistic analysis of technology rejection is lacking in the literature.

Importantly, Debreceny et al. (2002) has conducted useful summary work into the determination of inhibitors. Inhibitor Determination Methodology (IDM), developed out of work by Chwelos et al. (2001) and Iacovou et al. (1995), appears to be an appropriate context for the conduct of research in this area.

Figure 1: Inhibitor Determination Methodology (source: Debreceny et al. 2002)



Covering the entire IDM spectrum would prove to be too great an undertaking for a single document. Accordingly, this study covers Phase 1A of the IDM by identifying the population of inhibitor factors by way of a literature review and questionnaire survey. The review of the literature was conducted to identify principal barriers to technology adoption.

Method

Articles were taken from two groups of journals. The first group was deemed similar to other literature analysis studies in the IS field such as Delone and McLean (1992) and Ngai and Wat (2002). These journals included *MIS Quarterly*, *Journal of Management Information Systems*, *Information Systems Research*, *Information and Management* and *Management Science*. It was felt that this would give an indication of factors in use and was similar to other studies such as Delone and McLean (1992), Holsapple and Johnson (1994), and Straub and Nance (1990). Keyword searching, citation indexing and textual analysis were used to develop a list of inhibitors. The members were subsequently sorted into appropriate categories.

This study also sought to pursue journals from outside this group that might provide additional indicators from other areas of system analysis. In business, journals such as *Journal of Business Research* and *Journal of Business Venturing* were included. Also included were papers from journals which comment on social and technology interaction (such as *Technovation*).

Papers were selected on the basis that they discussed or mentioned technology rejection in some capacity. Keyword searching including terms such as, "inhibit", "barrier" and "reject" was also used. We looked for an explanation of the term and, cognisant of the implications of researching differing technologies, also noted the research domain in which the term was employed. For papers which tested their theory empirically, research items were selected on the basis that they were found to be significant or deemed statistically important. The literature search was conducted by the author, with the assistance of two research associates to provide additional advice (on the advice of MacQueen and Milstein 1999).

Results

This paper follows a broad classification method similar to that of Ngai and Wat (2002) and Lai and Mahapatra (1997). Importantly, the paper only notes those studies that specifically discussed the item as a barrier or inhibitor to adoption. This explains, for example, why legacy systems receive little coverage (despite the topic's popularity in the research literature).

Environment level

Table 1 shows the rejection factors relevant at the Environment level. The effect of positive environmental effects was noticed early on in the economics literature, notably by Morison

(1966) and Rosenberg and Birdzell (1986): that technology barriers were sufficiently low in western cultures to allow significant experimentation and adoption, and this explains the affluence in these areas. Chau and Tam (1997:5) argue that "one criticism of classical diffusion theory is that it has neglected market characteristics as an important factor in the adoption decision". Enns et al. (2001) also observe the importance of environmental conditions to IT proposal commitment.

