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Research Article

An Explanatory Framework for Achieving Business Benefits from ERP Systems

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Abstract

ERP systems are large integrated packaged software systems used by thousands of major organizations around the world. Yet outcomes from ERP use can be very different, and there is still not an adequate understanding of how and why organizations have such varying outcomes. Using a case study approach, we retrospectively examined the post-implementation periods in four manufacturing companies as processes within context over time. Analysis of the cases identified nine themes that explain "how" and "why" and form the components of a framework for understanding the achievement of business benefits in the post-implementation period. The new framework extends knowledge in two ways. It identifies new themes and the underlying relationships between them that explain and increase our understanding of how and why organizations have or have not achieved business benefits from ERP systems.

Keywords: Case Studies, Theory Building, ERP Systems, Business Benefits.

* Varun Grover was the accepting senior editor. This article was submitted on 30th December 2008 and went through four revisions.

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1. Introduction

Enterprise Resource Planning (ERP) systems are large, complex software packages that provide an integrated real-time environment based on an enterprise-wide data model. This set of software applications allows the processing of the core transactional data of the whole organization (Bancroft, Seip, & Sprengel, 1998). Collective investment by organizations worldwide in ERP systems since the early 1990s has totalled hundreds of billions of dollars. However, there have been widely varying outcomes from ERP system implementations, with a high degree of risk associated with implementation and use. Some organizations have had successful ERP implementations (Davenport, 2000), while others, such as FoxMeyer, have suffered disastrous business consequences (Bulkeley, 1996). Despite a large body of ERP research literature from a number of different perspectives, there is not an adequate understanding and explanation about how and why these varying outcomes occur. Further, Robey, Ross, & Boudreau's (2002) contention that most studies to date have concentrated on description rather than explanation still applies.

In this study, we considered the outcomes from ERP implementations from the perspective of the business benefits achieved from the ERP system in use. The goal was to better understand and explain how and why these organizations experienced the outcomes they did by examining the process of achieving business benefits over time. The two research questions we addressed in this paper were:

1. How do business benefits from ERP systems evolve during the post-implementation period?
2. Why do business benefits from ERP systems evolve during the post-implementation period?

We explored patterns of benefits realization in the years after “go-live” by conducting case studies of ERP system use in four manufacturing companies in Australia. In each case, achieving business benefits from ERP systems was viewed as an organizational change process, within a specific context, occurring over time. The focus was on the post-implementation period of the ERP life cycle, which is not well understood (Somers & Nelson, 2004). This study adds to a growing body of ERP literature that has considered the role of context in studying ERP implementations (e.g., Alvarez, 2008; Dechow & Mouritsen, 2005; Nandhakumar, Rossi, & Talvinen, 2005; Sia, Tong, Soh, & Boh, 2002; Wagner, Scott, & Galliers, 2006).

We identified themes that explained the extent of business benefits achieved by each of the four organizations. Although the themes may appear general in nature, each consists of more specific components that are, in turn, grounded in empirical data. In addition, we identified and explained interrelationships between these themes and combined them to build a new process-oriented explanatory framework (shown in Figure 1) that complements the variance-model views¹ of prior research.

In contrast to existing variance models (e.g., Davenport, Harris, & Cantrell, 2004; Gattiker & Goodhue, 2005), the new framework is a process model. It identifies the underlying processes, within context, through which business benefits are achieved from ERP systems. The framework depicts the ERP benefit-realization process in each organization within the broader environmental, organizational, and post-implementation-project context of each organization. It is argued that, over the course of some years, the six themes numbered 4 to 9 in the benefit-realization process had a major influence on, and were influenced by, the benefit-realization process. It is further argued that insights into the individual influence of, and relationships between, these themes – discussed and illustrated at some length in this paper – contribute to a better understanding of the process of how and why business benefits emerge over time from ERP systems (Dubin, 1969). This, it is hoped, will be useful to ERP researchers, information systems (IS) practitioners, ERP consultants, and

¹ Webster and Watson (2002, p. xix) say, “Variance theories incorporate independent variables that cause variation in dependent variables”. In diagrammatic representations of variance theories, the higher the score for the independent variable at the tail of an arrow, the higher the score expected for the dependent variable at the head of the arrow. Two alternatives to variance models are process models (Mohr, 1982), which identify a series of steps that if executed in the specified order lead to a predictable outcome, and configuration models (Ragin, 1987), which assert that the presence or absence of certain combinations of independent variables affect an outcome.

