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Abstract

This paper describes research in progress. The research aims to provide a deep understanding and explanation of the business benefits of ERP systems as they evolve during the post implementation period. The relationship of the research within the ERP literature is explained. The research design is outlined including the theoretical basis of the research. Finally some preliminary findings are presented and the current status of the research is reported.

Keywords: Business benefits, ERP systems, post-implementation

Introduction

Collective investment by organisations worldwide in ERP systems is in the order of billions of dollars (Stein, 1999). However, many of these substantial investments in IT infrastructure are made by a "leap of faith" (Stein, 1999) rather than by a justification of the investment according to tangible and intangible costs and benefits. Surprisingly few organisations know whether they have made a positive return on their investment due to their failure to build a business case prior to ERP implementation. Traditional measures of information systems (IS) investment justification such as return on investment (ROI) have been found to be inadequate (Coleman and Jamieson, 1994), as they do not take the intangible benefits of information systems into account. Few studies have looked at the business benefits of ERP systems. Of those that have (Shang and Seddon, 2000; Markus and Tanis, 2000), neither study has examined the post implementation phase of ERP implementation in an organisation in detail over time to determine its influence on business benefits in the longer term. It is of significant interest to senior management of organisations, IS practitioners and IS academic researchers to know more about the post implementation period of ERP systems, the business benefits that result during the period, and how and why these consequences occurred.

This research is studying the post implementation period of ERP systems in selected organisations. It seeks to understand and explain what business benefits have been obtained, and how and why these business benefits have evolved over time.

Background to the Research

This section outlines current research on ERP systems, in particular the research most relevant to this study. It concludes by putting the research in context with the existing literature.

There have been many ERP implementations claimed as successful but the tangible and intangible costs and benefits are not precisely known. There have also been some spectacular failures where the ERP project has been terminated after millions of

dollars have been spent by the company concerned e.g. Dell Computer spent US$30 million before abandoning its SAP implementation (Forman, 2000). Consequently, ERP systems have been studied from a number of different perspectives. These include project management, outsourcing, organisational knowledge, large packaged software, critical success factors for implementation, business benefits, to name a few. Esteves and Pastor (2001) provide a comprehensive annotated bibliography of ERP research in the period 1997 to 2000.

In order to provide a background to this research study three perspectives of the ERP literature will be discussed in turn. These are the ERP lifecycle perspective, the business benefits perspective and a "success" perspective.

A number of "life cycles" have been proposed for the ERP implementation process (e.g. Ross, 1998; Markus and Tanis, 2000; Parr and Shanks, 2000). These lifecycles differ in focus and in the number of stages proposed for the process. The model proposed by Parr and Shanks (2000) has three major stages and focusses on the implementation project itself. The lifecycle proposed by Ross (1998) consists of five stages. However, unlike the Parr and Shanks (2000) and Markus and Tanis (2000) models it does not specify a planning phase. Of the three lifecycles the Markus and Tanis (2000) enterprise system experience cycle is the most comprehensive in that it proposes four phases in ERP implementation with equal focus on each. The four phases are *Chartering*, *Project*, *Shakedown* and *Onward and Upward*. The *Chartering* phase is the initial planning phase, and the *Project* phase consists of all activities that contribute to get the system up and running. The *Shakedown* phase starts when the system goes "live" and finishes when normal operations are achieved. The final phase *Onward and Upward* starts when normal operation is achieved and lasts until the system is upgraded or replaced.

The IT (Information Technology) Balanced Scorecard (Willcocks, 1994) has been proposed as a way of evaluating the IT functon or a specific IT project (Van Gremburgen and Van Bruggen, 1997; Rosemann and Wiese, 1999). Application of the scorecard concept specifically to the actual performance of ERP systems was proposed by Rosemann and Wiese (1999). However, this ERP scorecard is only in the development stage. A framework for assessing the business benefits of ERP systems has been developed by Shang and Seddon (2000). The framework, shown in Figure 1 includes five dimensions of benefits: operational, managerial, strategic, IT infrastructure, and organisational, with multiple possible benefits within each dimension. This framework provides a convenient means of identifying the business benefits an organisation has realised in the *Shakedown* and *Onward and Upward* phases of the enterprise system experience cycle.