Table 1. Environment Level

Group	Factor	Innovation	Citation
Inhospitable or insufficient market acceptance	Small market scale	Electronic commerce	Debreceny et al. (2003)
	Conservative market attitude	IT and innovation	March-Chordà et al. (2002)
	Thin market or user base	Electronic Market Systems	Lee and Clark (1996)
	Imitation of other firms in marketplace	General system innovation	Abrahamson (1991)
	Lack of environmental participation	Interorganisational Systems	Riggins et al. (1994)
	Dominant organisations reject system	General system innovation	Abrahamson (1991)
	Inhospitable industry structure	General innovation	Chircu and Kauffman (2000)
Anti hype or fashion effects	System no longer deemed fashionable	General system innovation	Abrahamson (1991)
	"Too much hype"	Electronic commerce	Debreceny et al. (2003)
	Perception that innovation is a fashionable fad	General system innovation	Abrahamson (1991)
Inappropriate or ineffective environmental infrastructure	Lack of telecommunications infrastructure	Telework	Pérez et al. (2002)
	Government health and safety policies	IT innovation	Hadjimanolis (1999)
	Lack of government assistance	IT innovation	Hadjimanolis (1999)
	Shortage of skilled labour	IT innovation	Hadjimanolis (1999)
	Inappropriate economic climate	Microcomputers	Cragg and King (1993)
Lack of policy	Legal and policy infrastructure	Electronic commerce	Debreceny et al. (2003)
	Lack of consumer protection	Electronic commerce	Debreceny et al. (2003)
	Import tariffs and export policy	IT innovation	Hadjimanolis (1999)
	Lack of regulation	Electronic commerce	Schoder and Yin (2000)
	Governmental bureaucracy	IT innovation	Hadjimanolis (1999)
Supplier Problems	Poor software support	Microcomputers	Cragg and King (1993)
	Supplier lead-time problems	IS support for manufacturing	Chang (2002)
	Poor external software supply chain management	IS support for manufacturing	Chang (2002)
	Quality of service provider	Internet telephony	Corrocher (2002)
Others	Y2K problem	Electronic commerce	Debreceny et al. (2003)
	Union reluctance	Telework	Pérez et al. (2002)
	Bank policies on credit	IT innovation	Hadjimanolis (1999)
	Lack of testing institutions	IT innovation	Hadjimanolis (1999)
	Limited access to research institutions	IT innovation	Hadjimanolis (1999)
	Absence of accepted business practices	Electronic commerce	Schoder and Yin (2000)
	Union resistance	CAD/CAM	Beatty and Gordon (1988)

Firm/Organisation Level

Table 2 shows the factors relevant at the firm or organisation level. It is interesting to note, then, that much of this extant inhibitor research centres around firm-level inhibitors. As firms are some of the most common subjects and consumers of scholarly research, it is unsurprising that firm-level factors comprise the largest group in these results.

Within this group, infrastructure-related barriers are the most common. Specifically, a lack of infrastructure may prevent system adoption (Boyes and Irani 2004). Additionally, infrastructure which is unsuitable or better suited to legacy systems may prevent or preclude the adoption of a new system as existing business processes and facilities are otherwise incompatible. Insufficient resources may being about similar conditions, particularly if limited resources must be divided between competing projects. Some managers may be reluctant to devote precious resources, such as time and money, to unproven technology.

Table 2. Firm/Organisation Level

Group	Factor	Innovation	Citation
Insufficient or dominant Legacy system	Investments in current model	Electronic commerce	Debreceny et al. (2003)
	Existing technological inhibitors	Electronic commerce	Debreceny et al. (2003)
	Low degree of innovation	Electronic commerce	Debreceny et al. (2003)
Infrastructure Problems	Low diffusion of PC	Internet telephony	Corrocher (2002)
	Lack of IT management tools	Client/Server Computing	Schultheis and Bock (1994)
	High MIS staff turnover	IS support for manufacturing	Chang (2002)
	Lack of organisational communication	General innovation	Damanpour (1991)
Lack of Resources or Infrastructure	Inadequate financial means	IT innovation	Hadjimanolis (1999)
	Inadequate facilities	IT innovation	Hadjimanolis (1999)
	Lack of required investment	IS support for manufacturing	Chang (2002)
	Inappropriate IT infrastructure	IT adoption	Broadbent et al. (1999)
	Inflexible IT infrastructure	IT adoption	Broadbent et al. (1999)
	Lack of qualified personnel	IT innovation	Hadjimanolis (1999)
	Lack of resources	General innovation	Chircu and Kauffman (2000)
	Insufficient infrastructure	IT adoption	Broadbent and Weill (1997)
	Temporal constraints	IS Implementation	Thong (2001)
	Financial constraints	IS Implementation	Thong (2001)
	Inadequate financial resources	Information systems	Thong (1999)
	Lack of time	Microcomputers	Cragg and King (1993)
	Lack of time	IT innovation	Hadjimanolis (1999)
Structural Barriers	Insufficient firm size	Microcomputers	Cragg and King (1993)
	Overly formal organisation	General innovation	Damanpour (1991)
	Overly centralised organisation	General innovation	Damanpour (1991)
	Organisational culture	IT tools	Gobbin (1998)
	Lack of organisational co-ordination and co-operation	CAD/CAM	Beatty and Gordon (1988)
	Lack of organisational absorptive capacity	General innovation	Cohen and Levinthal (1990)