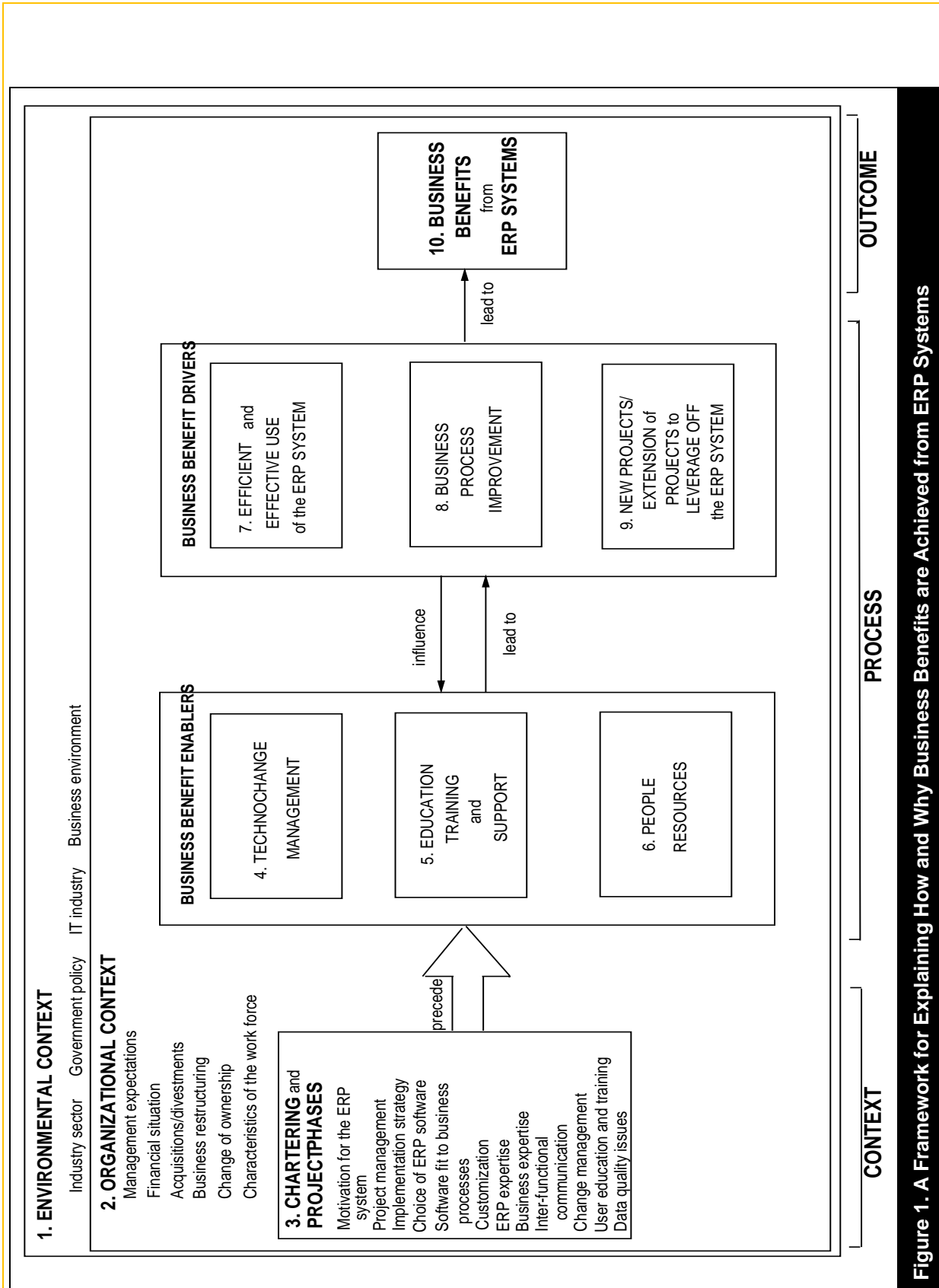


Figure 1. A Framework for Explaining How and Why Business Benefits are Achieved from ERP Systems

senior managers in businesses involved in the planning, implementation, and use stages with ERP systems. The nature of the contribution this framework makes to IS research can be classified according to Gregor's (2006) taxonomy as theory for explanation and understanding (Type II).

This study extends knowledge of ERP systems in three ways. The first is a focus on post-implementation, whereas most other ERP research has concentrated on earlier phases of the ERP lifecycle (i.e., the implementation project). The second is the identification of some new themes (or extension and clarification of them) for achieving business benefits post-implementation (e.g., the influence of project factors on benefits post go-live, and the importance of people resources to realization of benefits). And third, it provides a detailed explanation of "how and why" business benefits are achieved from ERP systems post-implementation that complements the variance-model logic of researchers such as Davenport et al. (2004), Gattiker and Goodhue (2005), and Seddon, Calvert, and Yang (2010).

In keeping with a conventionally structured academic paper, we illustrate the new framework at the start of this paper. However, it must be emphasized that the themes in the framework emerged from a grounded research approach to data collection and analysis, which was informed by review of the relevant literature throughout the process (Suddaby, 2006). The research approach we employed is explained fully in the research-design section of the paper. The rest of the paper presents background to the research, outlines the research design, and provides empirical evidence for the new framework and its relationship to the existing ERP literature.

2. Background Literature

We focus on explaining how and why organizations achieve business benefits from ERP systems during the post-implementation period. Two areas of the ERP literature that have focused on ERP systems in use are most relevant to this study. The first includes studies that identify "conditions" that lead to organizations achieving business benefits from ERP systems. Note that some literature on material resource planning (MRP) systems, the precursors to ERP systems (e.g., Klaus, Rosemann, & Gable, 2000), is included in this group due to its relevance to large packaged software. The second area includes studies with models that claim to predict how to achieve business benefits from ERP systems. We now discuss each of these areas of research and explain how our study extends previous work.