According to Markus and Tanis (2000) success with ERP systems is multi-dimensional and relative to the time at which it is assessed. Three success metrics are proposed: project metrics (budget, schedule and scope), early operational metrics (in the *Shakedown* phase) and longer term business results (in the *Onward and Upward* phase). Using these characteristics of success Markus and Tanis (2000) define what they call "optimal success" for ERP systems. The work reported by Markus et al. (2000) on problems encountered and success achieved with ERP systems uses this definition of "optimal success". They describe mainly problems and few business benefits from ERP system implementations. This is probably due to the fact that they deliberately chose organisations that had experienced problems. The organisations studied were at most only 18 months past go live date. Different organisations were studied at different stages of the ERP experience (excluding the *Chartering* phase) and the business consequences were related to events in the earlier ERP experience phases and to external influences due to changing business conditions. However, there is little information provided on the internal influences on the business benefits, such as changes to organisational structure and culture.

There is a strong need to develop an adequate understanding of how and why the post implementation period of some ERP implementations contributes to the provision of more business benefits in some organisations than others. This research project builds on the work of Markus and Tanis (2000), Shang and Seddon (2000) and Markus et al. (2000). The benefits framework of Shang and Seddon (2000) will be used to identify the business benefits in the *Shakedown* and *Onward and Upward* phases of the ERP lifecycle. It will be tested and enhanced as part of this research. This study will take a broader and deeper view than previous studies by relating the business benefits to both the internal and external context of the organisation, and the interactions between the two contexts. It will examine only the two phases, *Shakedown* and *Onward and Upward* and will study organisations that are at least three years past their go live date. The research will assess the business benefits in these two phases providing a detailed understanding and explanation of how and why any changes in business benefits occurred over time in the chosen organisations.

Research Questions

The aim of the research is to provide a deep understanding and explanation of the business benefits of ERP systems as they evolve during the post implementation period in selected organisations. The specific research questions are: (1) What are the business benefits of ERP systems? (2) How and why do business benefits evolve during the post implementation period? (3) How and why do some ERP implementations provide more business benefits than others?

Benefit Dimension	Benefit Categories
1. Operational	1.1. Cost reduction 1.2. Cycle time reduction 1.3. Productivity improvement 1.4. Data quality improvement 1.5. Customer services improvement
2. Managerial	2.1. Better resource management 2.2. Better decision making 2.3. Better performance control
3. Strategic	3.1. Supports current and future business growth plan 3.2. Supports business alliances 3.3. Supports business innovation 3.4. Supports cost leadership 3.5. Supports product differentiation 3.6. Supports external linkages 3.7. Enable worldwide expansion 3.8. Enable ebusiness
4. IT Infrastructure	4.1. Increased business flexibility 4.2. IT cost reduction 4.3. Increased IT infrastructure capability
5. Organizational	***5.1.*** Supports business organisational changes ***5.2.*** Facilitate business learning and broaden employee skills ***5.3.*** Empowerment ***5.4.*** Changed culture with common vision ***5.5.*** Changed employee behaviour with shifted focus ***5.6.*** Better employee morale and satisfaction

Figure 1. Shang and Seddon's (2000) Business Benefits of ERP Systems

Research Design

This section describes the theoretical framework that underpins the research and outlines the research method including site selection, the unit of analysis, data collection, and quality control. It concludes with a discussion of the limitations of the research.

