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ASSESSING BUSINESS BENEFITS FROM ERP SYSTEMS: AN IMPROVED ERP BENEFITS FRAMEWORK

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Abstract

This paper reports on the business benefits achieved from ERP systems in four Australian manufacturing organizations. The business benefits resulting from ERP use in each organization were assessed using the Shang and Seddon (2000) ERP business benefits framework. In addition to confirming the existing benefit dimensions and categories of the ERP benefits framework, the study identified new benefit categories and resulted in an amended and improved ERP benefits framework. The findings also provide some guidance on using the framework.

Keywords: ERP systems, business benefits, structuration theory, case study

Introduction

For more than ten years there has been an increasing industry trend to buy of-the-shelf software rather than custom build software to provide an integrated solution for the business transaction processing requirements of organizations. These Enterprise Resource Planning (ERP) systems are large, complex software packages that provide an integrated real-time environment based on an enterprise wide data model with a set of software applications which allow processing of all the data of the organization (Bancroft, Seip & Sprengel 1998). Despite collective investment by organizations worldwide in ERP systems in the order of many billions of dollars (Stein 1999), many organizations do not know if they have achieved a positive return on their investment.

To date most ERP research has concentrated on the implementation project itself. However the primary focus of this paper is on the business benefits achieved during the post-implementation period i.e. during the period of use of the ERP system. The specific research question addressed in this paper is:

What are the business benefits of ERP systems?

The improved ERP benefits framework developed in this study and the reported insights about its use contribute to the ERP research literature on assessing the business benefits from ERP systems. The results will be of interest not only to ERP researchers but also to ERP managers and consultants, and to senior managers in organizations that either intend to, or have already implemented an ERP system.

The rest of the paper is organized in the following way. The next section begins with a discussion of the research space within which the study is located. The existing literature on the ways the “success” of ERP systems has been measured is then reviewed. This frames the contribution of the study within the information systems (IS) literature. The research design is outlined, followed by the results combined with a discussion of the results in terms of the existing literature, and then the limitations of the study and the conclusions are presented.

Background

Three strands of research literature form the background to this study. They can be organized into three groups: the type of research, the theoretical background to the research and the relevant ERP literature. Each is outlined in turn below.

Type of Research

The research reported in this paper can be categorized according to the framework for replication research provided by Berthon, Pitt, M. & Carr (2002). Berthon et al. specify three dimensions of research space. The first is “theory” i.e. the philosophical lens which may include use of a specific theory. The second is “method” which includes the techniques of data generation and data analysis used. The third is “context” with both situational and interpretive characteristics. All replication studies can be categorized on a spectrum from pure replication of the three dimensions through to pure generation where all three of the dimensions are changed (Berthon et al. 2002). In this replication study three of the dimensions were changed i.e. theory, method and context. Table 1 below outlines these changes in detail. The use in this study of an interpretivist approach combined with a structurational lens focused attention on data that highlighted power and communication issues.

Theoretical Background

In this research IS are considered to be social systems (Land & Hirschheim 1983). IT, in this case the ERP system (i.e. the software, hardware, telecommunications), forms only a part of the IS since ERP systems are used within a social system. Therefore key ideas from structuration theory (Giddens, 1984), a social theory, were considered appropriate to assist in understanding and explaining the empirical evidence.

According to structuration theory (Giddens 1984) the three dimensions of social structure in social systems are *signification*, *legitimation* and *domination*. It is important to note that this social structure consists of rules and resources that exist only in the human actor’s minds.

Table 1: Research space (Berthon et al. 2002) of the two studies

Research Space		Shang and Seddon (2000)	This Study
Problem		What are the business benefits of ERP systems?	What are the business benefits of ERP systems?
Theory	<i>Theoretical lens</i> <i>Specific theory</i>	Positivist None	Interpretivist Structuration theory
Method	<i>Data collection</i>	Business manager perspective; 233 vendor success stories (published on the world wide web), follow up telephone interviews in 32 organizations, confirmation in four in-depth case studies from 30 face-to-face semi-structured interviews, internal company documentation, publicly-available information.	Business manager perspective; 28 face-to-face semi-structured interviews. internal company documentation, publicly-available information.
	<i>Data analysis</i>	Content analysis (not explicitly stated), using an initial framework developed from the literature.	Interview transcript data from each company were decontextualized to write a "story" of ERP implementation and use, then recontextualized through the development of emerging themes and interpretations (a grounded approach).
Context	<i>Investigative</i>	Vendor success stories from US, UK, Asia, Australia and four in-depth case studies of Australian utility companies; SAP, Oracle and Peoplesoft.	Four in-depth case studies of Australian manufacturing companies; SAP
	<i>Interpretive</i>	Exploratory study to develop business benefits framework; single researcher as outside observer	Study of ERP use employing business benefits framework to gauge benefits; single researcher as outside observer

There are also three dimensions of human action: *communication*, *power* and *sanctioning of conduct*. The dimensions of social structure are produced and reproduced over time by the dimensions of human action. This interaction between structure and human action is called the 'duality of structure' and it produces changing *interpretive schemes*, is affected by *resources* and may either establish new *norms* of behavior or reinforce old ones (Giddens 1984).

