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THREATS TO ERP SUCCESS: A CASE STUDY

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ABSTRACT
Enterprise Resource Planning (ERP) packages have transformed the way organisations go about the process of providing Information Systems. Instead of crafting each new Information System locally, organisations are able to install well-integrated, internationally sourced packages that seek to provide best practice from IT systems world-wide. These packages also provide very rich choice in features and functions so that the adopting organisation can tailor the package implementation to meet their very specific needs. However, the enormous growth rate in ERP adoption has slowed. It is apparent that some adopters are not yet realising the benefits that they had anticipated. Efforts to make ERP packages successful in small to medium enterprises, in particular, are facing challenges. This paper reports on case study research involving one adopter of the ERP package, SAP. The research uses an a priori ERP Success Model based on a framework developed to explain success in the adoption of CASE packages. From the study, a modified model is developed. The model proposes Task-Technology Fit (TTF), User Satisfaction, and ERP Utilisation as meaningful indicators of ERP success. The revised framework can assist IS managers developing new strategy involving ERP use.

Keywords: transaction processing systems; management information systems; enterprise resource planning; implementation success; literature review

1. Introduction
The move to Enterprise Resource Planning packages over the past five years has been an important part of the strategy of IT Managers in meeting the information needs of their organisations. So rapid was the adoption of ERP in the late 90’s that AMR Research (1998) was predicting that the market for ERP systems would leap from the estimated $15 billion in 1997 to $72 billion in 2002. The general thrust of the AMR predictions is supported by more recent projections (e.g. Gartner, 1999). Yet, in the face of the face of this rapid movement toward an ERP approach to providing IT systems, there are instances of organisations abandoning its use in disappointment with the level of benefits realised (Wheatley, 2000).

The IS literature provides accounts of the benefits of ERP packages. Holland et al (1999) summarise the claimed benefits as follows: Firstly, ERP provides an elegant, controlled approach to replacing large, inflexible legacy systems. Then, through the inclusion of best international practices, ERP offers potential for reducing IT development staff yet maintaining currency in IT capability. With a high level of functional integration, the packages are also seen to offer “reduction in inventories, lead times and costs, market responsiveness, improved control, increased competitiveness and improved organisational communication” (Holland et al., 1999, p.290).
This study uses the experience of an Australian state government agency to provide insights into the potential threats to ERP success. In the absence of adequate theory on ERP success, this case study uses as its guide for data collection a model developed to explain success in Computer Aided Software Engineering (CASE) package adoption. From this, suggestions are made for a new framework on ERP success. Because this theory is developed out of real-world observation and is in accord with established theory from related fields, it is hoped that it can provide credible guidelines for other potential ERP adopters.

1.1 Background on the Organisation Studied

The case study has been conducted at the Corporate Administration Agency (CAA) of the Queensland State Government, in Brisbane, Australia. Queensland is a large decentralised state with a population of only about 3 million people. CAA was established in 1997 to provide a range of corporate services for seven small-to-medium-sized statutory authorities within the government’s Arts portfolio. These authorities were bodies such as the Queensland Museum, the Art Gallery and the State Library. This “shared services model” is also applied elsewhere within the Queensland state government.

The CAA site was selected as an instance of the ERP package failing to achieve success. In an environment where use of SAP R/3 had been made mandatory for all Queensland state government departments and agencies, CAA senior staff had successfully mounted a business case arguing that they be permitted to abandon SAP use in favour of a smaller, cheaper locally developed package.

1.2 The ERP Package

Enterprise Resource Planning (ERP) has its origins in the concepts associated with Manufacturing Resource Planning (MRP) packages and their antecedents from the 1970s, Materials Requirement Planning packages. Some argue (Davenport, 2000) that the evolution of ERP software has been such as to make the analogy with MRP inappropriate. In this spirit, there have been moves to replace the term ERP with EWS (Enterprise Wide Systems) or just ES (Enterprise Systems). Although there is some difficulty in agreeing upon a definition of ERP (Klaus et al, 2000), there are certain features that can be seen to characterise ERP packages.

A fundamental feature of these packages is a high level of integration, with all applications sharing a single corporate database. The systems are designed for an on-line client/server environment. A high level of application functionality, richly configurable to the needs of the individual customer is an important objective embedded in these packages. The packages are also intended to provide best practice, in a global sense, through a range of standardised business processes.