Seven groups of conditions for achieving business benefits from ERP systems may be summarized as follows:

1. Influence of early phases in the ERP life cycle on subsequent phases: Markus, Axline, Petrie, and Tanis (2000) focused on problems encountered and success achieved with ERP systems by studying 16 organizations in various stages of the ERP life cycle. They studied organizations that had experienced difficulties and, hence, mainly describe problems and only a few benefits from ERP system implementations. The organizations studied were at most only 18 months past the go-live date. The business consequences were related to events in the earlier ERP life cycle phases.
2. Resources: According to Wilson, Desmond, and Roberts (1994), Deloitte Consulting (1998), Markus and Tanis (2000), Ross and Vitale (2000), Chang and Gable (2002), Davenport et al. (2004), Somers and Nelson (2004), and Wagner and Newell (2007), there can be a temptation to think that the ERP project is complete when the system goes live. Ongoing resourcing of the post-implementation phase is necessary to further develop in-house knowledge and provide extra staff when resource requirements increase.
3. Establish metrics: According to Deloitte Consulting (1998), Markus and Tanis (2000), Ross and Vitale (2000), and Davenport et al. (2004), many organizations do not know if business benefits have been achieved due to a failure to establish metrics. Although important across the whole post-implementation phase, during early post-

implementation, the ability to show some performance gains can have a morale boosting effect. Measuring and managing the benefit realization process is a characteristic of companies that have achieved success with their ERP systems.

4. Change management: According to Deloitte Consulting (1998), Ross and Vitale (2000), Shang (2001), Markus (2004), and Somers and Nelson (2004), the new roles and responsibilities for managers and users brought about by the use of the ERP system cannot be appropriated overnight but require a period of adjustment. During post-implementation, technochange management is needed to address resistance to change and to embed new job designs, which may impose more discipline upon users and facilitate organizational learning. In order to achieve this, additional resources may be required in the form of changed reward systems.
5. Education and training: According to Leonard-Barton (1988), Wilson et al. (1994), Deloitte Consulting (1998), Baskerville, Pawlowski, and McLean (2000), Koh, Soh, and Markus (2000), Markus and Tanis (2000), Ross and Vitale (2000), Lorenzo (2001), Chang and Gable (2002), Boudreau (2003), Duplaga and Astani (2003), Nah, Tan, and Teh (2004), Somers and Nelson (2004), and Boudreau and Robey (2005), further development of user and IT staff skills, knowledge, and experience is needed to reduce dependence on key users and external consultants. Retention of staff with technical or power user expertise can be a problem post-implementation. Education about the integrated nature of the ERP system can help to improve data quality by making users aware of the impact of input errors, and on going training in specific job skills and management reporting is needed.
6. Software fit to business: According to Wilson et al. (1994), Markus and Tanis (2000), Soh, Kien, and Tay-Yap (2000), Chang and Gable (2002), Shang (2001), Nah et al. (2004), and Gattiker and Goodhue (2005), good fit between the integrated nature of the software and the culture and structure of the organization is required. Although minimal customization is a critical success factor for implementation, a “vanilla” implementation may not fulfill the needs of all business units. Also cultural needs may not be adequately addressed by the software.
7. People: In a study of MRP implementation, Walsham (1992) noted the importance of the availability of experienced and skilled staff. Previous ERP research has also identified the importance of people (Deloitte Consulting, 1998; Koh et al., 2000; Kraemmergaard & Rose, 2002) in achieving business benefits from ERP systems. However, Deloitte Consulting (1998) is not specific about how people are important to achieving success, while Koh et al. (2000) specify IT skills, knowledge, and experience of users and IT personnel. Kraemmergaard and Rose (2002) show that the post-implementation period required more competencies from an ERP manager than other phases in the ERP life cycle. Furthermore, Lorenzo (2001) notes the differing user skills and abilities in different functional areas.

Despite an increasing volume of ERP research literature, only three studies published before or during this Australian study have reported models for predicting business benefits from ERP systems. We include a comparison of the new framework (see Figure 1) with these three studies in the Discussion section of this paper. We now describe these three studies in turn.

2.1. Study 1

Davenport, Harris, and Cantrell (2004) developed a variance model that identifies three main factors (integrate, optimize, and informate) that predict perceived business value. It incorporates time, acknowledged in other studies as an important influence on the achievement of business benefits from ERP systems, but ignores contextual factors. There are three main limitations to this study. The first is that it involves some organizations that had implemented more than an ERP system. That is, Davenport et al.'s (2004) use of the term “enterprise systems” includes, for example, customer relationship management (CRM) systems and supply chain management (SCM) systems. It is not known whether the same factors are involved in creating business value

from the entire range of enterprise systems. The second is that the model has an R-squared value of 0.13. This means that the model accounts for only 13 percent of the variation in the data. And finally, the study was done by a consulting company and could be construed as a means to encourage the use of their services.

2.2. Study 2

Gattiker and Goodhue (2005) developed a variance model of benefits from ERP systems at an individual manufacturing plant. Their results show that interdependence (between plants) was associated with increased benefits from ERP systems and differentiation (i.e., between plant differences) was associated with the converse. Three intermediate variables, coordination improvements, task efficiency, and data quality explained 71 percent of the variance in the benefits at plant level (R-squared value of 0.71). In addition, both customization and the amount of time elapsed since implementation had positive effects on the benefits at plant level. The Gattiker and Goodhue (2005) model goes some way toward explaining how these benefits are achieved (i.e., through coordination improvements, task efficiency, and data quality). It includes context in a limited sense (i.e., the interdependence and differentiation among plants). However, the model is limited by its focus on operational level benefits and, by doing so, ignores potential managerial and IT infrastructure benefits that might be expected to be observed at the plant level. The focus at the plant level also means that organizational and strategic benefits of ERP are not identified.