Assessing the Business Benefits of ERP Use

A number of authors have proposed ways of evaluating the "success" of ERP systems. For an ERP system in use Markus & Tanis (2000) state that "optimal success" involves measures of early operational performance followed by longer-term business performance. Early operational measures are those achieved during the early use phase of the ERP life cycle. It is important in this phase while the organization is adjusting to the ERP system that no long term damage is done to relationships with suppliers and customers. During this period it might be expected to see some tangible benefits from the use of the system such as reductions in financial close cycles. Longer-term business benefits to improve organizational performance might include reduction in IT costs, better decision making and improved business practices. According to Markus, Axline, Petrie & Tanis (2000) the success metrics should include indicators of human and organizational learning and system quality issues such as accuracy, reliability and response time. However Markus et al. (2000) only provide a general overview of the types of measures that can be used to determine "optimal success".

It was originally proposed by Willcocks (1994) that the Balanced Scorecard (Kaplan & Norton 1992) could be adapted to evaluate IT investments. Subsequently it has been used as a way of evaluating the IT function or a specific IT project (Van Grembergen & Van Bruggen 1997, Martinsons, Davison & Tse 1999). Application of the scorecard concept specifically to the implementation and performance of ERP systems in use was proposed by Rosemann & Weise (1999). Their scorecard concentrates mainly on the system quality aspect of ERP system use.

However, there are no reports in the literature of this ERP scorecard proceeding beyond the developmental stage (Rosemann 2001, Sedera, Gable & Rosemann 2001).

Another measurement tool was developed more recently by Gable, Sedera & Chan (2003) (see also Gable & Sedera (2004)). It attempts to span both system quality and business benefits aspects of the success of ERP systems in use. This validated measurement model was designed to cover success of the system from multiple perspectives, management, user and technical. It was developed from survey data from 27 Australian Government agencies. Based on DeLone & McLean’s (1992) dimensions of IS success, the only dimension not included is “use” as ERP use is assumed mandatory. This is a reasonable assumption for users at the operational level. However, it could be argued that it does not hold for manager users. The improved decision making expected from ERP systems involves voluntary use by managers who must learn to use the querying facilities of the system. The querying facilities are difficult to learn and many managers rely on pre-formatted reports (Ross & Vitale 2000). Therefore the assumption of mandatory use is a shortcoming of this model. In addition there is no evidence as yet of its applicability to the private sector.

Yet another approach to the evaluation of ERP systems in use is Shang & Seddon’s (2000) ERP benefits framework, shown in Figure 1. It was developed from a study of 233 vendor success stories published on the web, and interviews with managers in 34 organizations using ERP systems. The framework was validated subsequently using in depth case studies in four Australian utility companies. It includes five dimensions of business benefits: operational, managerial, strategic, IT infrastructure, and organizational. Within each dimension there are multiple business benefit categories. The framework views business benefits mainly from the perspective of business managers i.e. middle and senior management. The operational, managerial and organizational business benefits can be obtained from the perspective of business unit managers, strategic benefits from the perspective of senior management, and IT infrastructure from the perspective of the IT manager. It provides a convenient means of identifying the business benefits an organization has realized in the post-implementation phase of the ERP system life cycle. However, it must be emphasized that it does not suggest that every organization will or should obtain *all* of these benefits, but that the framework provides a comprehensive list of the business benefits that are *possible* from ERP systems.

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 Enables world wide expansion 3.8 Enables 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 organizational changes 5.2 Facilitate business learning and broaden employee skills 5.3 Empowerment 5.4 Changed culture with a common vision 5.5 Changed employee behaviour with a shifted focus 5.6 Better employee morale and satisfaction

Figure 1: Shang & Seddon’s (2000) ERP benefits framework

The Gable et al. (2003) model and Shang & Seddon’s (2000) framework described above provide two viable measurement models for assessing the business benefits of ERP systems in use. In this study the business benefits of

ERP use in each of the four organizations were assessed using Shang & Seddon's (2000) ERP benefits framework. At the time of starting data collection for this research (February, 2001), it was the only fully developed and validated, published measurement model available for ERP systems.

The Shang and Seddon framework is not without its critics. Both Gable et al. (2003) and O'Grady (2002) point out that some categories of benefits overlap. O'Grady (2002) points to overlap in the managerial and strategic dimensions, while Gable et al. (2003) provide no examples of overlap. Another criticism of the framework is its unitary managerial perspective (Gable et al. 2003).

Further criticisms are that it does not include the dimensions of time and context (O'Grady 2002). However, the only contextual issue O'Grady considers important is the organization's motivation for implementing the ERP system. The motivation (i.e. business, technical, financial) of an organization to implement an ERP system has been linked to both success with ERP systems (Markus 2000) and the extent of IT-enabled organizational change possible (Venkatraman 1994). The Gable et al. (2003) measurement model can be criticized for the same shortcomings. Both time and context have been recognized as important in the measurement of ERP success by other researchers (Larsen & Myers 1999, Markus & Tanis 2000).

Both Shang (2001) and O'Grady (2002) agree there is a time order to achieving benefits i.e. that operational and IT infrastructure benefits precede managerial, organizational and strategic benefits. However this time order aspect is not explicit in Shang & Seddon's (2000) benefits framework.