Lack of Strategic Planning, Management and Support	Lack of clear strategy or vision	IS support for manufacturing	Chang (2002)
	Lack of management planning	IS support for manufacturing	Chang (2002)
	Lack of top management support	IT and innovation	March-Chordà et al. (2002)
	Management inertia	Client/Server Computing	Schultheis and Bock (1994)
	Lack of clear strategy	IT innovation	Hadjimanolis (1999)
	Manager resistance	CAD/CAM	Beatty and Gordon (1988)
	Lack of ability to plan strategy	IS support for manufacturing	Chang (2002)
	Lack of motivation	IT innovation	Hadjimanolis (1999)
	Lack of organisational commitment	Interorganisational Systems	Riggins et al. (1994)
	Lack of management commitment	IS support for manufacturing	Chang (2002)
Uncertainty or Lack of Information	Manager uncertainty	CAD/CAM	Beatty and Gordon (1988)
	Uncertainty of market acceptance	IT and innovation	March-Chordà et al. (2002)
	Technical uncertainty	IT and innovation	March-Chordà et al. (2002)
	Lack of environmental knowledge	General technology	Parente and Prescott (1994)
	Lack of market understanding	Electronic commerce	Debreceny et al. (2003)
	Lack of market information	IT innovation	Hadjimanolis (1999)
	Unclear future business model	Electronic commerce	Debreceny et al. (2003)
Others	Unclear system responsibility	IS support for manufacturing	Chang (2002)
	Health and security concerns	Telework	Pérez et al. (2002)
	Poorly defined production processes	IS support for manufacturing	Chang (2002)
	Perceived threats to operational stability	Client/Server Computing	Schultheis and Bock (1994)
	Excessive focus on direct labour productivity ratios	CAD/CAM	Beatty and Gordon (1988)
	High personal risk for managers	CAD/CAM	Beatty and Gordon (1988)
	Perception of hidden costs	CAD/CAM	Beatty and Gordon (1988)
	Heterogenous managerial constituency	IS/IT	Enns et al. (2001)
	Manager disagreement	IT adoption	Broadbent and Weill (1997)
	Lack of business and IT cohesion	IT adoption	Broadbent and Weill (1997)
	Perception of IT as a cost sink	IS/IT	Enns et al. (2001)
	Misalignment with organisational goals	IS/IT	Enns et al. (2001)
	Perceived expensive alterations to business process	General innovation	Chircu and Kauffman (2000)
	Lack of accountability	Electronic commerce	Schoder and Yin (2000)

Workgroup / Individual/Employee/User/Personal Level

Table 3 shows those factors relevant at the workgroup or individual levels. At this level, common groupings include insufficient skills or experience, and personal resistance or “fear”.

Literature emphasis on these user and individual levels has been increasing (e.g. Gobbin 1998). Of late, team-based development, “virtual organisations” and collaborative work have come to prominence, largely due to the advent of reliable high-speed networking technology (Post and Kagan 2001, Eder and Igbaria 2001, Pendergast and Hayne 1999). Groups can help provide personnel motivation and project momentum, meaning ongoing system development is not undermined by staff departures or “skill-drain” (Wood 2000, Cross 2000). Also, the use of groups allows code fragments to be developed in parallel, with a high degree of system familiarity among programmers (facilitating testing). As a result, it is not surprising that individual and small group factors were common in the literature search.

The persuasiveness of such groups during the adoption process may be significant, as a result: adoption may be predisposed towards those innovations that are preferred by the “dominant coalition” (Hage 1980). For some small firms (in terms of employees), this persuasive effect could be quite large as individual employees have the power to sway the rest of the firm. These effects might also occur in larger firms in cases where small groups are formed to analyse problems or drive new projects.