Theoretical Framework

The implementation and use of an ERP system is viewed in this research from the perspective of organisational change (Davenport, 2000). The work of Pettigrew (1989) on organisational change has provided a basis for researchers such as Walsham and Orlikowski to study the adoption and use of information systems from a perspective of organisational change. The framework (see Figure 2) that underpins this research is adapted from Orlikowski (1993) who developed a framework using grounded theory based on a study of CASE tool use in two different organisations. Orlikowski's framework is quite general in nature and was used by Shanks (1997) in a study of strategic data planning. The historical context, not included by Orlikowski, has been added to the framework in the internal context, as it is an important aspect to be included when studying organisational change (Pettigrew, 1990; Walsham, 1992).

The framework shown in Figure 2 shows the context of the ERP post implementation phase in the organisation having three aspects, namely, external, internal and the ERP implementation project team. The process of ERP use can be studied over time from the conditions prior to adoption and use i.e. the influences of planning and implementation before the ERP system went "live", through early operational use, to the longer term consequences of its use. It is in the latter two parts of the process, early operational use and longer term use, that Shang and Seddon's (2000) benefits framework will be used to identify the business consequences of the system.

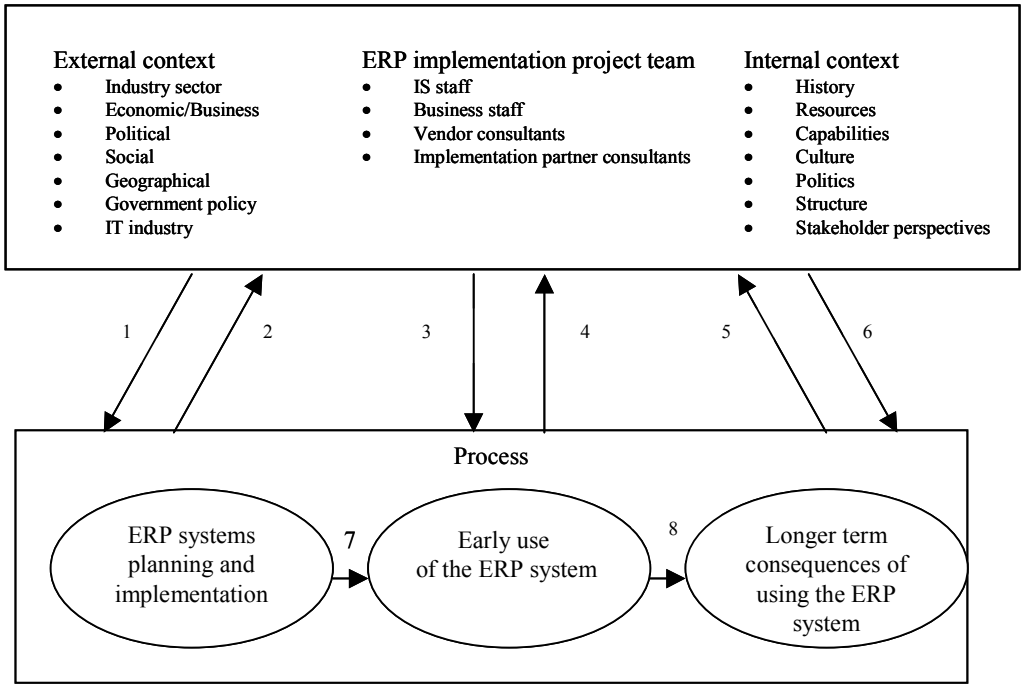

Figure 2. Framework for the research (adapted from Orlikowski, 1993)

The different components of the framework (see Figure 2) are discussed in more detail below, beginning with the three different aspects of context: external; internal; and the ERP implementation team. Then the three aspects of process are explained, concluding with the interaction between context and process.

The geographical, economic, business and sectoral environment in which the company operates, Government regulations, and social and political factors are some of the possible external contextual factors that will need to be taken into account. Differing performances between organisations can be explained by the way that management assesses and responds to its environment (Pettigrew and Whipp, 1991).

Competition operates on three levels across time (Pettigrew and Whipp, 1991). The organisation chooses strategies to support the bases on which it decides to compete. At the level of the industry sector the market structure, industry maturity and commercial networks must be taken into account.