Research Design

A multiple case study method was used. This was appropriate since the focus was on a contemporary phenomenon within a real life context (Yin 2003). The four case study sites were from different organizations within the manufacturing sector in Australia. There were a number of reasons for choosing manufacturing organizations. 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 organizations (Willcocks & Lester 1999). A more complete implementation of an ERP system was more likely in a manufacturing organization (i.e. more modules implemented).

In all four manufacturing organizations SAP software was adopted providing some consistency to allow comparison and contrast. Across the four cases there was variety in motivation for the ERP implementation, organization size and the implementation strategy used. As the time elapsed since going "live" with an ERP system is an important influence on the business benefits achieved (O'Grady 2002), all organizations in this study had more than 18 months experience with the ERP system, and some as long as five years. Since business benefits take time to accrue it was expected that with this time frame business benefits from the ERP system would be clearly evident. The organizations were named ManA, ManB, ManC, ManD to preserve anonymity. Table 2 gives some background information on each of the case study sites. The full names of the SAP modules referred to in Table 2 are: Finance (FI), Controlling (CO), Production Planning (PP), Materials Management (MM), Sales and Distribution (SD), Project Management (PM), Asset Management (AM), Human Resources (HR), and Business Warehouse (BW).

The primary source of data was from in-depth interviews. The interview protocol was based on Orlikowski's (1993) framework on CASE tool use which was adapted for ERP systems. It provided a guide to examining ERP planning, implementation and use as a process within context. The interview questions were aligned with the categories of internal and external context, the ERP implementation project team context, and the ERP systems planning, implementation and use process. The Shang and Seddon (2000) benefits framework was used as a basis for the questions on the business benefits achieved during use of the ERP system (see Staehr et al. (2002) for more detail). Key informants were chosen because of their position within the organization. As far as possible the informants were chosen according to their perceived ability to report on the business benefits achieved in particular dimensions of Shang & Seddon's (2000) framework. That is, the operational, managerial and organizational business benefits were obtained from the perspective of business unit managers, strategic benefits from the perspective of a senior manager and IT infrastructure from the perspective of the IT or ERP manager. The Shang & Seddon (2000) ERP benefits framework (shown in Figure 1) was used as a checklist to prompt the informants for the business benefits that had been achieved in their organization. (Note that this version of the ERP benefits framework, not the later version of the framework published in Shang & Seddon (2002) was used in this research. This was because at the time of commencing this research the later version was not available.)

The role of the researcher in this study was that of an “outside observer” (Walsham 1995). The main advantage of this role is that the researcher is not seen as having a stake in certain interpretations and outcomes and therefore interviewees may be more frank. However a disadvantage is that the researcher does not get a feel for the organization as an insider would. Also, as was the case in this research, the researcher may be denied access to some data (e.g. documentation about the the ERP system planning, implementation and use), because of their status as outsider (Walsham 1995).

Table 2: Background data for case study sites

	ManA	ManB	ManC	ManD
Motivation for Implementing SAP	Business reasons	Business reasons	Financial, technical reasons	Business reasons
Cost of Implementation	More than AUD\$20 million	~AUD\$25 million	~AUD\$1 million	Not available
Sites	Multiple	Multiple	Multiple	Single
Modules	FI, CO, PP, MM, SD, PS, BW	FI, CO, MM, PP, SD, AM	FI, CO, MM, PP, SD	FI, CO, PP, MM, SD, HR
Version of SAP implemented	4.5	3.0F , then upgrade to 4.6B	3.1H, technical upgrade to 3.1I	3.0F, 4.6B, 4.6C
Implementation Strategy	Big Bang	Small Bang (one site or logical group of sites at a time)	Big Bang	Incremental (module by module)
Implementation Approach	System replacement	System replacement	Vanilla	Vanilla as possible
Implementation Partner	No, used internal expertise	Yes	Yes	Yes
Business process reengineering	No	No	No	Yes
Customisation?	Yes – extensive in some areas	Yes - kept to a minimum	Minimal - Customized reports	Minimal – interfaces needed due to nature of implementation strategy
Business Restructuring	IT and Finance shared services before go-live	Accounts payable and accounts receivable shared services after go-live	Yes, but not enabled by SAP	No
Was project completed on time, within budget and within original scope?	Yes, but some unresolved issues	Yes	Overrun of ~4 months	On time, within budget, HR module abandoned.
Number of users	~680	~1000	~150	~130
When were the business benefits assessed?	21 months after go-live	Four years after first site went live. One and a half years after last site went live i.e. full implementation	~four (4) and a half years post go-live	Project spanned Mar 97 to Jan 99, so 4 and a half years after last module went live.
Business benefits achieved (assessed using the Shang & Seddon (2000) framework	Limited	Extensive	Limited	Substantial

Interviews were conducted at ManA and ManB in late 2001, at ManC in 2002 and in ManD in 2003. The interviews were tape recorded, transcribed and returned to informants for checking to ensure accuracy. To provide further information on each case data were obtained from other sources where possible. This consisted of documentation in the form of internal company documents, company presentations, company newsletters, data from financial databases, company web pages and newspaper articles. The Nudist software package (*Nudist (Version 5.0) 2000*) was used to manage the research data.