2.3. Study 3

Seddon et al. (2010) propose a variance model called organizational benefits from enterprise systems (OBES) that predicts benefits from ERP/ES. It was developed from the ES, ERP, and general IS literature. The authors conduct preliminary qualitative assessment of the model by analyzing 126 customer presentations by senior managers from one ERP vendor at two of the vendor's conferences. This model, like the model in Study 1 described above, is not ERP-specific but includes all enterprise systems.

In summary, this study extends existing knowledge in four ways; that is, it is at the organizational level, it is ERP-specific, it considers the post-implementation phase, and it is process oriented. Existing work differs either by considering the whole range of enterprise systems, by concentrating on the project phase of ERP implementation, by not being at the organizational level, and/or by developing a variance model-type understanding of ERP benefits-realization phenomena.

3. Research Design

3.1. Theoretical Background

The perspective taken in this research is that IS are social systems (Land & Hirschheim, 1983). Information technology (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. During ERP system use, IT-enabled organizational change occurs as a process over time. During this process there is interaction with other social systems that may be either internal or external to the organization (Whittington, 1992), and which either enable or constrain the desired outcomes (i.e., the business benefits achieved from the ERP system).

ERP implementation and use is also viewed in this study from the perspective of organizational change (Bingi, Sharma, & Godla, 1999; Boudreau & Robey, 1999; Davenport, 2000; Willcocks & Sykes, 2000). Although all IS projects involve some degree of organizational change, ERP implementation and use can be differentiated by the capacity to involve extensive change across a number of functional areas in an organization. An ERP implementation is not merely installation of a software package, since the implementation requires configuration of the software to the particular requirements of the organization. This may involve configuration of more than 8,000 tables (Davenport, 2000, p. 302). In addition, the change to the organization can encompass a

change in structure (e.g., shared services) (Davenport, 2000, p. 114), changes to work practices right across the organization (Davenport, 2000, p. 69), and changes that affect external parties such as customers and suppliers (Davenport, 2000, p. 22).

Explaining the achievement of business benefits from ERP systems requires an understanding of IT-enabled organizational change in a complex social setting. Therefore, we deemed the development of an emergent process theory of the type described by Markus and Robey (1988) as the most suitable for this study. Since emergent process theories are non-deterministic and assign a major role to chance in the process of achieving outcomes, business benefits are explained through the examination of sequences of events over time. External factors not under the direct control of the organization may impact business benefits at any stage of the ERP life cycle and are explicitly acknowledged.

The new framework developed in this study (see Figure 1) is an example of an emergent process theory (Markus & Robey, 1988; Orlikowski & Baroudi, 1991; Walsham & Han, 1991). Process theories of IT and organizational change, appropriate for explaining how outcomes vary over time, have been neglected in information systems research in favor of deterministic theories (Boudreau & Robey, 1999). Emergent process theories are based on the premise that the impacts of IT result unpredictably from complex social interactions (Markus & Robey, 1988). Pettigrew (1990, p. 268) supports the use of process theories when studying organizational change and says that “theoretically sound and practically useful research on change should explore the contexts, content and process of change together with their interconnections over time”.

In their seminal article on theorists’ assumptions about the nature of causal influence in IS research, Markus and Robey (1988) outline three dimensions of causal structure, that is, causal agency, logical structure, and level of analysis. In this study, causal agency is attributed an “emergent” perspective where outcomes (business benefits from ERP systems) occur from the dynamic interaction between human action and external and internal contextual influences (Markus & Robey, 1988). The second dimension, logical structure, involves explaining how and why outcomes (i.e., business benefits of ERP systems) develop over time. Table 1 shows how this study fulfills Markus and Robey’s criteria for the logical structure dimension.

	Process Theory	In this study
Definition	Causation comprises necessary conditions in sequence; chance and random events play a role	During post-implementation, the Business Benefit Enablers (themes 4, 5, and 6) precede the Business Benefit Drivers (themes 7, 8 and 9). Unplanned events from the “Environmental”, “Organizational”, and “Chartering and Project” phases contexts also influence the business benefits achieved post-implementation. For example, a change in Government policy such as the introduction of the Goods and Services (GST) in Australia can affect the business benefits achieved from the ERP system. In one case entity, this caused an unusual pattern of demand for a product prior to and after its introduction. Coping with this took IT resources away from the achievement of business benefits from the ERP system.
Role of Time	Longitudinal	Organizational change due to implementation of the ERP system was examined retrospectively as a process within context over time. That is, informants were asked to reflect retrospectively on the planning, implementation, and use of the ERP system and the organization’s achievement of business benefits from the ERP system.
Assumptions	Outcomes may not occur (even when conditions are present)	Themes 4 to 9 are “necessary but not sufficient” conditions for particular outcome states (i.e., business benefits), only some of which may be desirable in the sense of containing many business benefits.
Elements	Discrete outcomes	The business benefits of ERP systems were assessed using the Shang and Seddon (2000) ERP benefits framework, which has 25 discrete outcomes.
Logical Form	X is a necessary but not sufficient condition for Y i.e. If Y, implies X but not, if X implies Y	When a desirable set of business outcomes is observed, as for the case entities ManB and ManD, this indicates that at least a subset of the conditions (themes 4 to 9) are present.

The third dimension concerns the levels of analysis used in this study. Consistent with the perspective of IS as social systems (Land & Hirschheim, 1983) and the recommendations of Markus and Robey (1988) for emergent process theory development, multiple levels of analysis were used in this study. The post-implementation period of the ERP system was viewed from the level of society (e.g., Government policy), organization (i.e., the case entity), group (e.g., ERP implementation team, senior management), and individual (e.g., business manager, user).