Among the many ERP packages now marketed, five dominate viz. SAP, Oracle, Peoplesoft, Baan and JD Edwards. Of these, SAP is said to have about 60% of the world market (Holland et al, 1999).

1.3 ERP Success

As indicated earlier in this paper, much of the literature on ERP deals with the many benefits that can be, or have been, achieved from ERP adoption. However, this global success is facing challenges. Some implementers of ERP have failed to achieve the expected benefits while others have abandoned ERP implementations or reduced their scale (Al-Mashari et al.,
In large part, these disappointments have been attributed to the great size and complexity of the packages and the associated problems in customisation and organisational change. Others have noted (Soh et al., 2000) that ERP implementers outside Europe and North America can also experience problems arising from what have been called “cultural misfits”. These cultural misfits relate to the inability of the global packages, in spite of their enormous functional flexibility, to readily address specific functional needs associated with the local laws and local practices. In such cases, workarounds in the form of add-on modules have been more common than changes to the package source code, presumably because these less populous countries do not justify suppliers changing the packages. A by-product of this approach is increased maintenance costs for the organisations involved, since upgrades of an ERP package may not interface easily with the add-on module and, worse still, the mismatches may not be detected until after the package has been customised and put into operation. Again, the risk of introducing software bugs is increased by this “bolt on” approach.

2. Framework Guiding The Study

To assist in the development of a data gathering protocol, a preliminary ERP Success Model has been proposed, as indicated earlier in this paper. The ERP Success Model chosen is adapted from a CASE Success Model (Smyth, 1999) that had been shown to explain effectively the principal factors involved in successful CASE adoption. Such a choice is justifiable in the absence of established theory to explain ERP success. Fundamental similarities between CASE package adoption and ERP package adoption support the adaptation of the CASE Success Model as a basis for studying ERP success.

A major point of commonality between CASE and ERP is a high level of theoretical benefit, the theoretical benefit not being consistently realised in practice. In both cases, there is evidence of some adopters abandoning use of the package out of dissatisfaction at the same time as other adopters report a high level of benefit. With both CASE and ERP, the implementation of the package is a non-trivial exercise; the costs are high, the complexity and range of features very great, and the organisational impact extensive. While CASE as a phenomenon came to prominence in the 1980s, ERP is a more recent arrival.

The model chosen as a framework for this study of ERP success is shown in Figure 1. Task-Technology Fit (TTF), perceived usefulness and user satisfaction are shown as the three constructs that most satisfactorily influence ERP success in an organisation. Another important aspect of the preliminary framework is the potential impact on perceived usefulness and user satisfaction of a range of organisational factors. These may include top management support, the presence of an ERP champion, organisational culture, and organisational politics.
2.1 ERP Success

In information systems implementation research, there has been a lot of attention given to measuring “success” in implementation (DeLone and McLean, 1992, Garrity and Sanders, 1998). The review by Garrity and Sanders highlights the variety of different measures that have been used in IS success research. Each measure is shown to have both advantages and disadvantages in representing adoption success. On the basis of a multiple case study of CASE success factors (Smyth, 1999), Utilisation emerged as the most effective choice for the dependent variable in understanding and explaining CASE success. Hence, in this study ERP Utilisation is selected as a trial surrogate for ERP success. This is also consistent with the approach outlined by Igbaria et al (1997). Two dimensions of ERP Utilisation are embodied in the proposed framework: (1) the proportion of eligible users who use the ERP package and (2) the persistence of ERP use more than two years after adoption of the package.

2.2 Task-Technology Fit (TTF)

The Task-Technology Fit (TTF) construct is taken from IS implementation theory. Goodhue and Thompson (1995, p.218) describe TTF as “the correspondence between task requirements, individual abilities, and the functionality of the technology”. They validate the TTF construct and show it to be a predictor of implementation success. In an important contribution to implementation research, Goodhue (1995) demonstrates that users can successfully evaluate TTF. Adapting this idea to the study of ERP implementation, TTF here describes the extent of match between the facilities provided by the ERP package, the tasks undertaken by the users of that package, and the skills and attitudes of the individual users.