Table 3 shows the job titles of the participants and the duration of the interviews in each organization. To provide triangulation other sources of data collected were company documentary evidence and archival data such as post-

Table 3: Interview details

Case	Job Title	Duration of Interview(s)
ManA	Finance Business Analyst, Retail	45 minutes
	Business Improvement Manager, Corporate Financial Services Customer Service representative, SAP implementation team	55 minutes
	Materials Manager	One hour and 10 minutes
	Site Manager	One hour and 15 minutes
	IT Manager	50 minutes
	General Manager Finance, IT and Planning	40 minutes
	Logistics and Planning Manager	40 minutes
	Finance Team Leader, SAP Implementation Team	55 minutes One and a half hours
ManB	General Manager IT and Business Solutions	One and a half hours
	Group Business Solutions Manager, Finance	One hour and twenty minutes
	Group Project Manager	One hour
	Group Business Solutions Manager, Manufacturing	One and a half hours
	SAP Applications Manager	One hour
ManC	Group Financial Controller	45 minutes
	Financial Accountant	25 minutes
	Sales and Marketing Manager	30 minutes
	Commercial Manager	One hour and 5 minutes
	Market Manager	45 minutes
	Customer Service and Export Manager	One hour
	Commercial Manager	One hour and ten minutes
	Business Systems Manager	One hour
Principal Consultant (from Implementation Partner Company)	One hour and ten minutes	
ManD	Vice President, Information Technology	One and a half hours
	Group Leader SAP	One and a half hours
	Executive Vice President and Chief Financial Officer	35 minutes
	Vice President, Trading and Aftermarket Division	One hour and ten minutes
	Section Manager, Electronics Final Assembly	One hour and ten minutes

implementation reviews etc. The case study research design conformed to the principles for conducting interpretive field studies in information systems developed by Klein & Myers (1999).

Results and Discussion

The four organizations achieved a different number and extent of business benefits from their ERP systems. A brief overview of each case indicating the extent of business benefits achieved and the major contributing influences are described below.

The ManA Case: ManA achieved limited business benefits from its SAP system. It is interesting to note that despite the existence of IT shared services enabled by SAP, IT cost reduction was not achieved at ManA. A contributing influence may have been that the division depended on contractors for approximately 40% of its IT staff. However, although there was no IT cost reduction at ManA there were IT cost reductions at the parent company’s corporate level due to the formation of IT shared services. In addition only one strategic business benefit was achieved. There were two main contributors to this. The first was the number of unresolved issues remaining from the implementation that had to be dealt with when the system went live. And the second was the relatively short period of time after go-live (21 months) at which the business benefits were assessed.

The ManB Case: In contrast ManB achieved extensive business benefits from its SAP system. The SAP implementation at ManB was undertaken as a strategic business initiative proceeding despite a predicted negative return on investment. The ‘small bang’ implementation strategy allowed the project team to learn from the early site implementations and this knowledge was used to improve subsequent site implementations. However the use of the same team for both development and training and support post implementation influenced the operational and managerial benefits achieved. There was inefficient and ineffective use of the system by inexperienced users which

had a direct impact on productivity. Also some managers failed to adopt the new work practices required to improve management decision making through the use of SAP.

The ManC Case: ManC achieved only limited business benefits from its SAP system despite four and a half years having elapsed since going live with its SAP system. The SAP implementation was motivated by a need to reduce costs and to solve the year 2000 problem. The implementation was not completed on time. This affected the training schedule, with the training needing to be repeated close to go-live. This was inadequate due to IT staff being involved in data conversion and testing at the same time. There were issues of software fit due to some complex manufacturing processes at ManC. A lack of financial resources pervaded the Shakedown and Onward and Upward phases at ManC. There was a lack of people resources resulting from redundancies, departure of all but one member of the SAP project team within six months of going live and managers and users not having the required skills and abilities to use SAP well. This resulted in an ongoing dependence on the implementation partner. The financial constraints meant that SAP was not upgraded.

The ManD Case: ManD achieved substantial business benefits from its SAP system. Change management started in the planning phase with the importance of having business representatives on the project team recognized from the beginning. The staged implementation (i.e. module by module) was a low risk option. There was no performance dip after go-live at ManD as business managers found from the start that SAP was an improvement compared with the legacy systems. Business process improvement was driven by headquarters in Europe who expected more done with less financial resources. It was also driven by employee incentive schemes for improved business processes.

Changes to the Shang and Seddon (2000) ERP Benefits Framework

This study confirmed the existing benefit dimensions and categories of the Shang & Seddon (2000) ERP benefits framework and resulted in some additions and changes to the framework. An amended Shang & Seddon (2000) ERP benefits framework with all changes resulting from this study is shown in Figure 2.