3.2. Method

Case study and grounded theory methods were combined to inductively build theory (Benbasat, Goldstein, & Mead, 1987; Eisenhardt, 1989; Fernandez, Lehmann, & Underwood, 2002; Yin, 2009). Figure 2 below gives an overview of the research design.

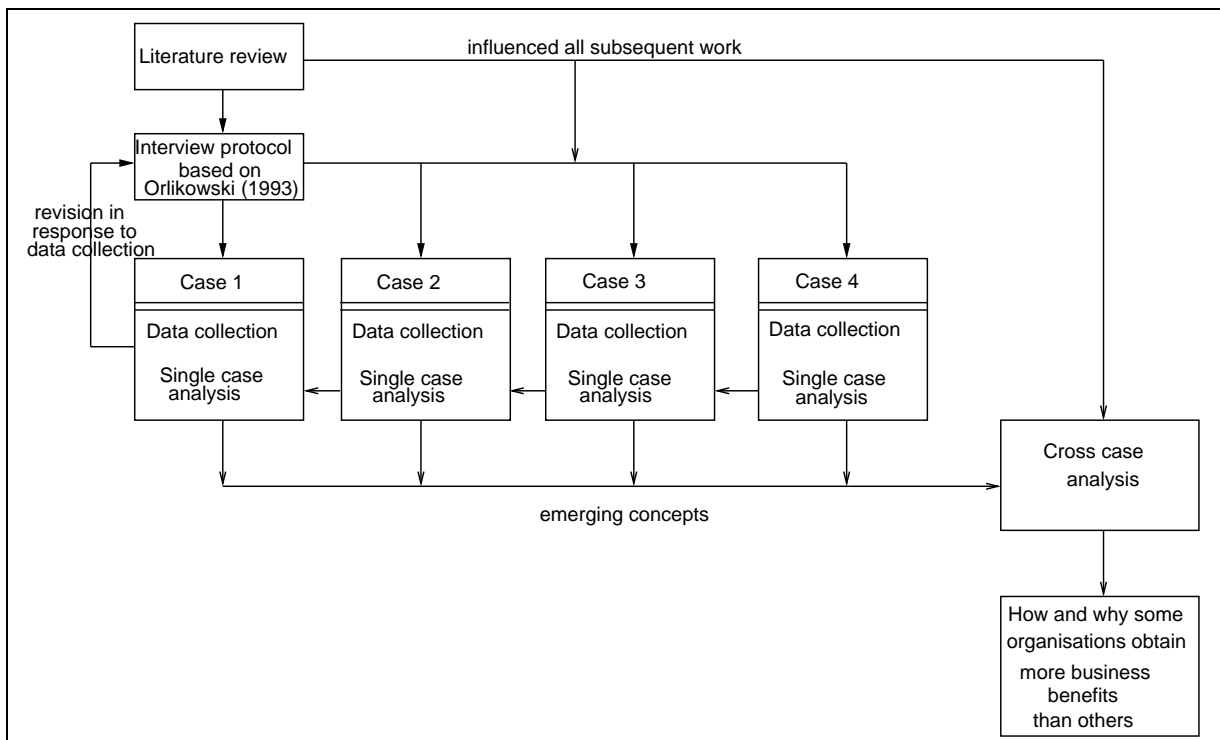


Figure 1. Overview of the Research Design

We chose a multiple-case-study design since an understanding of the four Australian manufacturing companies studied had the potential to provide more deeply grounded, multiple sources of evidence and, therefore, more robust theory (Eisenhardt & Graebner, 2007; Stake, 1994; Yin, 2009, pp. 60-62). According to Yin (2009, p. 32), the unit of analysis in case study research can be concrete (e.g., individuals, organizations) or more abstract (e.g., relationships, decisions). The unit of analysis in this study falls into the more abstract category. It is the continuous process of ERP use in the post-implementation period, in context, in the selected organizations (Pettigrew, 1990). Since the objective was to develop theory, we chose the cases using a theoretical sampling method in order to maximize the chances of theoretical insight. We chose cases that increased the likelihood of replication of findings or were likely to provide contrary replication (Eisenhardt & Graebner 2007).

All four manufacturing organizations had implemented SAP R/3 ERP software. This provided some consistency to allow comparison and contrast. In addition to similarities, there were differences among the organizations in terms of size, structure, and culture. The comparisons made possible by having multiple cases allowed investigation of how variability in context influences the process of

organizational change and the eventual outcomes (i.e., business benefits) associated with the planning, implementation, and use of the ERP system (Pettigrew, 1985).

3.3. Data Collection and Analysis

Since this study considered ERP implementation and use as organizational change, the theoretical framework developed by Orlikowski (1993) for CASE tool use provided a good starting point for data collection. The framework shows organizational change as institutional contexts and human action interacting over time. Corbin and Strauss (2008, pp. 39-40) outline four situations where theoretical frameworks may be useful in qualitative research. One of these is "if the researcher is building upon a program of research or wants to develop middle-range theory, a previously identified theoretical framework can provide insight, direction and a useful list of initial concepts. However, a researcher should remain open to new ideas and concepts and be willing to let go if he or she discovers that certain "imported" concepts do not fit the data. The importance of "remaining open" is essential". Therefore, we adapted the theoretical framework developed by Orlikowski (1993) for ERP system use (see Figure 3 below) and used it to underpin data collection.