2.3 User Satisfaction

The user satisfaction construct has long been used in implementation research (Ives et al, 1983) as an indicator of implementation success. Here, the concept is adapted to indicate the extent to which users believe that the ERP available to them meets their requirements.
2.4 Perceived Usefulness

Perceived Usefulness, as adapted from its use in implementation theory, is seen as a belief by the system users that using the ERP package would lead to future benefits. In this framework, perceived usefulness also embraces the concept of relative value, so that usefulness is perceived in terms of the benefit relative to the cost.

2.5 Organisational Factors

The model proposed in Figure 1 allows for a range of organisational variables including the presence of an organisational champion for ERP, personnel policies, and organisational politics to influence perceived usefulness and user satisfaction.

3. The Research Method

This research was conducted using the case study approach. The case study is valued as a research method for its capacity to examine a phenomenon in its real-life context (Benbasat et al, 1987, Gable, 1994). A great strength of this method is its facility for retaining and exploiting the “richness” of a situation. Because of the suitability of the case study to deal with poorly structured, lightly researched problem domains, it has been judged as well suited to the exploratory phase of an investigation. However, the case study can be shown (Yin, 1994) to be well suited to descriptive and explanatory research as well. In this investigation of ERP success, the case study method is used for exploration, for description, and for the testing of theory.

In the absence of established theory to explain ERP success factors, this research has started with a framework adapted from a CASE success model which, in turn, has its base in IS implementation theory and innovation adoption theory. The ERP Success Model has been used to guide data gathering, in particular. Yet, the nature of case study research is such that employing a guide to data gathering can provide a focus without inhibiting unnecessarily the discovery of unexpected phenomena.

The case study approach used conforms to that advocated by Yin (1994, p.21) in that it takes a theoretical framework, the ERP Success Model, as a basis for data gathering. Because the theory that is developed using this research method has a sound theoretical base tested by real-life observations of ERP use, its potential relevance to IS managers is heightened. Semi-structured interviews were used to collect data for the CAA case study. A series of interviews was held with the Executive Manager of the Financial Services Branch of CAA, the individual responsible for IT. To support the interviews and provide a basis for triangulation of evidence, written documentation was also collected from CAA. This included the Business Case for SAP use, a Business Case for its replacement, Service Level Agreements, and data on transaction volumes. A formal case study protocol, based on the propositions embodied in the ERP Success Model, was used to guide data gathering. The protocol detailed the purpose of the study, the main variables to be observed and appropriate measures for each of the variables.

4. Empirical Findings From The CAA Study

Analysis of the data from CAA shows that the proposed ERP Success Model must be modified to explain adequately the interaction of factors contributing to ERP success. The Modified ERP Success Model, as shown in Figure 2, takes Task-Technology Fit (TTF), User
Satisfaction and ERP Utilisation as a more practical three-dimensional indicator of ERP Success. In another change from the initial ERP Success Model, it also shows TTF as a factor influencing perceived usefulness. This relationship emerged clearly from an analysis of the CAA data. Similarly, there emerged a need to add to the framework a recognition of Cost Factors, both fixed and variable, as major contributors to Perceived Usefulness of an implemented ERP package.

Figure 2 Modified ERP Success Model

4.1 ERP Success

According to the criterion of ERP Utilisation, CAA is seen as an unsuccessful ERP adopter. In this regard, CAA can be seen as atypical of the bulk of ERP adopters, as supported by the ERP literature. At CAA, ERP use has persisted just a little longer than the two years set as a base indicator of adoption success. However, senior management at CAA have indicated that they would have abandoned SAP use much earlier if government policy had not prevented it. Significantly, the CAA case casts doubt on the usefulness of Utilisation as a general measure of ERP success. The CAA case highlights the possibility of organisational factors contributing to continuing use of an ERP package within an organisation where the TTF is poor, perceived usefulness is low, and user satisfaction is low. Because ERP packages offer high levels of integration and because they can accommodate multi-entity organisations, it is likely that many ERP implementations involve mandated use of the package across all entities in the organisation in the same way that all Queensland government departments and agencies had been required to use SAP.

Again, once an organisation has chosen to implement an ERP package, it is unlikely that individual users will have a lot of freedom in the extent to which they utilise features offered
by the package. As in the CAA case, following initial definition of user requirements, and consequent package configuration, the extent to which users use package features is largely mandated by their operational needs.