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 1.6 User accountability
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 innovation 3.3 Supports cost leadership 3.4 Supports product and service differentiation 3.5 Enables external linkages 3.6 Enables world wide expansion
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 organizational changes 5.2 Facilitates learning and broadens employee skills 5.3 Empowerment 5.4 Changed culture with a common vision 5.5 Changed employee behaviour with a shifted focus 5.6 Better employee morale and satisfaction 5.7 Standardization

KEY: *Benefit category*= new business benefit

Figure 2: Amended ERP benefits framework

New Business Benefits

Two new benefit categories were added to the framework and one addition to a category (see Figure 2 above). They are **1.6 User accountability**, added to the Operational category; **5.7 Standardization**, added to the Organizational category; and “service”, added to the original 3.5 Supports product differentiation so it becomes 3.5 Supports product and **service** differentiation.

The use of the ERP software enforced user accountability through increased visibility, transparency and discipline that was reported in all of the organizations. Table 4 shows some sample empirical evidence from all four organizations for this new benefit category “User accountability”.

Table 4: New benefit category – User accountability

New Benefit Category	Empirical Evidence
User accountability	<p>“...it forces accountability...with SAP because it’s integrated you actually see the impact of your actions almost instantly...it’s made people more accountable because there’s transparency in what happens...you have somebody like a warehouse person who’d never worry about dollars before becomes a bit more aware of that.” (Business Improvement Manager, Corporate Financial Shared Services, ManA)</p> <p>“I think everyone knows, by the time you get to them that everything they do you’re going to be able to be audited and checked [sic]. All you can do is sell that as a good point, rather than take the big brother approach. Big brother approach, is almost a given, that whatever you do these days you can be traced.” (Group Business Solutions Manager -Manufacturing, ManB)</p> <p>“It’s taken some time,...probably a couple of years, as I think the production people were a bit reluctant to take on board SAP because it tends to make them more accountable and allows you to sort of hone in a lot more in production areas.” (Commercial Manager, ManC)</p> <p>“Everything you book in or out is immediately updating finance. They just have to think, Big Brother’s watching you.” (Vice President, Information Technology, ManD)</p>

The existing power structures (*structures of domination*) between management and operational users in the form of *authoritative resources* were reinforced and strengthened at ManB through the use of the SAP software (*allocative resources*). Senior management gained increased visibility right across the organization, whereas before data needed to be aggregated from multiple systems. Users at the operational level were more accountable as errors could be traced back to individuals. This increased accountability of users, achieved by the monitoring of work processes in a real time, on line, integrated system, provided increased operational business benefits by bringing any problems quickly to the attention of management.

Paradoxically this increased management control resulted in users actually being empowered. They were able to make autonomous decisions since the ability of managers to monitor the work of users through the use of SAP was enhanced. Managers could delegate responsibility since they were able to manage more by exception.

In contrast to the other operational benefits in Shang & Seddon’s (2000) framework this is an intangible business benefit. It also is a business benefit that is directly related to the integrated nature of ERP systems. The characteristic of user accountability has been reported in other studies in the information systems literature in general (e.g. Zuboff 1988), and in other studies of ERP systems (Koh, Soh & Markus 2000, Sia, Tang, Soh & Boh 2002).

The second new business benefit to be added to the Shang & Seddon (2000) ERP benefits framework was “Standardization”. Empirical evidence for the different aspects of standardization achieved is shown in Table 5.

With ERP systems, organizations can standardize business processes across individual businesses and across sites. This allows standardization of staff induction and training and also provides increased flexibility for staff deployment across different businesses and sites. This is made possible by improved employee *communication* through common *interpretive schemes* that are similar across the organization regardless of the business or site.

The increase in multi-skilling at ManC, where employees worked across functional areas, was facilitated through the standard interface provided by the software. Standardization across different sites was reported by O’Leary (2000)

Table 5: New benefit category - Standardization

New Benefit Category	Empirical Evidence
Standardization	<p>“...it’s much easier from a human resources point of view to move people across the organization. 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 organization...Areas like SAP training, staff induction, obviously to some extent we’ve been able to standardize because our processes are much more similar across all our businesses than they were historically.” (General Manager Finance, IT & Planning, ManA)</p> <p>“I think it enables people to move very quickly. We’ve had people move across divisions, across groups. The fact that they’re all on SAP and they can adapt. It’s just one part of their learning curve that they don’t have to worry about.” (General Manager, Information Technology & Business Solutions, ManB)</p> <p>“...we’re doing more work with less people. So the only way we can cover is for the people that may have just been doing accounts receivable for example, are now doing accounts and customer service.” (Customer Service & Export Manager, ManC)</p> <p>“Whereas now, management can concentrate and prioritize, having the same system across all of the plants, they can make much more qualified judgments on where to put energies into—either projects or help, or you know cost cutting.” (Group Business Solutions Manager -Manufacturing, ManB)</p> <p>“The internal people that were helping to manage those systems have swung fully onto SAP, where they used to manage separate systems they’re now all on SAP and have reduced risk as well by cross training, so there’s no one person that knows any one job.” (Group Business Solutions Manager Manufacturing, ManB)</p> <p>“a common architecture, a common application and a common language.” (General Manager, Information Technology & Business Solutions, ManB)</p>

as the means for organizations to provide “one face to the customer” through the use of standard documents from different businesses and sites.

The ERP system also provides a standard IT infrastructure for the organization. One advantage made possible by the standardization of the IT infrastructure was a broadening of IT staff skills through cross training so that there were at least two, sometimes three people who knew any one function. This resulted in improved IT infrastructure risk management at ManB. The standard IT infrastructure also made it easier to roll out new projects to the sites.