Orlikowski (1993) developed her framework using grounded theory based on a study of CASE tool use in two different organizations. Her framework is quite general in nature and was used by Shanks (1997) in a study of strategic data planning. We added the historical context, not included by Orlikowski, to the framework in the organizational context, as it is an important aspect to consider when studying organisational change (Pettigrew, 1990; Walsham, 1992).

The adapted Orlikowski (1993) framework (see Figure 3 below) shows the context of the ERP post-implementation phase in the organisation having three aspects, namely, environmental, organizational, and the ERP implementation project team. We studied the process of ERP use over time, from the conditions prior to adoption and use, that is, the influences of the Chartering and Project phases of the ERP lifecycle before the ERP system went "live", through early operational use, to the longer term consequences of its use. The arrows in Figure 3 indicate the interaction over time between the contexts of the organizational change (i.e., environmental, organizational, and the ERP implementation team) and human action during the process of achieving business benefits from the ERP system (i.e., during the Chartering and Project phases, early use, and longer term use of the ERP system).

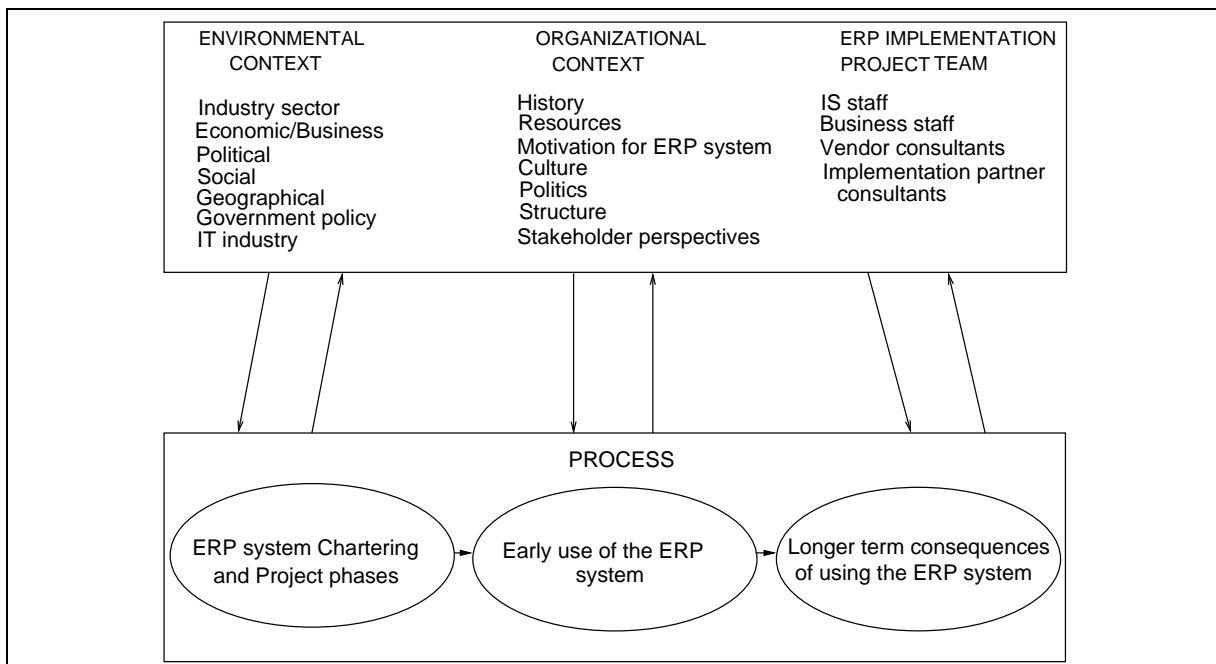


Figure 3. Framework for Data Collection (adapted from Orlikowski, 1993)

A full explanation of the adapted Orlikowski framework can be found in Staehr, Shanks, and Seddon, (2002). We used the Shang and Seddon (2000) ERP benefits framework (Figure 4) to assess the business benefits achieved during early and longer term use of the ERP system. Together, the adapted Orlikowski framework and the Shang and Seddon (2000) ERP benefits framework formed the basis for our semi-structured interview protocol used in data collection.

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 4. Shang and Seddon's (2000) ERP Benefits Framework

We used an adapted grounded-theory building approach to analyze the data. In keeping with a grounded-theory method, data collection and data analysis proceeded in tandem (Glaser & Strauss, 1967; Corbin & Strauss, 2008). This allowed for us to use a theoretical sampling approach for both the informants within each case and for each case, in turn.

We named the organizations ManA, ManB, ManC, and ManD to preserve anonymity. Table 2 gives some background information on each of the case study organizations. The primary source of data was from face to face, in-depth, semi-structured interviews. We conducted interviews during 2001-2003. Informants were asked to reflect retrospectively on the planning, implementation, and use of the ERP systems and the organization's success in achieving business benefits from the ERP system. We conducted nine interviews at ManA, five interviews at ManB, nine interviews at ManC, and five interviews at ManD. We tape recorded and transcribed the interviews then returned the transcripts to informants for review to ensure accuracy. To provide further information on each case, we obtained data 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. Having multiple informants at each organization and access to a number of different data sources assisted in identifying multiple interpretations and contributed to more sound and credible case stories (Klein & Myers, 1999; Yin, 2009).