Within the research into technology adoption, management attitude is a recurring theme. Predictably, managers are key gatekeepers in the adoption process, and their own attitudes clearly must affect the outcome of technology uptake (Baldwin and Lin 2002). To some extent, this can be attributed to managers’ own idiosyncratic psychological intention (Rosenberg and Hovland 1960) and degree of personal innovativeness (Midgley and Dowling 1978).

Examining the factors below, it appears that barriers consist of mostly skills-related issues. The concept of the lack of skills is common in both the academic and popular literature. This finding comes contrary to the recent emphasis on “generic” or “non-technical” skills in the education literature, whereby employers emphasise skills such as teamwork, interpersonal communication and critical thinking over technical skills such as programming or debugging. This finding suggests that while the absence of these skills may not pose a barrier on entry to the firm, it may act as a barrier to system use once inside the firm.

Another effect consists the role of the “champion” in system development. This term describes a key motivator for product trials. Goode and Stevens (2000) observed the importance of the champion in new and unproven technology environments. The champion pushes for a particular technology to be developed or used in the firm, based on external evidence or experience. However, the presence in Table 3 of factors such as “perceived power erosion or asymmetry” and “low personal affective reward”, suggests that there may also exist the concept of an “anti-champion” who prevents, inhibits or advises against adoption. There appears to be little published evidence of such a concept, though Baba et al. (1996:53) observe that, “antichampions stand to lose power and/or prestige as a result of change…the authority and power they command gives them opportunity to damage the change effort”.

Table 3. Workgroup/Individual/Employee/User/Personal Level

Group	Factor	Innovation	Citation
Insufficient skills or experience	Skill shortage	Electronic commerce	Debreceny et al. (2003)
	Skills shortage	Microcomputers	Cragg and King (1993)
	MIS lack analysis and design skills	IS support for manufacturing	Chang (2002)
	Staff skill problems	IS support for manufacturing	Chang (2002)
	Lack of technical skills	Internet telephony	Corrocher (2002)
	Lack of IS knowledge	Microcomputers	Cragg and King (1993)
	MIS inexperience	IS support for manufacturing	Chang (2002)
	Lack of system knowledge	Telework	Pérez et al. (2002)
	Lack of IT knowledge	WWW technology	Nambisan and Wang (1999)
	Requirement to learn new skills	Interorganisational systems	Nault et al. (1997)
	Expertise constraints	IS Implementation	Thong (2001)
	Lack of project knowledge	WWW technology	Nambisan and Wang (1999)
	Lack of specific application knowledge	WWW technology	Nambisan and Wang (1999)
	Lack of technological experience	IT innovation	Hadjimanolis (1999)
	Insurmountable knowledge acquisition burden	Computer systems	Attewell (1992)
	Inadequate employee technical training	IT innovation	Hadjimanolis (1999)
Personal resistance or fear	Employee resistance to change	Telework	Pérez et al. (2002)
	Manager resistance	Telework	Pérez et al. (2002)
	Employee opposition	Telework	Pérez et al. (2002)
	User resistance to technology	System adoption	Kendall (1999)
	Resistance to change	Electronic Market Systems	Lee and Clark (1996)
	Fear of failure	IT and innovation	March-Chordà et al. (2002)
	User fear	Client/Server Computing	Schultheis and Bock (1994)
	Resistance to change	IT innovation	Hadjimanolis (1999)
	Customer resistance to innovation	IT innovation	Hadjimanolis (1999)
Personal rejection	Unfavourable user perceptions	General innovation	Chircu and Kauffman (2000)
	Individual predisposition towards non-adoption	General innovation	Chircu and Kauffman (2000)
	Lack of individual absorptive capacity	General innovation	Cohen and Levinthal (1990)
	Low personal affective reward	Group Support Systems	Reinig et al. (1995)
Others	Poor user/MIS relationship	IS support for manufacturing	Chang (2002)
	Perceived power erosion or asymmetry	Electronic Market Systems	Lee and Clark (1996)
	Difficulty in using technology	System adoption	Kendall (1999)
	Perception of system ineffectiveness	General system innovation	Abrahamson (1991)
	Perceived innovation incompatibility	General innovation	Tornatzky and Klein (1982)
	Perceived difficulty in using system	Communications terminals	Cats-Baril and Jelassi (1994)

