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Explaining and Predicting Information Systems Acceptance and Success: An Integrative Model

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EXPLAINING AND PREDICTING INFORMATION SYSTEMS ACCEPTANCE AND SUCCESS: AN INTEGRATIVE MODEL

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Abstract

This paper proposes a new model – the Information Systems Acceptance (ISA) model - to explain and predict IS acceptance. Drawing on previous literature, and the results of a series of case studies, the ISA model integrates four sets of factors influencing IS acceptance: (i) technology characteristics; (ii) management actions; (iii) service quality; and (iv) system use, user satisfaction and system outcomes. These sets of factors are drawn from well-established frameworks. Building on established theories, the model incorporates previous research, overcomes some of the limitations associated with these individual theories, and assembles IS acceptance factors into a comprehensive and useable conceptual framework. .

Keywords: Critical mass, Diffusion of Innovations, Quality Systems Software Case study

1 INTRODUCTION

Numerous factors affect IS acceptance. These include software; hardware; the perceptions and needs of individuals, groups and organisations; resources; organisational culture and politics; a critical mass of users; implementation processes, the extent of system use and project management issues. Because of the size and complexity of issues, most researchers have focused on individual factors influencing systems acceptance, or on the interactions between a small set of factors. Perspectives have included the notion of critical mass; organisational culture, power and authority, the socio technical system, quality dimensions, usefulness and ease of use, to name only a few.

Research into individual components contributing to IS acceptance is clearly needed to validate the influence of each component. But a piecemeal approach is ultimately inadequate. Without an overarching framework to explain systems acceptance, it is difficult to understand the role each component plays in relation to the other pieces. A fragmented approach also makes it difficult to determine whether relevant research issues have been overlooked (Cooper & Zmud 1990). One way to address this problem is to create a model that includes components that subsume other components. In this way, a comprehensive model can be presented simply, and when required, individual parts can be broken down into sub-components for further study or use. This paper presents such a framework.

In this paper, we are concerned principally with an IS from the point when software is delivered to the client ready for implementation within the organisation, and made available to individuals. By 'implementation', we mean all the events, actions and decisions involved in putting an innovation to use (Rogers 1995). We are also concerned with success. 'Success' and 'acceptance' are closely related; for our purposes, 'success' means that 'the new system is accepted in the work place as the way of doing the tasks that the system has been designed to carry out…or is invoked as a support tool on a regular basis' (Land 1994: 275). Only if an IS is in use - if it has been accepted - can it be expected to produce outcomes for the individual and the organisation.

'Success' can be seen in different ways from different stakeholders. Users might term software successful if it facilitated job performance, but the same IS might be considered unsuccessful by managers if it did not, for example, reduce warehouse stock. A project might be over budget and behind schedule, but deliver required functionality and required minimal maintenance. These different perspectives of success are important research issues in their own right. However, in this paper, we remain focused on success defined by system acceptance and use.

The remainder of the paper is organised as follows. The next section describes the research project and provides the background to the current paper. We then describe the methods used to establish the initial data set, and the three-stage process used to arrive at the ISA model. Finally, we examine the model's implications.

2 THE RESEARCH PROJECT

2.1 Research project background

The model presented in this paper was a major outcome of a research project investigating the capacity of quality systems software (QSS) to empower or disempower users (Seen 2005). QSS is a groupware product designed to support organisational quality programs such as certification to ISO 9000. During data analysis of the research project, it became clear that the level of system use affected user outcomes – organisations where the system was used comprehensively gained greater benefits than organisations where use was more occasional. This led us to undertake a new project to explore the factors contributing to QSS use.

We used a three-stage process for this exploration. First, the project's original data set was re-examined for evidence relating to factors affecting QSS acceptance. Second, the literature was

searched for models relating to system acceptance. Because extant models failed to account for all the factors arising from the data a third stage was required: the development of more comprehensive model that would explain our observations.

The initial project data set was drawn from a preliminary action research project undertaken in a single organisation over twelve months, and ten further case studies, all using the same QSS software (see Seen 2005). Organisations were selected to represent a variety of size, industries and experience (good; neutral or poor) of using the software. During the case studies, semi-structured interviews were held with the main users of the QSS application, supported by reviews of documents and follow up telephone calls. In talking about their experiences with QSS, interviewees mentioned issues relevant to system use and this later became an important focus of the research, leading us to conduct a search for an explanatory framework. Table 1 provides details of the case study participants.