The characteristics of the current economic climate such as the exchange rate and finance/industry relationships will be influencing factors. These sectoral and national contexts are not static and management must continuously respond to them over time. It is the difference in responses by management to these contexts that give rise to different business consequences.

The internal context includes the history of the organisation as it will have an effect on its current and future performance. For example, a requirement for skills that the human resources of the organisation do not have, and need to acquire, will affect the rate and pace of business change and the resultant business benefits. Both Pettigrew (1990) and Walsham (1992) have emphasised the need to include the history of the organisation when studying organisational change.

There are other factors in the internal context of an organisation that may have an influence on the relative success of the ERP system and consequent business benefits to the organisation. Two examples of internal factors include resources available during the post implementation phases (Ross, 1999) and the degree of change in cultural, political and power relationships within the organisation (Walsham, 1992) due to the ERP system.

The ERP implementation project team is an important contextual part of this research. It may consist of a project manager and representatives from the appropriate business units, the ERP vendor, the ERP implementation partner and the IT department of the organisation (Bancroft, 1996). The precise composition, skills and experience of the ERP implementation project team is important. A number of issues in relation to the ERP implementation project team in the post implementation period may have

an impact on what business benefits eventuate and how quickly they are obtained. Some examples are a) Whether, or how long the project team continued to function after going "live" with the ERP system? b) Were the same experienced consultants provided for the entire period of time required? (How to find the right R/3 consultant, 1996) c) Were resources put into internal staff training to reduce future dependence on the ERP vendor and/or implementation partner? (Brown & Vessey, 2000)

The process part of Figure 2 has three parts: conditions for adoption and use, early operational use, and business benefits resulting in the longer term. The arrows numbered 7 and 8 on Figure 2 indicate the progression in time of these three stages.

The ERP systems planning and implementation bubble refers to the details of the ERP implementation itself. This might include the extent of planning undertaken for the ERP system by the organisation and any effects of the implementation process, for example, time relative to schedule, cost relative to budget and functionality relative to original proposed scope (Markus et al., 2000). These will all influence the business benefits gained. The early operational use of the ERP system is assessed in the *Shakedown* phase of Markus and Tanis (1999) which occurs immediately after the ERP system goes live. Shang and Seddon's (2000) benefits framework will be used to guide data collection. *Shakedown* is an important phase as often performance suffers before normal operations are reached (Markus et al., 2000). This may have lasting business consequences to the organisation. Loss of customers may occur due to, for example, billing inaccuracy caused by the inevitable performance dip that accompanies organisational change (Eason, 1997). Different stakeholder perspectives of the business consequences of the ERP system will be obtained.

The longer term business consequences of the ERP system can be determined in the *Onward and Upward* phase of post implementation. In this stage the Shang and Seddon (2000) framework will be used again to assess the business benefits from different stakeholder perspectives. The time frame of the *Onward and Upward* will extend for at least three years past the go live date. This particular point in time has been chosen because Deloitte Consulting (1999) calls post implementation "ERP's Second Wave" and claims it can last up to four years. Also, Willcocks and Lester (1999) note that the financial benefits of IT may take several years to be realised due to the time required for learning and adjustment.

The arrows numbered 1 to 6 on Figure 2 represent the interactions between context and process. This research will take a processual approach to examine how events unfold over time, from the initial planning for the ERP system through to the longer term business results in the *Onward and Upward* phase of the ERP experience lifecycle. In particular the study will look at how action and context interact with each other. That is, the three aspects of context both constrain and enable action, and action can change context. It is only through a detailed study of how and why these interactions influence the business consequences of the ERP system over time can a deep understanding of the business impact on the organisation be gained.

Research Method

A multiple case study method will be used. This choice of method can be justified as follows:

- According to Yin (1994) a case study method is appropriate when three conditions are met: “how” or “why” questions are posed, the investigator has little control over events, and the focus is on a contemporary phenomenon within a real life context. The proposed research meets all three conditions. The questions ask “how” and “why” (see section 3), the researcher will have had no control of events within the selected organizations, and ERP systems are a contemporary phenomenon.