System Level

Table 4 shows those factors relevant at the System level. System cost is a major factor in conventional non-adoption. Madden et al. (2000) find this with regard to telecommunications carriers, Bouchard (1993) and Lee (1998) observe this with EDI. However, as noted in Goode (2005), these costs extend to training and support, which aren’t always clear or easily measurable. It is also possible that the anticipation of these costs could act as a sufficient barrier to adoption.

The table shows many different system types. If each innovation affects an organisation in different ways, then different business units may obtain differing levels of experience from the innovation. This will further affect future innovation (consistent with Nault et al. 1997).

Table 4. System Level

Group	Factor	Innovation	Citation
System or training cost	Excessive cost	Microcomputers	Cragg and King (1993)
	Subsystem costs	Telework	Pérez et al. (2002)
	System costs	Telework	Pérez et al. (2002)
	Innovation cost	IT and innovation	March-Chordà et al. (2002)
	Innovation costs too high	IT innovation	Hadjimanolis (1999)
	Price of software	Internet telephony	Corrocher (2002)
	Excessive training costs	CAD/CAM	Beatty and Gordon (1988)
	Implementation costs	Client/Server Computing	Schultheis and Bock (1994)
	Training costs	Client/Server Computing	Schultheis and Bock (1994)
System complexity	System complexity	Client/Server Computing	Schultheis and Bock (1994)
	System complexity	Information systems	Thong (1999)
	Overly complex innovation	System adoption	Kendall (1999)
Legacy system or process incompatibility	System incompatibility	CAD/CAM	Beatty and Gordon (1988)
	Difficulty in integrating system with procedures	IS support for manufacturing	Chang (2002)
	Weak links to other processes	IS support for manufacturing	Chang (2002)
	Adverse effects on other systems	Computer software	Brynjolfsson and Kemerer (1996)
	Technical constraints	IT adoption	Broadbent and Weill (1997)
	Difficulty in integrating subsystems	IS support for manufacturing	Chang (2002)
System value and valuation	Payoff period too long	IT innovation	Hadjimanolis (1999)
	Unclear investment payback	Client/Server Computing	Schultheis and Bock (1994)
	Unclear value of system	System adoption	Kendall (1999)
	Failure to measure true benefits	CAD/CAM	Beatty and Gordon (1988)
	Unfulfilled payoff expectations	CAD/CAM	Beatty and Gordon (1988)
	Lack of perceived benefit	Information systems	Thong (1999)
System-specific problems	Unfriendly system interface	IS support for manufacturing	Chang (2002)
	Over-provision of information	MIS	Ackoff (1967)
	Data inaccuracy	IS support for manufacturing	Chang (2002)
	Lack of content	Electronic commerce	Debreceny et al. (2003)
	Immature technology	Client/Server Computing	Schultheis and Bock (1994)
	High innovation failure rate	IT and innovation	March-Chordà et al. (2002)
	Suspicion of unproven technology	Electronic Market Systems	Lee and Clark (1996)
Security and Risk	Threats to data security	Client/Server Computing	Schultheis and Bock (1994)
	Lack of security	Electronic commerce	Schoder and Yin (2000)
	Excessive risk	IT innovation	Hadjimanolis (1999)
	Perceived increased transaction risk	Electronic Market Systems	Lee and Clark (1996)
Others	Unstructured system (not off the shelf)	Microcomputers	Cragg and King (1993)
	Frequent system changes	IS support for manufacturing	Chang (2002)
	Data collection or manipulation problems	IS support for manufacturing	Chang (2002)
	Innovation too easy to copy	IT innovation	Hadjimanolis (1999)
	Ineffective product	Electronic Market Systems	Lee and Clark (1996)

Conclusions

This paper has examined the literature in order to explore the factors of innovation rejection. Davis et al. (1989) argue that "practitioners and researchers require a better understanding of why people require better understanding of why people resist using computers in order to devise practical methods for evaluating systems" (p. 982). However, the results presented in this paper suggest that resistance and rejection may occur at levels other than the individual user.