Company Pseudonym	**Industry Type**	**Company Size at Interview Site** **Small (≤50 employees)**	**Position of Interviewees**
AlumCo	Manufacturing: alumina refiner	Large	ISO Co-ordinator; Document Controller
AppliCo	Manufacturing: electrical appliances	Medium	Customer Liaison Manager; Appliance Production
FleetCo	Service: vehicle fleet management	Large	National Standards Manager
PharmaCo	Service: pharmaceutical retailer	Medium	Quality Associate
DrinkCo	Manufacturing: beverage producer	Large	Quality Control Supervisor; Analytical Services Manager
ThermalCo	Manufacturing: insulation	Large	Quality Systems
AcoustiCo	Manufacturing: insulation producer	Small	Administration Manager
MetalCo	Service: metallurgical services	Small	Quality and Technical Manager
FabriCo	Manufacturing: fabric	Small	Administration Manager
HandleCo	Manufacturing: doorware	Medium	Quality Manager; Quality Engineer

Table 1. Company and interview position details

3 STAGE ONE: SEARCHING AND ANALYSING THE PROJECT DATA SET

The first part of the research project involved interrogating the project transcripts in order to find evidence relating to QSS acceptance within the case study organisations. Based on interviewee responses, categories relating to QSS acceptance were created. Transcripts were re-read and relevant interviewee statements were coded and linked to these categories, gradually building up a picture of QSS acceptance issues. We then searched the original transcripts for further data (both corroborative and contradictive) relating to themes within these categories. This served to confirm and deepen conclusions, and to seek explanation of disconfirming evidence. Tabulated data was presented to other researchers for review and discussion, given the inferential and subjective nature of analytic work. Our analytical stance was post-positivist, which is based on an ontology where an objective world of cause-and-effect connections is understood to exist outside the subjective (but nonetheless valid) interpretations of individuals. Our analysis drew heavily from the analytical methods of Glaser and Strauss (1967), Patton (1990) and Miles and Huberman (1994).

With the data organised into matrices, it became possible to see that most factors relating to QSS acceptance at the case studies fell into three categories: those relating to *QSS characteristics* (such as the software's capacity to meet user needs and ease of use), those relating to *management actions* (such as adequate resourcing, and communication of system purpose) and those related to *service quality* (such as vendor support). These all affected users' degree of acceptance of the QSS application deployed at the case study sites, and consequently, organisational outcomes. In general, when these factors were present, the QSS application achieved wider acceptance and had a stronger impact on the organisation.

4 STAGE TWO: SEARCHING FOR RELEVANT MODELS

The literature on IS implementation, adoption, acceptance, use and success is prolific. We reviewed 32 previous studies in these areas (not listed in this paper for reasons of space) published between 1985 and 2003. Both 'factor' (for example, Davis, Bagozzi & Warshaw 1989) and socio-technical (for example, Wilson and Howcroft 2002) studies were reviewed.

Despite the plethora of available theories, none of the studies, alone, could provide an adequate explanation to account for the levels of QSS uptake at the case study organisations and consequent organisational outcomes. However, it appeared feasible that a combination of models might provide a solution. The next task was to determine which of the existing theories best matched the data drawn from the case study sites; could be applied at the individual level but yet had implications for the wider organisation; and could be intuitively understood. We were also seeking theory that incorporated a 'cause and effect' framework because we wanted to develop a tool that would assist managers in understanding how their decisions and actions would affect QSS acceptance and consequently, organisational outcomes.

Of the research reviewed, we found *critical mass theory* (Oliver, Marwell & Teixeira 1985) helpful in explaining the importance of establishing a base number of IS users. From there, two additional models stood out as useful in explaining the categories revealed through the data gathered at the case study sites: Rogers' (1995) Diffusion of Innovations (*DOI) theory*, and Land's (1994*) Information Systems Implementation (ISI) theory*. A third theory – DeLone and McLean's (2003) *Information Systems Success (ISS) model* – provided the required 'cause and effect' framework through which other theories could be linked, and also brought in issues relating to user intentions, user satisfaction, system use and the effects of system outcomes. DeLone and McLean's model thus provided a link between the individual user and organisational outcomes. Combining and refining these models offered a useful means for analysing the issues affecting QSS acceptance within the case study organisations. Additionally, they were comprehensive models in their own right; already incorporating many IS acceptance factors that had been frequently validated. Comprehensive models were preferable to those that addressed fewer issues and which would have then necessitated greater cobbling together, thereby creating the piecemeal approach we were trying to avoid.

The following sections present a brief review of these four theories mentioned above. Only the aspects most relevant to IS acceptance are presented here.