- In their paper on evaluating investments in IT, Farbey, Land and Targett (1999) provide a framework for the selection of a research method appropriate for the type of investment being evaluated. Where uncertainty as to cause and effect is high, and uncertainty as to objectives is also high, qualitative, interpretive and case study approaches are suggested. These characteristics are consistent with this study that aims to understand and explain the business benefits of ERP systems.

Site Selection

Four sites will be chosen from different manufacturing sectors. There are a number of reasons for choosing the manufacturing sector. The research literature since the 1980's has shown productivity increases in the manufacturing sector due to the use of IT (e.g. Weill, 1990) for both the sector as a whole, and individual organisations (Willcocks and Lester, 1999). A more complete implementation of an ERP system is more likely in the manufacturing sector (i.e. more modules). ERP systems actually grew out of Material Resource Planning (MRP) systems that were designed for manufacturing companies. Shang (2001) has studied the business benefits of ERP systems in the service sector in Australia. There are no other studies of the business benefits of ERP systems in Australian manufacturing companies. A study involving the manufacturing sector will complement the work done by Shang (2001) and will broaden our knowledge of the business benefits of ERP systems. The chosen organisations will all have

implemented their ERP system at least three years ago. In this time frame the business benefits of the ERP system should be clearly evident.

Unit of Analysis
The unit of analysis in the study is the continuous process of post implementation of the ERP system in context in the selected organisations (Pettigrew, 1990). Post implementation commences at the go live date and continues through the *Shakedown* and *Onward and Upward* phases (Markus et al., 2000). In Figure 2 the early use of the ERP system involves study of the *Shakedown* phase and the longer term business benefits involves study of the *Onward and Upward* phases.

Data collection
The primary source of data is from in-depth interviews with key informants chosen because of their position within the organisation. Examples of personnel interviewed are representatives of senior management, business unit managers, the ERP manager, internal IS staff, vendor staff and implementation partner staff as appropriate. The adapted Orlikowski framework (Figure 2) and the Shang and Seddon (2000) framework (Figure 1) have been used to provide the basis for the semi-structured interview protocol. The interview questions are aligned with the categories of internal and external context, the ERP implementation project team context, and the ERP systems planning and implementation process. The Shang and Seddon (2000) benefits framework is used as a basis for the questions on early use of the ERP system and the longer term consequences of using the ERP system. Interviews are tape recorded to ensure accuracy. To provide triangulation other sources of data collected are company documentary evidence and archival data such as post implementation reviews, audit reports etc.

Quality control
The case study research design conforms to the principles for conducting interpretive field studies in information systems developed by Klein and Myers (1999).

Limitations of the Research

One limitation to the research is that senior management and business unit managers may overrate the business benefits from the ERP system (Ragowsky et al., 1996). Willcocks (1999) calls this the "management rhetoric of success". To overcome this documentary evidence of business benefits will be be sought whenever possible. Another limitation is that some business benefits of ERP systems may only become apparent after a relatively long period of time (DeLoitte Consulting, 1999; Willcocks and Lester, 1999). Therefore case study sites will be chosen where the post implementation period has been at least 3 years.

Research Outcomes

This research will provide three main contributions. The use of Shang and Seddon's business benefits framework to investigate the benefits in the *Shakedown* and *Onward and Upward* phases of post implementation will test the framework and extend it if new business benefits are discovered. The second contribution will be an explanation and deep understanding of how and why the business benefits have evolved during the post implementation period. This will come from a detailed study of the interaction between context and process over time within the selected organisation. And finally, the research will provide an explanation and understanding of how and why some organisations gain more business benefits from their ERP systems than others.