The reasons for technology rejection appeared to be divisible into four broad categories, being the environment, the firm, the user/workgroup and the system-level. As the seminal Mason and Mitroff (1973) observe, "there are a large, if not infinite, number of ways that one can discuss the influence of organisational structure on the design of MIS". To compound the problem, IS researchers must extrapolate discussion from a range of literature domains, including the management, economics, psychology and organisational behaviour literatures (Weill and Olson 1989, Benbasat and Zmud 1999). In the words of Meyer and Goes (1988), "levels of analysis and domains of explanation are inextricably linked". Whereas the original TAM has been used as an indicator of system use and success (Legris, et al. 2003, Davis 1993), the concept of innovation rejection should not be taken to infer system failure.

Because "most adoption studies do not follow a process approach, little is known about the factors that affect the process prior to actual adoption" (Frambach and Schillewaert 2002) and it is possible that these factors will have a significant effect on the innovation process. Olshavsky and Spreng (1996) make similar comments. As discussed earlier in this paper, some factors may affect adoption before others and further work is needed into which rejection factors come into play at which times in the innovation process.

Brown and Venkatesh (2003) argued that early adopters may be "opinion leaders, receiving social esteem by being the first of their group to adopt". However, this paper argues that some actors may seek to extract some cachet through visibly adopting high-priced innovations. However, other actors may likewise have sound rational reasons for not adopting the innovation. Non-adopting across may also acquire cachet by holding off on the acquisition, thereby avoiding "dot zero" quality effects. This is analogous to some extent to catastrophe theory, as discussed in Thom (1975) and Zeeman (1976), were a firm experiences some degree of uncertainty, which is bounded by a degree of predisposition towards technology adoption. The organisation experiences a shock that almost instantaneously affects this uncertainty and causes them to decide on the adoption or otherwise of an innovation.

The study is subject to a number of crucial limitations. First, as with the initial development of both TAM and TAM2, the researcher cannot be certain that the list of factors developed in this paper is parsimonious or complete. Additionally, there may be other ways of dividing the factors obtained from the literature search. Piatier (1984), for instance, divides adoption barriers into endogenous (from within the firm) and exogenous (from without). Further confirmatory work may assist in this regard.

Second, it should be noted that this model does make a number of assumptions about the innovation under examination. First, the list of factors may not be suited to all system types. For example, larger or more expensive systems (such as packaged enterprise systems) may cost millions of dollars and take many months to implement and hence do not offer adopters the ability to trial the technology as easily as smaller systems.

A number of fertile avenues for research result from this study. First, the list of factors clearly begs further development and subsequent empirical assessment. Additionally, the list of factors requires further development into a more useful tool for application in research environments (consistent with Meyer and Goes 1988).

Second, the literature places significant emphasis on the "process" of innovation. Damanpour (1991:562) describes innovation as "a process that leads to a decision to adopt as well as activities that facilitate putting an innovation into use and continuing to use it". Barua et al. (1995) offer similar discussion with respect to IT value analysis. However, very little discussion about barriers to innovation could be found for the process level. Enns et al. (1993), for instance, describe the effect of a lack of 'homework' on the part of managers with respect to the innovation proposal development process.

Third, researchers could consider exploring TAM and the resulting rejection model in conjunction, perhaps in an effort to explain system discontinuance. As in Davis et al. (1989), longitudinal exploration might be useful.

Additional work is also needed into the degree and magnitude of antecedence in the model. For instance, a poor quality system may result in unhappy staff and, subsequently, a disinterested workgroup. This could result in an unsympathetic innovation environment. This theory of antecedence may also explain why some firms can get part of the way along the adoption process and then discontinue their interest in the innovation.

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