4.1 Critical mass effect on groupware acceptance and use

Achieving a critical mass of users is the key to successful groupware acceptance, outweighing even perceived ease of use and perceived usefulness (Lou, Luo & Strong 2000). Rogers (1995: 313) also explains the importance of critical mass to groupware:

> An interactive innovation is of little use to an adopting individual unless other individuals with whom the adopter wishes to communicate also adopt. Thus, a critical mass of

individuals must adopt an interactive communication technology before it has utility for the average individual in the system.

Rogers (1995) suggests that critical mass is generally achieved at between 10-20% of the target population; Markus (1987) argues that 16% is the tipping point. Interactive media researchers, Bair & Mancuso (1985) and Hiltz (1984), consider that an absolute number of users – about 30 – suffices for interactive media (Markus 1987).

As most modern IS are based on a community of users, the implication for managers is that achieving a critical mass of users should be given high priority during IS implementation. In searching for factors that are likely to help a system obtain a critical mass of users, several models, particularly the DOI, ISI and ISS models (discussed below), have a contribution to make.

4.2 Diffusion of innovations (DOI) theory

DOI theory can be used to explain the rate at which an innovation is adopted, and why it is or is not used. It has been used in a number of studies within the IS domain including Brancheau and Wetherbe (1989), Kaplan, Nissen, Klein & Hirscheim (1991) and Dick and Rouse (1995).

Rogers asserts that the rate of adoption of an innovation is partly attributable to five characteristics of the innovation: 'relative advantage'; 'compatibility'; 'complexity'; 'trialability' and 'observability'.

- Relative advantage refers to the degree to which an innovation is perceived as better than the idea it supersedes, taking into account the benefits arising from and costs incurred in establishing an innovation. .
- Compatibility refers to the degree to which an innovation is perceived as being consistent with past experiences or previously introduced ideas, existing values or beliefs, and the needs of potential adopters.
- Complexity refers to the degree to which an innovation is perceived as difficult to understand and use. In general, the more complex an innovation, the slower its rate of adoption. Complexity is also relative. A user with relevant skills may regard an innovation as simple, while an individual lacking the necessary skills will consider the same innovation complex.
- Trialability refers to the degree to which an innovation may be experimented with on a limited basis. The degree to which an innovation can be experimented with also affects its rate of adoption. In general, innovations that can be used initially in a non-live environment or modular innovations that can be broken down so that portions of the innovation can be trialed will be adopted more rapidly.
- Observability refers to the degree to which results of using an innovation are visible to others, and able to be described and communicated to others.

DOI theory posits that if an innovation offers advantages over the existing situation; is compatible with existing beliefs and needs; is easy to use; can be trialled; and its results are observable, then it is more likely to be rapidly adopted.

DOI theory is not without its critics. Lyytinen and Damsgaard (2001) suggest that simplistic assumptions underlying DOI theory reduce its ability to explain diffusion of complex computer technologies, and argue for greater focus on the context or environment of the diffusion. Fichman (1992) cautions against transferring DOI theory wholesale to the IS domain; he notes that DOI theory was developed under the assumption of voluntary adoption, but that, within organisations, adoption may be encouraged by management or even mandated. Fichman also notes that DOI theory may need modification to make it more appropriate to complex multi-user technologies. However, Larsen (2001) suggests that even with its drawbacks, DOI has a contribution to make to IS theory. He points out that aspects of DOI theory (namely, innovation characteristics) may assist in the understanding of user beliefs, attitudes and behaviour with regard to a new system. For these reasons, we have selected only the portion of DOI theory that relates to innovation characteristics to include in our model.

4.3 The information systems implementation (ISI) model

Implementation processes, largely instigated by management, also affect a new system's acceptance in the workplace. The ISI model (Land 1994) is based upon research designed to identify the factors most important in determining a user group's successful adoption of a new system. Land's model recognises that the introduction of a technological innovation is essentially a change process that requires planning and managing, and is affected by six groups of factors:

- Motivation for introducing the new system
- Commitment to the system
- Organisational culture
- The management of the implementation process
- The 'distance' between the existing system and the replacement system
- The technology itself

Land argues that the motivation for the new system is important because failure to clarify the motivating factors or to share the reasons behind the acquisition reduces the motivation of stakeholders to work with the system. Strong management commitment to the new system is likewise essential because this determines the level of resources provided to support the new system, and the extent to which managers themselves use the system.

Land also found that an important feature of successful implementation is a sharing of values - a common organisational culture - among stakeholders. The concept of organisational culture is related to the concept of 'motivation for the new system', which also relies on the sharing and aligning of objectives to motivate users to accept the new system, and also relates to 'compatibility' within the DOI model.