We chose the key informants because of their position within the organization. That is, the operational, managerial, and organizational business benefits were obtained from the perspective of business unit managers, strategic benefits from the perspective of senior management, and IT infrastructure benefits from the perspective of the IT manager. In attempting to eliminate data collection bias, when possible, we chose informants from differing geographical areas, functional areas, managerial levels, and in one instance from another organization (Eisenhardt & Graebner, 2007).

Table 2. Background Data for Case Study Organizations

	ManA	ManB	ManC	ManD
Motivation for Implementing SAP	Business reasons	Business reasons	Economic and 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
Year of first go-live	2000	1997	1998	1997
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 (all modules at one site, or 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 and a half years post go-live	Project spanned Mar 97 to Jan 99, so four and a half years after last module went live.
Business benefits achieved (using Shang & Seddon (2000) ERP benefits framework)	Limited	Extensive	Limited	Substantial

The first step in data analysis involved the preparation of case descriptions detailing the individual “stories” of ERP planning, implementation, and use in each organization. The adapted Orlikowski (1993) framework provided the basic structure for writing the story of each case. We wrote the stories using the following headings: Environmental context, Organizational context, ERP Chartering and Project phases, Early use of the ERP system, and Longer term use of the ERP system. The process of writing the stories served to de-contextualize the data from the original individual transcripts (Coffey & Atkinson, 1996, p. 30). Describing the context of each case in detail meant that we became intimately familiar with the process and case, thus, enabling the process of re-contextualization, that is, the development of emerging themes and interpretations. During this process, through constant comparison, recurring themes emerged from the similarities and

differences of the individual stories, and a process of re-contextualization occurred until we reached theoretical saturation. The new themes and the relationships between them arose from our interaction between the empirical data and the academic literature.

We developed the new framework (Figure 1) progressively as we analyzed each case. None of the cases was a source of empirical evidence for all of the themes in the final framework. We identified themes in the following three ways. The first group of themes, the contextual themes, were identified on the basis of the influence of environmental or organizational social systems in enabling or constraining human action in the achievement of business benefits from the ERP system. This led us to identify the three contextual themes, namely, the environmental context, the organizational context, and the chartering² and project phases context. The second group of themes, the business benefit enablers, facilitated changes to the social system. This was done by encouraging managers and users to adopt new ways of communicating, new norms, and new power structures consistent with achieving business benefits from the use of the ERP system. This led us to identify the three themes: Technochange management; education, training, and support; and people resources. The third group of themes, the business benefit drivers, identified evidence of mechanisms for achieving business benefits through changes to the organizational processes required for ERP system use. The three themes in this group are efficient and effective use of the ERP system, business process improvement, and new projects/extension of existing projects to leverage off the ERP system. These nine themes all contributed to the achievement of business benefits, theme 10, which we assessed using the Shang and Seddon (2000) ERP business benefits framework.

3.4. Evaluation of the Research

The quality of the research process may be assessed using the guidelines provided by Dubé and Paré (2003) for rigor in information systems case study research. Those guidelines are divided into three areas: Design issues, data collection, and data analysis. Appendix A shows how this study conformed to Dubé and Paré's guidelines for explanatory case research in each area. In addition, we identified aspects of the method that increased construct validity, internal validity, external validity, and reliability (Yin, 2009, p. 41).

4. Case Study Analysis

The four organizations achieved a different number and extent of business benefits from their ERP systems. Table 2 summarizes the characteristics of each ERP implementation and provides a general description of the business benefits achieved. We present a brief overview of each case indicating the extent of business benefits and the major contributing influences below.

4.1. The ManA Case

The business benefits at ManA were limited in number and extent. The 21-month period after go-live was not long enough to achieve benefits across all Shang and Seddon's (2000) benefit dimensions (see Appendix B). In the manufacturing area, one site had only achieved normal operations after 18 months and another had not emerged from the early use phase after 21 months. ManA achieved more operational, managerial, and IT infrastructure benefits than organizational and strategic benefits. The business benefits achieved during the post-implementation period were influenced by the unintended consequences of decisions made in the chartering and project phases, such as extensive customization and forced redundancy of staff with SAP expertise. Managers underestimated how long it would take to achieve benefits, and this influenced the availability of post-implementation resources. Education and training mainly occurred prior to implementation, and there were problems with the level of on-site support provided post-implementation.

² Markus and Tanis (2000) defined four phases in the ERP lifecycle as "chartering", "project", "shakedown", and "onward and upward". In this paper, we sometimes combine the "shakedown" and "onward and upward" phases and refer to them simply as "post-implementation".

The implementation of the SAP system in ManA was viewed as a system replacement with a mainly technical approach to the project. There was limited acknowledgment that SAP would be used within a social system. Managers and users needed time and resources during the post-implementation period to adjust to communicating and performing their work tasks using the new SAP system. Both environmental (i.e., the IT industry in Australia) and organizational social systems influenced human action and conspired to extend the early use period of the SAP system, therefore limiting the business benefits achieved at ManA.

4.2. The ManB Case

The business benefits at ManB were extensive. The strategic approach that ManB adopted toward its SAP implementation indicated a business rather than a technical motivation. In fact, the project proceeded despite a predicted negative return on investment. Business benefits were achieved in all dimensions and categories of the Shang and Seddon's (2000) framework (see Appendix C). ManB achieved business benefits that were not even thought possible prior to the SAP implementation. Control of inventory provides significant business benefits to manufacturing companies, and this was achieved at ManB through the use of the SAP system.