Accepting that at the level of the corporate sub-system and at the level of individual user, continuing ERP use may be mandated rather than chosen, User Satisfaction and Task-Technology Fit jointly provide a preferable success indicator in the ERP context. It should be stated that, like Utilisation, User Satisfaction is also a widely used success measure in IS implementation research (Ives et al., 1983). The decision to choose User Satisfaction as an additional success measure is consistent with the emerging view that “there can be no single account of success but only different perceptions influenced by context” (Kanellis et al., 1998, p.136). The Utilisation concept has been taken from the literature of innovation diffusion as postulated by Rogers (1983). However, Rogers’ ideas of diffusion are predicated on a setting where innovation adoption is open to the wishes of the adopters. In the ERP context, TTF, User Satisfaction and, where utilisation is voluntary, ERP Utilisation appear to be a sound choice as indicators of ERP success. Where the utilisation of ERP is not voluntary, ERP Utilisation is discounted as a dimension of success but Organisational Factors and Perceived Usefulness, which are deemed to influence ERP Utilisation in a voluntary setting, are still proposed to influence ERP success even though their influence is not manifested by a change in the level of ERP utilisation.

This change in the success indicators is reflected in the modified model, Figure 2. The dotted line from ERP Utilisation to ERP Success is to indicate that the ERP Utilisation measures are contingent on utilisation being voluntary.

4.2 Task-Technology Fit (TTF)

The TTF construct can be seen to be a very robust construct and of major importance in explaining the lack of ERP success at CAA. SAP was used to meet the information processing needs in relation to all financial applications in the agencies serviced by CAA. None of the agencies has large or complex financial processing requirements. Because the agencies are all small, financial transaction volumes are smaller than for government departments and for many other agencies. The average monthly financial transaction volume for the client agencies is only about 10,000 transaction lines. For the smallest agency it is only 1,500 transaction lines; and for the largest, it is 20,000 transaction lines per month.

Similarly, reporting requirements are generally simple. Prior to using SAP, these agencies had used small accounting systems that made it easy for the end users to extract required information. The SAP financial system offered a level of functionality far beyond that sought by the agencies. Ironically, the very richness and complexity of SAP made it more difficult for the CAA users to extract ad hoc information. And even though SAP offers rich functionality, CAA found that the package did not address adequately some of the requirements specific to the government agencies. Aspects of what Soh (2000) called “cultural misfits” were also evident. For instance, the users found the package did not cater well to Queensland agency receipting requirements, where no products were sold nor invoices raised. Overall, the match between task and the software technology was not good.

Likewise, the match between the technology and the users was not strong. The users were accustomed to simplicity and flexibility and responded unhappily to the size and perceived complexity and inflexibility of the SAP offering.

It may also be the case that specific implementation factors exacerbated the poor TTF at CAA. It seems that the specification of user requirements developed to guide the configuring of SAP Financials erred on the side of keeping the implementation process simple so as to reduce the likelihood of errors and so as to speed up the changeover process. Rather than
seeking to offer CAA customers increased functionality that could have been provided by SAP to assist the users, the tendency was to concentrate on core requirements similar to those that were provided for prior to SAP implementation. Hence, there appears to have been little attempt to provide some of the Decision Support capabilities of SAP to agency users. The package was also configured to meet a common set of financial processing and reporting needs across all government departments and agencies, rather than being tailored to individual agency requirements.

So, the fit between task and ERP technology was poor, and between technology and user was also poor. Systems Theory teaches that the whole is greater than the sum of the parts. Consequently, TTF, the sum of all the interactions between task, technology and user, was very poor at CAA. It is clear from an analysis of the data that this poor TTF contributed to a diminished Perceived Usefulness of ERP. It is also clear that the poor TTF contributed to a low level of user satisfaction, which ultimately concluded with SAP’s abandonment at CAA.

4.3 User Satisfaction

User satisfaction at CAA, essentially a subjective item, was measured on a Likert scale where 1 is “Extremely Dissatisfied” and 7 is Extremely Satisfied. The consolidated User Satisfaction score for ERP at CAA indicated users to be Very Dissatisfied. The high level of dissatisfaction when SAP was used at CAA manifested itself in the preparation of a Business Case prepared by CAA management for the replacement of SAP by a smaller, cheaper financial package. The case was accepted and CAA subsequently replaced by a Queensland produced package, Finance One.