The distance between the existing system and the new system is '…a notional measure of the extent of the change…' (Land 1994: 276). This concept is related to Rogers' 'complexity' and 'compatibility' factors; if a system is difficult to use or not compatible with existing beliefs and needs, the distance to travel will be greater. Land found that to traverse the distance the user had to have strong motivation and to perceive positive payback from making the change. The issue of 'distance' also relates to 'management commitment': if there is little distance between the two systems, then fewer resources and less change in management and staff behaviour is required to implement the new system.

Land found that 'technology' plays an important role in determining the success or failure of a new system. He determined that the most important technology related factors were (i) the extent to which the new system delivered the expected functionality; (ii) the actual performance of the system in terms of factors such as response time, security, and help facilities; and (iii) the way skills in using the system could be acquired, with incremental learning favoured over the necessity of having to acquire large blocks of skills in order to use the system. These issues are all raised within Rogers' DOI theory under 'relative advantage', 'complexity' and 'trialability'.

4.4 The information systems success (ISS) model

Rogers' DOI model and Land's ISI theory delineate the technology and implementation factors related to IS acceptance. However, these theories lack a 'cause and effect' framework that shows the relationship between factors and technology adoption and use. For this purpose, a third IS model – the Information Systems Success (ISS) model proposed by DeLone et al. (1992; 2003) – has much to offer. This model clarifies the relationship between (i) factors that influence MIS effectiveness; (ii) system use; and (iii) outcomes. The model can also be used to explain the process of how individuals, groups and organisations move from awareness of a technical innovation through adoption, acceptance and finally "success". It shows how acceptance at early individual levels can be linked to later organisational level outcomes (Larsen 2003).

Originally resulting from a review of 180 previous studies, the ISS model has been validated in the years since its inception with 16 subsequent studies substantiating most of the model's associations (DeLone et al. 2003). The model focuses on factors that are *part of* success at various levels, rather than variables that *cause* success. However, the causal aspect of the model recognises that success at certain levels then causes success at other levels.

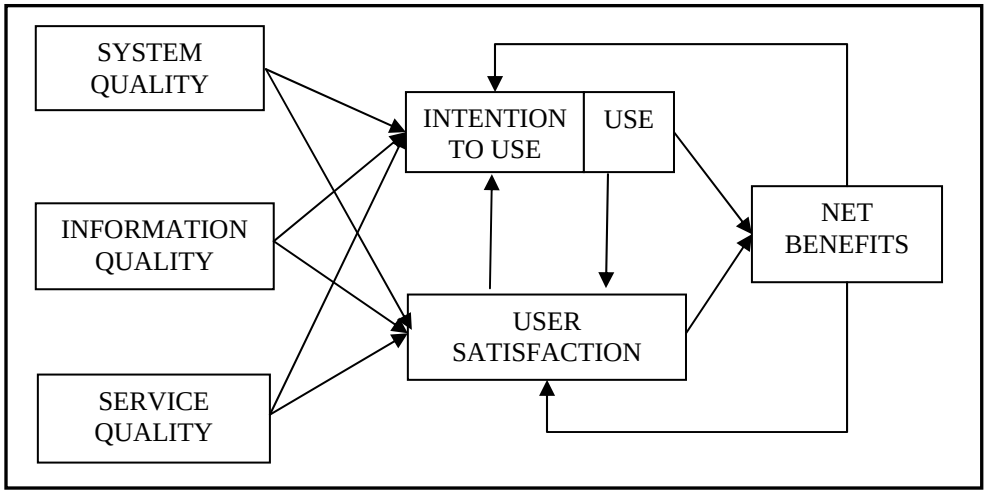

Figure 1. Updated ISS Model (DeLone et al. 2003)

The ISS model revised by the authors in 2003 (presented in Figure 1) includes the variables of system quality, information quality, service quality, intention to use/use; user satisfaction and net benefits. The term 'net benefits' is used to encompass the outcomes resulting from system use. DeLone et al. (2003: 22) use the word 'net' because '…no outcome is wholly positive, without any negative consequences'. They also state that, depending on the context, '…different actors, players, or stakeholders may have different opinions as to what constitutes a benefit to them'. For some stakeholders, 'net benefits' may be negative; for example, jobs may be deskilled even while productivity increases. The context will also determine the level at which 'net benefits' is to be considered; for example, at an individual, departmental, organisational and/or national level.