Standardization also allowed comparison between plants which was not so easy with the legacy systems. At ManB it was reported that it was much easier to prioritize new projects and training and support. In addition standardization facilitated communication in the strategic planning process. Senior management was able to *communicate* more easily as they were now all using common *interpretive schemes*.

Experience with the ERP system allowed for service differentiation (shown in Table 6) from its competitors. Customers that were considering or undertaking implementation of an ERP system were given free consulting advice by ManB.

Table 6: New partial benefit category – Service differentiation

New Partial Benefit Category	Empirical Evidence
Supports service differentiation	<p>“...with a major customer we’ve got a totally electronic interface with them for all the commercial transactions and over and above that, they are looking to implement SAP and I’ve been up to see them a few times and others have gone to them—just sharing experiences, it’s free consulting. We provide a lot of that to our customers and don’t hesitate in doing it. We’re not just selling them a [product], we’re selling them a [product] plus if you’re interested we’ll let you know everything we know. That is definitely what we are trying to leverage from and being different to other suppliers.” (General Manager, Information Technology & Business Solutions ManB)</p>

A new example for one benefit category was found during the course of this research. For the benefit category “Supports current and future business growth plan” the potential for efficient and effective divestment of businesses

occurred at ManB provided the ERP software was configured appropriately. This can be added to the example of ease of incorporating acquisitions (already mentioned by Shang & Seddon (2000)).

Combined Business Benefit Categories

The criticisms by O'Grady (2002) and Gable et al. (2003) of overlap between the dimensions were investigated, and there were minor changes made due to overlap, though not in the operational and managerial dimensions as suggested by O'Grady, but in the strategic dimension. Two separate instances of overlap in the strategic dimension of the Shang & Seddon (2000) ERP benefits framework were identified. The first involved the categories 3:1 Supports current and future business growth plan and 3:2 Supports business alliances. These two categories have been combined in 3:1 Supports current and future business growth plan. This allows divestments as well as acquisitions to be included since both are supported well by ERP systems, and both can contribute to an organization's current and future business growth plan. The second overlap occurred with the 3:6 Build external linkages and 3:8 Enable ebusiness categories. These two categories have been combined in one category called 3:6 Enable external linkages. Since ebusiness provides a means to build external linkages it can be included in the 3:6 Enable external linkages category. With additions and removal of some overlap this has resulted in the same total number of categories (25) in the modified framework (see Figure 2 above).

Influences on the Extent of Business Benefits Achieved

The Shang and Seddon (2000) ERP benefits framework was used to determine *what* business benefits each of the organizations achieved. ManB achieved extensive business benefits, ManD substantial business benefits, and ManA and ManC limited business benefits from their ERP systems. During the course of determining the business benefits some interesting insights as to *how* the differing business benefits were achieved by each organization emerged from the data. The extent of business benefits achieved by the organizations in this study was related to the motivation for the ERP implementation (Markus & Tanis 2000), the time since go-live of the assessment (Deloitte Consulting 1998, Larsen & Myers 1999, Markus & Tanis 2000, O'Grady 2002), the functional area within the organization (Shang & Seddon 2000), and the particular site within the organization. Each of these influences is discussed in turn below.

Neither motivation for the ERP implementation nor the time the business benefits are assessed are addressed directly in the framework but both need to be considered when assessing the business benefits achieved by a specific organization. In this study the focus was on the organization as a whole rather than a particular functional area or site. Of the four organizations studied ManC was the only one that had primarily technical and economic reasons for implementing an ERP system. It achieved few strategic business benefits even though four and half years had elapsed since go-live. As a consequence of the desire to reduce costs it also remained on an early version of SAP R/3 which limited the business benefits possible. At ManA, the sole strategic benefit was due to the implementation of shared services by the parent company, but there was a much shorter elapsed time since go-live for business benefits to be achieved. In contrast ManB and ManD, with similar lengthy times after go-live to ManC, achieved many strategic benefits. Overall, these results support the existing literature that attributes the extent of business benefits to the motivation the organization has for its ERP implementation and the time at which the benefits are assessed (Deloitte Consulting 1998, Larsen & Myers 1999, Markus & Tanis 2000, O'Grady 2002).

This study provided empirical evidence for O'Grady's (2002) contention that there is a time ordering for the achievement of business benefits in different dimensions of the Shang & Seddon (2000) framework. According to O'Grady (2002), the order that the business benefits from the five dimensions of the Shang & Seddon (2000) framework are achieved are IT infrastructure, then operational and managerial benefits, followed by organizational and strategic benefits. Operational benefits, e.g. reduced financial cycle times, were achieved relatively quickly by all organizations in this study. Managerial benefits in terms of standard reports also were achieved. However the use of the ERP system to obtain new insights for managerial decision making was achieved much more slowly. This required business managers to understand the ad hoc reporting capabilities and be prepared to use the ERP system themselves. IT infrastructure benefits were achieved early, with the exception of IT cost reduction which proved elusive for three of the four organizations studied. The failure to achieve IT cost reduction may not be that unusual since a survey of US manufacturing firms indicated that decreased IT costs were not one of the areas of benefit from ERP systems for many firms (Mabert, Soni & Venkataramanan 2000). Organizational benefits were achieved in

varying degrees across the four organizations. And only ManB and ManD reported substantial strategic benefits due to the use of the ERP system.