Preliminary Findings

All initial interviews at the first case study site, ManA, have been completed. ManA is a publicly owned Australian company employing around 9,000 staff across approximately 30 countries and with revenue of $A4 billion annually. SAP was implemented primarily for business reasons and used as an enabler for restructuring to a shared services model. The case study entity is Consumer Products (CP), the last Division to implement SAP. The implementation was essentially a systems migration taking approximately 12 months. There are a number of different businesses within the CP Division. These are referred to below as A, B, C, and D. Data collection commenced in August 2001. Three preliminary findings from analysis of interview data follow.

First, analysis of the ManA interview data have revealed a benefit not mentioned in prior studies, e.g., Shang and Seddon (2000). It involves the standardisation of staff induction and training. Prior to the SAP implementation the businesses in CP had their own

different custom-built legacy systems. This meant that the transfer of staff within the Division to another business required training in a new system. The use of the SAP system means that there can now be some standardisation of staff induction and training and it is much easier to move staff across the businesses within the Division.

> "*What it means is it's much easier from a human resources point of view to move people across the organisation. Certainly in terms of service people, support people, account managers, as well as the functional people in areas like finance, HR, are much more transient across different parts of our organisation. In other words in the old days the A people knew the A system but it was very difficult to move any of those into the B business. But now it allows us to move people much more rapidly and therefore have a much stronger workforce to support our businesses. Areas like SAP training, staff induction, obviously to some extent we have been able to standardise because our processes are much more similar across all our businesses than they were historically."* (General Manager for IT, Planning and Finance, CP, ManA)

Second, the CP Division of ManA adopted a very unusual approach to providing business staff for its project team. When the SAP implementation team for the CP Division was formed it was felt that it would be too costly for the business to take out their very best business people to join the project team. Instead, because some redundancies were expected as a result of the planned move to centralized shared services, staff who were expected to be made redundant at the completion of the project were chosen for the project team. This meant that some of the business representatives on the SAP implementation team went into the project knowing that they would be leaving the company when the project was finished. This approach raises a host of issues that can be discussed at the presentation. Here is one opinion:

> "*I could talk on this forever because this is where you really have to draw the fine line because to get the best out of SAP you have to release your best people. Now releasing your best people means your operational things suffer and people are generally loath to actually give their best people so we haven't always got the best people, although ideally we'd have liked to but that's where we are. The other danger that I see with doing that, of taking people into this, is sometimes, and again this is a personal view, where I believe if ever we could redo everything we 'd probably do it slightly differently, is that by taking people from the business and putting them there, yes, you share a bit of knowledge but you also carry across bad practices because if a person is doing a job today and is comfortable with the way they are doing it and you then go and configure your SAP to mirror what you've done, what you've done is you've taken an existing process without reengineering, without doing a BPR, and therefore your bad habits get configured and personally I've actually seen this happen*."(Business Improvement Manager, Financial Shared Services, ManA)

Third, several respondents in CP mentioned a deskilling of employees who knew the old systems and the business very well. In general the older/experienced users of the old systems have not adjusted to the new SAP system as well as the newer/younger users. This is attributed to the newer/younger users' better knowledge of personal computers and Windows based systems and a willingness to "play" with the SAP system. In the customer service area the older/experienced users of the old systems have actually lost status in that it is the newer/younger users of the SAP system who now can assist other users when there is a problem. However, in the warehousing area the SAP interface was customised with the express purpose of making the transition for users easier. Many of the users in this area did not have any computer skills at all. The training for the SAP system was structured with this in mind and has been so successful that it has resulted in some users going out and buying computers for personal use at home.

An important issue in this research is whether it is possible to separate out the business benefits of the ERP system from other organisational or IT changes. It is certainly pointed out during the interviews that the benefits should only be those that have resulted from use of the ERP system. The findings at ManA indicate that respondents are able to differentiate:

> *"Productivity has improved but it is not to do with SAP. It has to do with some other changes, the robot line etc.that we have put in."* (Materials Manager, CP, ManA)

Current Status of the Research

Thirteen interviews have been completed at the time of writing and further analysis of the data will have been completed by the time of the conference. Preliminary findings from data collection at other companies will also be available.

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