The model can be interpreted as follows. The system will be evaluated in terms of 'system quality', 'information quality' and 'service quality'. Singularly and jointly, these characteristics affect subsequent 'use' or 'intention to use' and 'user satisfaction'. That is, '…users and managers experience these features by using the system and are either satisfied or dissatisfied with the system or information products' (DeLone et al. 2003: 11). The authors go on to explain that "Use" must precede "user satisfaction" in a *process* sense, but positive experience with "use" will lead to greater "user satisfaction" in a *causal* sense". As a result of using the system, certain "net benefits" will be achieved. If the outcomes are positive, then use of the system will be reinforced. However, even if the 'net benefits' are negative, the feedback loops are still valid. Negative outcomes are likely to lead to decreased use, and possible cessation of the system.

5 STAGE THREE: RECONCILING THE EXTANT MODELS AND DEVELOPING THE ISA MODEL

None of the DOI, ISI and the ISS models, individually, covers *all* of the issues that our case studies identified as affecting technology acceptance. A limitation of the DOI model (in addition to those discussed earlier) is that, while it provides a framework to enable analysis of an innovation, it does not comprehensively address the management implementation issues (with the exception of the role of the change agent or champion) that also affect the acceptance of an innovation (Kwon & Zmud 1987). DeLone et al. (2003) note that their ISS model has been criticised for not incorporating management

control variables such as user involvement and top management support. The ISS model also considers only quality influences on intention to use, and use. A criticism levelled at IS implementation theories is that they generally neglect theory related to diffusion of innovations (Kwon et al. 1987).

These limitations made it necessary to draw upon all three models in order to assemble a framework that could explain the factors influencing QSS acceptance and level of use at the case study organisations of our research project. This integrated model - which we have titled the IS Acceptance (ISA) model - is shown in Figure 2. In the ISA model, Rogers' DOI model forms the basis of the *technology characteristics* group of factors, while Land's ISI theory underpins factors related to *management actions*. Along with *service quality* (DeLone et al. 2003), these feed into DeLone and McLean's feedback loops. Together these provide a richer suite of issues for management to consider when planning a new IS system, and more leverage points for action.