Within the organization the business benefits varied not only between different functional areas, supporting Shang & Seddon’s (2000) findings, but also varied from site to site. These findings are consistent with an emergent perspective on organizational change (Markus & Robey 1988). Since the business benefits achieved are situated in a specific social context and are dependent on the interactions of individual managers and users and the ERP software, this results in varying outcomes in different functional areas and different sites in the same organization. In all organizations the finance area achieved more business benefits more quickly than the manufacturing area. Some sample empirical evidence is shown in Table 7.

Table 7: Variation in the achievement of business benefits

Type of Variation	Empirical Evidence
By functional area	<p><i>“In finance, they definitely changed culture and they have, because they know more about the system, they sort of think of things to improve things so that’s the position, and streamline procedures so anything that they think could be improved in their area they talk to us about it. They think SAP could do this, so the vision is there you know, streamline all the procedures as much as they can, make use of as many functions as they can.”</i> (Vice President, Information Technology, ManD)</p> <p>However in manufacturing <i>“It [SAP] demanded that the company have a lot of discipline put in place over the accuracy of the bill of materials. ...It took us a long time to get on top of those disciplines and get the raw materials very accurate. ...The purchasing and supply area still has a problem to this day, because the back flushing process never worked properly.”</i> (Commercial Manager, Logistics, ManC)</p>
By site	<p>At a small ManA manufacturing site, <i>“I’ve got to say business improvement has really only come in the last, probably the last three months, as things have started to settle down and as things have started to make sense, so it has taken a long time.”</i> (Logistics and Planning Manager, Business B, ManA)</p> <p>versus the largest ManA manufacturing site</p> <p><i>“The information we are getting from the system is still questioned. . . . Our service still isn’t there and I guess for us that is the ultimate measure in our performance.”</i> (Materials Manager, Business A, ManA)</p> <p>And the business benefits were not uniform across all sites at ManB</p> <p><i>“Once again, if you go across fifty sites it will vary and there are still some sites that would say, well, we wouldn’t rely on these numbers for one reason or another, other sites would heavily rely on them.”</i> (Group Business Solutions Manager - Finance, ManB)</p>

There were a number of reasons for the difference in business benefits achieved in the two functional areas. The users in the finance area were more likely to be computer literate and already accustomed to a GUI interface from the use of software such as MS Excel. In the finance area the advantages of the ERP system are obvious with mundane tasks being taken over by the software, e.g. financial close, freeing the users in finance from book keeping roles. However, in contrast in the manufacturing area the operational users are most likely using a GUI interface for the first time and more likely than not needed to learn basic computer skills before being trained to use the ERP system. This study confirms Lorenzo’s (2001) findings that user skills are better in the finance area and that this results in the achievement of more business benefits from a finance perspective.

Both ManA and ManB showed a variation in business benefits from site to site (see Table 8 for supporting empirical evidence). In their study of local plant level benefits from ERP systems Gattiker & Goodhue (2005) found that interdependence between plants increases the business benefits achieved through the integration provided by the ERP system. There was substantial interplant trading at ManB. However, Gattiker & Goodhue (2005) found that differences between plants decreased benefits. They suggested that customization is one way to alleviate this although they could not provide supporting evidence. ManB was able to accommodate the differences between plants by using several different templates, and in the case of one plant, letting it keep its legacy system. Therefore

the interdependence between plants and the accommodation of variation between plants positively influenced the extensive business benefits achieved at ManB.

Limitations of the Study

There are four issues that need to be discussed concerning the primary dependence of this study on perceptual information from business managers. Each of the four issues are presented and discussed in turn:

1. Senior management and business unit managers may overrate the business benefits achieved from the ERP system (Ragowsky, Ahituv & Neumann 1996). Willcocks (1999) calls this the “management rhetoric of success”. Interviewing of multiple informants at each case study site and the researcher’s role as an outside observer (discussed in Research Design above) may have assisted in minimizing this effect.
2. The ability of participants to separate out the business benefits of the ERP system from other organizational or IT changes. It was certainly pointed out during the interviews that the business benefits reported should only be those that have resulted from use of the ERP system. The findings indicated that respondents were able to differentiate. For example:

“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, ManA)

3. Although the use of Shang & Seddon’s (2000) ERP benefits framework to prompt participants for business benefits could be interpreted as leading the participant to report positive experiences, it did not seem to have this effect. Participants seemed to have no problem in stating that some business benefits were not achieved. For example, at ManB one participant when responding to this part of the questionnaire agreed that the use of SAP had supported the organization’s acquisitions and divestments. However he also said that this depended on the way the software had been configured.