4.4 Perceived Usefulness

Perceived Usefulness, or expected future benefit of SAP at CAA, was low. In part, this can be seen to have been a consequence of a poor TTF, as described earlier. However, there was one other dominating factor. This was the perceived unreasonably high cost of using SAP for the financial information processing of the client agencies. Government policy dictates that CAA be self-funding. Hence, the charges to CAA agency clients have to be sufficient to cover all the costs, both fixed and variable, incurred by CAA in providing the information processing needs of the client agencies. Because of the richness and complexity of SAP, the acquisition cost is very high. Moreover, the costs involved in version upgrades are also very high. It was the impending cost of a mandatory upgrade, estimated at A$300,000 for CAA, that caused CAA management to present a business case for abandoning SAP for a cheaper, more flexible replacement financial package.

A complicating factor, an unavoidable significant organisational factor for CAA, was the government requirement that the processing of SAP financial data for CAA clients should be done through the state government computer centre, CITEC. CITEC billed CAA on a bureau basis, with CAA obliged to distribute these charges across its client agencies. CAA management felt that the CITEC processing charges for SAP, based on using a large, expensive package for relatively simple applications and small volumes of transactions, further inhibited CAA’s ability to provide client agencies with cost-effective information processing.

The Modified ERP Success Model acknowledges that Cost Factors impact on Perceived Usefulness of an ERP package. Because of the very high cost of these large, complex packages, it is likely that in all ERP implementations the magnitude of the fixed and variable
costs will influence the perception of future benefits from ERP. Similarly, organisational factors are likely to influence Utilisation, and ultimately Success, of ERP in any implementation. Here, at CAA, policy on information processing was significant. It seems likely (Robey, 1995) that one or more organisational factors will impact the ERP utilisation, or desire to utilise, and, through it, the success of the implementation.

4.5 The Influence Relationships in the ERP Success Model – Support from Theory

The influence relationships, depicted by arrowed lines in the ERP Success Model, are supported not only by the data from CAA (and from previous studies of CASE success) but are supported also by the established literature on IS implementation and innovation adoption. The influence of organisational factors on utilisation is a fundamental tenet of innovation diffusion theory (Rogers, 1983). The influence of Task-Technology Fit on Perceived Usefulness, as supported by the CAA data, is an extension of the finding of Ease of Use as a causal antecedent to Perceived Usefulness (Davis et al., 1989). Ease of Use is subsumed in TTF in the ERP Success Model. Again, the influence of Perceived Usefulness on ERP Utilisation is also consistent with the Technology Acceptance Model as demonstrated by Davis et al. (1989). The reciprocal relationship between User Satisfaction and ERP Utilisation is equivalent to the relationship between Use and User Satisfaction described by DeLone and McLean (1992). The influence of TTF on User Satisfaction corresponds to the relationship between TTF and user beliefs about using the system as shown by Goodhue and Thompson (1995). Hence, the pattern of influences observed in the CAA case study are all supported by theory from the related disciplines of IS implementation and innovation adoption.

4.6 Summary of Findings of the CAA Case Study

This empirical investigation at CAA suggests that the Modified ERP Success Model is a useful framework for understanding ERP success. The modified model accommodates well the data encountered at CAA. Importantly, the modifications retain the consistency with established IS implementation theory and innovation adoption theory.

5. Implications For Research And Practice

For Information Systems Managers, the research has important implications. Because the Modified ERP Success Model that is proposed is developed out of real-world empirical data, it should be generalisable to other real-world situations. The IS Manager can, for instance, apply Task-Technology Fit concepts to consider a “panel” approach to packages in large and diverse organisations where there are variations in size of entities in the organisation, features of users and processing needs. In such instances, the ERP package could be available to those entities where the fit is good, and a smaller, local package for others. In a progressively more “open” IT world, where it is becoming increasingly easy to interface software from different vendors, this approach becomes easier and more appealing.

For ERP vendors eager to move into the Small-to-Medium Enterprise (SME) market (Holland et al, 1999, p.291), the study also has implications. The overwhelming challenge for the vendors is to be able to offer software incorporating the best practices from around the world, yet to minimise complexity that can result in a poor fit with the experiences and attitudes of users from smaller enterprises. Likewise, means need to be found to be
responsive to local requirements associated with customs and practices in the less populous markets. For other researchers, the rigour of the case study method applied and the influence on the model of sound theory from related fields should make the ERP Success Model worthy of further testing.

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