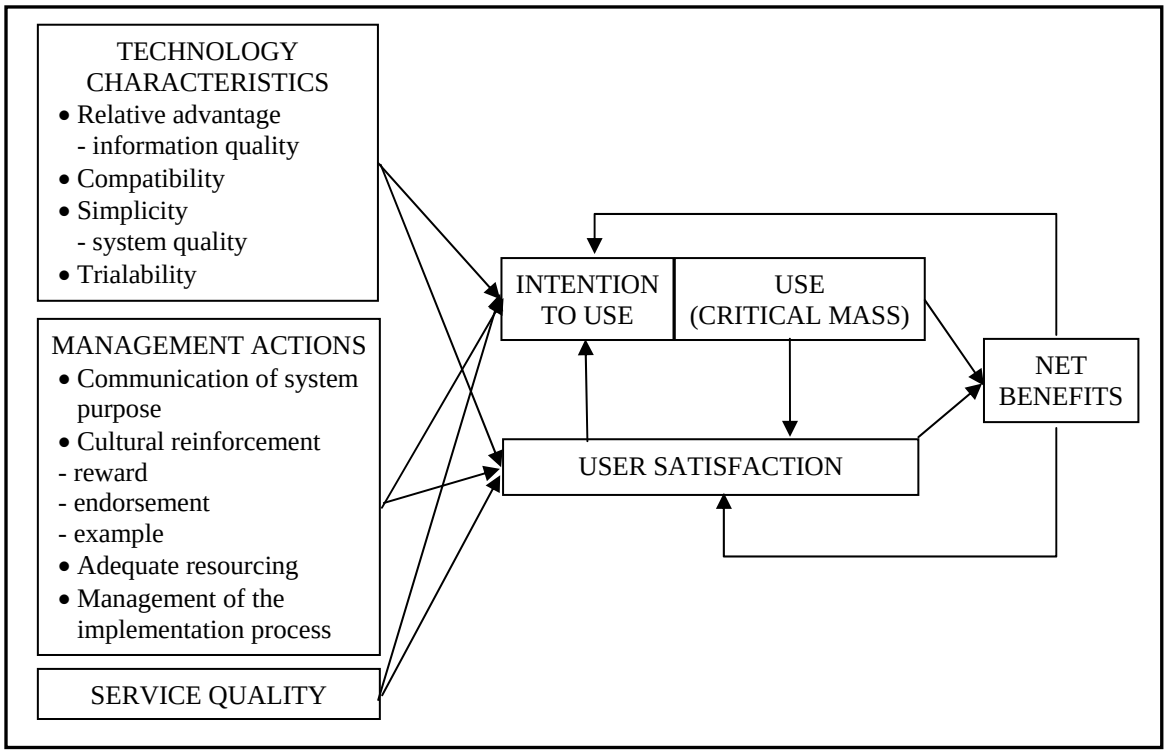

Figure 2. The ISA Model

The ISA model does not lose the DeLone and McLean system and information quality characteristics, which are both characteristics of technology; what it does do is identify that there are other technology aspects (relative advantage; compatibility; trialability) drawn from DOI theory that are also important. Within the *technology characteristics* group of factors we have thus combined Rogers' DOI concepts with DeLone and McLean's system and information quality factors. While system quality and information quality factors could be implied by the relative advantage factor, and system quality could also be implied by the simplicity factor, we have chosen to list them in order to highlight their importance. We have changed complexity to 'simplicity' to make the term positive, in line with the other factors. Observability has been omitted because IS are rarely tangible products that can be observed, and because this dimension is unlikely to differ between IS.

Because system implementation is largely a management responsibility, we have entitled this part of the model *management actions*. We have renamed 'motivation for introducing the new system' as 'communication of system purpose' to reflect the required management action. Because organisational culture has so many aspects, we instead specify the term 'cultural reinforcement', because culture is also about what is rewarded or reinforced. One way in which managers can develop value congruence

(one of Land's critical aspects of systems implementation) is through management responses to staff actions. Our case studies identified that such reinforcements are critical to on-going system use. Cultural reinforcement can also take the form of management endorsement, and management 'leading by example' where managers themselves use the IS. The factor 'adequate resourcing' is included because of the necessity of ensuring appropriate funding - whether to provide time release and training, data conversion, system modification or any other activity necessary for the smooth implementation of the system. We have omitted 'management commitment' because this is evinced through the 'cultural reinforcement' factors and 'adequate resourcing'. 'Management of the implementation process' we leave unchanged. Land's 'technology' factor is omitted because Rogers' DOI variables already focus on technology characteristics.

We have separated *service quality* from both technology characteristics and management actions because ongoing support of the system (the main point of service for system users) is increasingly provided by an external party (the software vendor, or an outsourced entity). Service quality depends on the reliability, responsiveness, knowledge and empathy of staff supporting the technology (DeLone et al. 2003). These issues are also raised by Kwon et al.'s (1987) 'designer-user interactions' factor. 'Service quality' also depends on the willingness of the provider to adapt the IS over time to changing demands.

We have also added the notion of critical mass to DeLone and McLean's 'use' construct. This is because it is not enough that some users use the system; for interactive technologies a critical mass is needed. There is evidence that critical mass is one of the more important determinants of motivation for innovation uptake (Lou et al. 2000).

Our model can be interpreted as follows. The new system possesses certain characteristics (shown in the box headed 'technology characteristics') in terms of (i) the advantages it offers over the *status quo* and in particular, the information made available from the system; (ii) compatibility with existing systems and organisational mores; (iii) simplicity (typified by system quality, and in particular, ease of use); and (iv) trialability – the capacity for experimentation by users.

Users will develop expectations of the technology (initially through vendor demonstrations, reviews in industry journals, through training and information sessions or by seeing the technology in use by colleagues or at other organisations) that will influence their intention to use the technology. If the expectation is positive, users are more likely to use the software. Once they are using the software, users will develop opinions regarding the software based on their experiences, leading to differing levels of user satisfaction.

'Management actions' also affect 'intention to use'. For example, failure to clarify management objectives related to the technology's acquisition, or to share the reasons behind the objectives, may reduce the intention of users to work with the technology. Cultural reinforcement (in the form of rewards, expectations, and management example) can positively influence 'intention to use'. In particular, if poor 'technology characteristics' have created negative expectations of the software that would otherwise adversely affect 'intention to use' and 'user satisfaction', cultural reinforcement may help to overcome these negatives. Resources provided by management (for example, to fund training or software customisation) will assist implementation processes and may be used to help overcome problems related to 'technology characteristics' such as poor system quality. The management (that is, the planning and execution) of implementation activities affect 'intention to use'.

The components of 'management actions' will also affect 'user satisfaction'. Management's degree of communication, commitment, resourcing, and implementation management will all affect 'user satisfaction'. An appropriately planned and executed implementation, where users are kept informed, the process is supported by adequate resources and management buy-in is evident will create higher levels of satisfaction.

Service quality, whether provided externally or internally, will also affect 'intention to use' and 'user satisfaction'. A negative interaction with the service provider is likely to reduce 'intention to use' and 'user satisfaction' while a positive interaction may increase 'intention to use' and 'user satisfaction'.