“Well, we’ve had one recently where the divestment—we’ve got, there are two business that are staying with [ManB] and two that are being sold to the new company, and they are in the one company code under SAP, and to actually split things out within a company code is difficult.” (SAP Applications Manager, ManB)

4. The reliability of business managers’ perceptions. As it was not possible to obtain and compare quantitative data from before and after the ERP system was implemented, the perceptions of managers of the business benefits achieved from the ERP system were used. A recent study reported in Harvard Business Review by Mezas & Starbuck (2003b) cast a dim light over research that relies on the perceptions of managers. However a close examination of the original research paper indicates that there are few recent studies of the accuracy of managerial perceptions (Mezas & Starbuck 2003a). The limited available literature reported in the paper on the topic is mainly from the 1970s and 1980s and involved old technology where reports were delivered periodically in hard copy. This is not comparable to the situation today when business managers in many cases have access to on line real time ad hoc reports. There are also question marks over the two empirical studies conducted by Mezas & Starbuck (2003a). The first study involved managers in executive MBA courses who the authors acknowledge may not have had very much management experience. The second study involved business managers in a large organization interpreting what would arguably be the most complicated reports a manager is likely to come across i.e. quality performance reports. These reports were delivered quarterly and used three different units of measurement—defects per million, a nonlinear sigma scale and defect-rate percentages. For the reports with data expressed in percentages (i.e. more easily understood) 70% of managers’ perceptions were fairly accurate. Since the variety and timeliness of data available to business managers today are substantially different from the past and the results of Mezas and Starbuck’s studies are inconclusive, it seems that more research is required before it can be claimed that managers’ perceptions of the state of their businesses are unreliable.

The reliance on the perceptions of business and ERP managers to assess the business benefits is a major limitation of this research. However, ‘hard’ or objective data on business benefits achieved with the ERP systems in the four organizations studied was not made available to the researcher. In some cases it was likely that it did not even exist, and for some business benefits it is questionable as to whether it was possible to obtain. Simon & Murphy (2002) claim that only two of the benefits in the Shang & Seddon (2000) are tangible, and only up to five are quantifiable.

However, the Shang & Seddon (2000) ERP benefits framework must be acknowledged as a relatively crude measure of an organization's business benefits from an ERP system. Both the motivation for the ERP implementation and the time elapsed since the system went live influenced the business benefits achieved, neither of which is included in the framework. The fact that different business benefits were obtained in different functional areas and at different sites within an organization made the ERP benefits framework difficult to use when assessing the business benefits of each case as a whole. These differences in business benefits achieved in different functional areas and at different sites point to the importance of human agency in achieving business benefits from ERP system use. In this study there was empirical evidence of different skills and abilities of managers and users in different functional areas and different sites within the same organization. These findings highlight the need to interpret the ERP benefits framework for a specific organization in a broader context than a simple list of business benefits.

Conclusions

In this research the Shang & Seddon (2000) ERP business benefits framework was confirmed, amended and improved (see Figure 2). The original Shang & Seddon (2000) framework was tested using a new philosophical lens, a different method and in a new context (see Table 1). The original testing of the framework by Shang and Seddon (2000) involved positivist case studies of four companies from the Australian service sector, while this research involved four interpretivist case studies from the Australian manufacturing sector. In addition, the ERP systems in three of the four manufacturing organizations had been in use for substantially longer than the ERP systems in the utility companies (four as opposed to three years).

The new ERP benefits framework (see Figure 2) can be used in the future by researchers and managers with the knowledge that its original dimensions and categories have been independently tested, confirmed, and extended. The two additional categories and the partial new category inform organizations of additional business benefits that are possible from ERP systems. Therefore the changes to the ERP benefits framework provide a refined tool which can be used to increase the business value achieved from ERP systems. According to Berthon et al. (2002) there is a paucity of IS research that tests and extends existing theory, and furthermore it is under-valued in the IS literature. This study has made an important contribution to this type of IS research.

The study provided some detailed insights not only into what business benefits were achieved in each of the four manufacturing organizations but how they were achieved. These findings indicate that care should be taken when using the framework to plan, assess and/or compare the business benefits from ERP systems. Although not part of the framework, the contextual situation in each organization (i.e. motivation for implementation, time elapsed since go-live, functional area, site) should be taken into account when using the ERP business benefits framework. Although the effect on business benefits from ERP systems of motivation, time and functional area has been identified by others (e.g. Deloitte Consulting 1998, Larsen & Myers 1999, Markus & Tanis 2000, O'Grady 2002, Shang & Seddon 2000), benefit variation by site has not. Another new finding from this study is to suggest that taking all four influences into account is important when using the ERP benefits framework to evaluate the business benefits achieved from an ERP system.

The study also highlighted some implications for the comparison of business benefits from ERP systems of different scope. That is, the potential business benefits will be less when only one or two modules are implemented compared with when modules are implemented right across the value chain (Venkatraman, 1994). Since the number and extent of business benefits can also vary with functional area and site, for ERP implementations of larger scope it is therefore important that data is collected from multiple functional areas and sites. This has implications for both qualitative and quantitative research in the type and number of participants interviewed or surveyed. For example, where an ERP implementation involves the whole value chain, collecting data primarily from participants in one or two functional areas may be misleading as managers and users in these functional areas may have different skill and ability levels to those in other functional areas.

The new ERP benefits framework along with the insights about its use provides guidance to managers and researchers who wish to evaluate the business value of ERP systems. Although the study involved only four organizations it is possible that the findings may apply to other ERP systems, other package software and in other organizations and contexts.

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