As DeLone and McLean identified, a positive experience with the software creates user satisfaction that will then lead to increased 'intention to use' and thus 'use'. A sufficiently large body of users will create a 'critical mass', which, in turn, will influence others' 'intention to use'. Use of the system will create 'net benefits'. If the 'net benefits' are negative, the feedback loops will act to decrease 'use' and 'user satisfaction', and possibly lead to discontinuance of the system (DeLone et al. 2001).

6 CONCLUSIONS AND IMPLICATIONS FOR MODEL USE

The integrated model described above was used in the research project to explain the factors affecting acceptance of an interactive technology – a form of groupware – at the case study sites. The ISA model thus helps to fill a gap recognised by Briggs, Nunamaker & Sprague Jr (1997) who called for (among other things) further research into groupware adoption. However, we suggest that the ISA model offers a framework that may be relevant to IS beyond groupware. We have found the ISA model to be a useful tool to analyse the issues affecting IS acceptance within organisations, and to frame our discussions with users and management. Although the model in this paper originated from case study data based on organisations using QSS (a groupware product), further development of the model drew on established IS frameworks where individual relationships within the original models have frequently been validated. Consequently, the ISA model has relevance to software and IS beyond QSS, and provides a foundation for further research.

While work is required to validate the model further, at this point it meets the "complete" "parsimonious", "simple" and "predictive" criteria espoused by DeLone et al. (1992). The ISA model provides a comprehensive view of the issues being surveyed, and organises existing research into a more streamlined, understandable and coherent whole. The ISA model also has some general predictive value for IS acceptance, as the following section demonstrates.

Our model can be used as a diagnostic lens to identify potential impediments to successful IS, and consequently, as a tool to evaluate the likely success of an IS. By evaluating the proposed system in terms of its technology characteristics, management actions and service quality, managers will be able to predict the likelihood of the system being accepted by users. If necessary, changes could be made to the technology, management factors or service quality to enhance the chances of system success. For example, evaluation of a proposed system might reveal high 'relative advantage' and 'compatibility', but also low 'simplicity' and 'trialability'. This combination of factors could negatively impact users' 'intention to use' and 'satisfaction' with the product and potentially jeopardise the success of the IS. The focus of the diagnostic lens could then be turned to 'management actions', to determine whether sufficient activities had been set in place to overcome these problems. If, for example, organisational priorities were such that managers could not allocate time for staff to learn a difficult new system, or mistakes were not part of the organisation's culture, managers might conclude it prudent not to invest in the new system at the present time due to the likelihood of failure. Alternatively, aware of the potential for failure, managers might make the decision to invest resources in modifying the interface to improve simplicity, additional training, or creating a trial database with which users could practise without fear of altering live data. In either case, applying the ISA model would have alerted management to the potential lack of system success, and offered leverage points for action.

7 LIMITATIONS AND FUTURE RESEARCH

The conclusions presented here have limitations intrinsic to the research approach. Drawn from an interpretive case study, the findings are generalisable to a theory, rather than a population (Yin 1994). In addition, for this research, the same QSS product was in use at all of the case study sites. This was necessary in order to limit the amount of variation in the research. In general, this would restrict the

generalisability of results to situations involving software products with similar functions. However, because we expanded our research to draw from extant models whose validity has been well demonstrated, we believe the ISA model has validity beyond the QSS domain. We suggest this model be applied to a number of different technologies to test whether this is indeed the case.

Factors other than those included in the ISA model presented in this paper affect IS acceptance. For example, task characteristics and organisational size are not included in the ISA model, although their relevance to acceptance has been demonstrated (Cooper et al. 1990; Rogers 1995). For further research we suggest a comparative study between the ISA model and prior research to consider whether other independent variables merit inclusion. While inclusion of all known factors would render the ISA model unwieldy and unusable, further research is required to ensure that the most influential independent variables are included in the ISA model. We also suggest a survey of existing meta models to identify whether other model combinations offer similar benefits in terms of presenting a comprehensive picture of the issues involved in IS acceptance.

In practical terms, the development of more refined diagnostic tool based on the ISA model to help predict IS acceptance would help managers considering new information systems. Such an instrument would enhance the chances of appropriate software being acquired and consequently used.

All models are wrong, but some are useful (Box 1979). An IS is a major investment. We would argue that a model that increases our understanding of IS acceptance and use is valuable. If a system is not used, the only outcomes will be wasted investment and increased cynicism.

References

Bair, J. H. & Mancuso, L. (1985) *The office systems cycles: The process and technology of office automation*. The Hewlett-Packard Company, Palo Alto.

Box, G. (1979) Robustness in the Strategy of Scientific Model Building. In: *Robustness in Statistics*. Launer, R. & Wilkinson, G. (eds), pp. 199-217. Academic Press**,** New York.

Brancheau, J. C. & Wetherbe, J. C. (1989) Understanding Innovation Diffusion Helps Boost Acceptance Rates of New Technology. *Chief Information Officer Journal*, 2, 23-31.

Briggs, R. O., Nunamaker, J. F. & Sprague Jr, R. H. (1997) 1001 unanswered research questions in GSS. *Journal of Management Information System*, 14, 3-21.

Cooper, R. B. & Zmud, R. W. (1990) Information Technology Implementation Research: A Technological Diffusion Approach. *Management Science*, 36, 123-139.

Davis, F. D., Bagozzi, R. P. & Warshaw, P. R. (1989) User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. *Management Science*, 35, 982-1003.

DeLone, W. H. & McLean, E. R. (1992) Information Systems success: The quest for the dependent variable. *Information Systems Research*, **3**: 60-95.

DeLone, W. H. & McLean, E. R. (2003) The DeLone and McLean Model of Information Systems Success: A Ten-Year Update. *Journal of Management Information Systems*, 19, 9-30.

Dick, M. & Rouse, A. (1995) *The Introduction of Object-Orientation in Australian Software Development Organizations: The Applicability of Diffusion of Innovation Theory*. 3rd European Conference on Information Systems, Department of Informatics, University of Economics and Business, Athens.

Fichman, R. G. (1992). Information Technology Diffusion: A Review of Empirical Research. *Proceedings of the thirteenth international conference on information syste*ms, Dallas, University of Minnesota.

Glaser, B. G. and Strauss, A. L. (1967). *The discovery of grounded theory: Strategies for qualitative research*. Chicago. Aldine

Hiltz, S. R. (1984) *Online communities: A case study of the office of the future*. Ablex, Norwood, NJ.

Kaplan, B., Nissen, H., Klein, H. & Hirscheim, R. (1991) Models of Change and Information Systems Research. In: *Information Systems Research, Contemporary Approaches and Emergent Traditions*, Elsevier Science, IFIP.

Kwon, T. H. & Zmud, R. W. (1987) Unifying the Fragmented Models of Information Systems Implementation. In: *Critical Issues in Information Systems Research*, Boland Jr R. J. & Hirschheim R. A. (eds.), pp. 227-251. John Wiley Information Systems Series**,** Chichester.

Land, F. (1994) The Management of Change: Guidelines for the Successful Implementation of Information Systems. In: *Computer-Supported Cooperative Work: The multimedia and networking paradigm.* Scribener S.A. R. (ed), pp. 273-286. Unicom, Aldershot.

Larsen, T. J. (2001). The Phenomenon of Diffusion: Red Herrings and Future Promise. *Diffusing software product and process innovations*. M. A. Ardis and B. L. Marcolin Eds. Boston, Kluwer Academic Publishers**:** 35-50.

Larsen, K. R. T. (2003) "A Taxonomy of Antecedents of Information Systems Implementation: Variable Analysis Studies." *Journal of Management Information Systems*. 20 (2): 169-246.

Lou, H., Luo, W. & Strong, D. (2000) Perceived critical mass effect on groupware acceptance. *European Journal of Information System*s, 9, 91-103.

Lyytinen, K. and Damsgaard, J. (2001). What's wrong with the diffusion of innovation theory? *Diffusing software product and process innovations*. M. A. Ardis and B. L. Marcolin Eds. Boston, Kluwer Academic Publishers**:** 173-189.

Markus, M. L. (1987) Toward a Critical Mass Theory of Interactive Media - Universal Access, Interdependence and Diffusion. *Communication Research*, 14, 491-511.

Miles, M. B. & Huberman, A. M. (1994) *Qualitative Data Analysis: An Expanded Sourcebook*. 2nd ed. Sage Publications, Thousand Oaks.

Oliver, P., Marwell, G. & Teixeira, R. (1985) A theory of the critical mass: interdependence, group heterogeneity, and the production of collective action. *American Journal of Sociology*, 91, 522-556.

Patton, M. Q. (1990). *Qualitative evaluation and research methods*. 2nd ed. Newbury Park, CA. Sage.

Seen, M. (2005). *Information technology and quality systems: An investigation of the capacity of a groupware product to empower people and support organizations*. Unpublished PhD Thesis. Monash University, Melbourne Australia.

Rogers, E. (1995) *Diffusion of innovations*, 4th ed. The Free Press, New York.

Wilson, M. and Howcroft, D. (2002) Re-conceptualising failure: social shaping meets IS research. *European Journal of Information Systems*. 11 (4): 236-250.