It can be concluded overall that the extensive business benefits achieved at ManB were due in part to the success of the chartering and project phases, that is, there were no issues left over from these phases that had to be dealt with post-implementation. In particular, the "small bang" implementation strategy allowed progressive learning to occur. This new knowledge was actually used to improve later implementations.

Bonuses paid to IT staff ensured that ManB did not lose IT staff due to the demand for SAP expertise in the Australian IT industry at the time. Therefore, ManB was not subject to a reduction of people resources due to environmental demand. This is an example of successful technochange management where loss of IT staff was prevented by management (i.e., human agency).

Attention to education, training, and support and change management during the post-implementation period brought business benefits. Ongoing change management and education, training, and support during post-implementation facilitated the change from the old work practices used by business managers and users, to those required to communicate about and work with the new SAP system. However, the use of the same team (i.e., people resources) for new project development; change management; and education, training, and support post-implementation influenced the extent of operational and managerial benefits achieved.

4.3. The ManC Case

The business benefits at ManC were limited in number and extent. Despite a four-and-a-half year period after go-live, ManC did not achieve business benefits across all of Shang and Seddon's (2000) benefit categories (see Appendix D).

Financial constraints influenced the decision to implement a software package, since senior managers believed a package would provide the cheapest option and no need for ongoing maintenance. A lack of financial resources pervaded the whole post-implementation period at ManC. The Project phase was not completed on time. This affected the training schedule, with the training having to be repeated close to go-live. The training was inadequate due to IT staff being involved in data conversion and testing at the same time. Consequently, business managers and users did not have the required skills and abilities to use SAP well. There were also issues of software fit due to some complex manufacturing processes at ManC.

There was a lack of people resources resulting from forced redundancies. A shortage of resources (i.e., SAP expertise) in the Australian IT industry (a social system external to ManC) resulted in the departure of all but one member of the SAP project team within six months of going live. This resulted in an ongoing dependence on the implementation partner. The financial constraints meant that SAP was not upgraded.

4.4. The ManD Case

ManD achieved business benefits in nearly all categories of all dimensions of the Shang and Seddon (2000) business benefits framework (see Appendix E). ManD was also known in the industry as having implemented SAP with the fewest customer complaints, in contrast to its two competitors. However, one important business benefit that was not achieved was IT cost reduction. The number of IT staff was not reduced, and the firm acknowledged that although there were cost savings with SAP, they were not in the IT area.

Contrary to the experience in many organizations, ManD did not experience a performance dip after going live with its SAP system. Contributing influences may have been business process reengineering prior to implementation, and an incremental implementation strategy (i.e., module by module), which resulted in only a limited change for the business to cope with each time a module was added.

Corporate executives drove the business process improvement, expecting more to be done with fewer financial resources. It was also driven by employee incentive schemes rewarding improved business processes. These are examples of proactive technochange management.

There were clear differences between different parts of the business, with Trading more advanced in its use of SAP compared with manufacturing. Finance users were the most competent. There were different reasons given for this limited use of SAP by some managers and users. One reason was that SAP was perceived to be complicated, another was that some users were nervous or apprehensive about using the system. In perceiving the system as complicated, users were indicating the extent of the change necessary for them to work effectively with SAP. Another problem was mistrust of the data from the system. Users did not understand that the quality of the data under their control going into the system affects the quality of data produced by the system. In addition, there was evidence of some managers using the old norms and resources by requesting reports from the IT department rather than directly obtaining reports from the SAP system. The dependence at ManD on on-the-job training, and an expectation that business managers and users would learn for themselves post-implementation, contributed to these ongoing issues.

5. Cross-Case Analysis

Figure 1 depicts the framework consisting of themes that influenced the number and extent of business benefits achieved by the organizations. Since time is an important indicator of the extent of business benefits achieved, it must be noted that ManA had the least elapsed time since the SAP system went live to when the business benefits were assessed. In the results section below, we provide empirical evidence for only selected examples of the themes due to space constraints.

5.1. Why Do Organizations Achieve Business Benefits from Their ERP Systems During the Post-Implementation Period?

We identified three contextual themes that explain “why” and influence “how” business benefits were achieved from the ERP systems during the post-implementation period in the four organizations (see Figure 1). These environmental and organizational themes influenced the achievement of business benefits right across the ERP lifecycle, that is, the chartering, project, and post-implementation phases. In contrast, the chartering and project phases have an antecedent influence on the post-implementation phases.

We identified these themes in one, mostly more than one, or all of the case studies (see Table 3 for a summary and Tables 4 and 5 for sample evidence). Where we identified a theme in more than one case, its influence on achieving business benefits varied from case to case depending on the individual circumstances in each organization. For each theme, we provide examples of the influences identified, along with the relevant organization(s) in which they occurred.

5.1.1. Theme 1: Environmental Context

The social, economic, and competitive environment that surrounds ERP implementation and use must be considered. This involves multiple levels of analysis and consideration of the social systems outside the organization that through human agency influence the achievement of business benefits from the ERP system. The top row of Table 3 provides examples of the environmental influences affecting the process of achieving business benefits and present during the post-implementation periods of the four organizations.

Table 3. Three Contextual Themes that Influenced the Achievement of Business Benefits in the Four Organizations

Contextual Theme	Example Influences on Business Benefits Achieved (Organization)
<p>1. Environmental Context</p>	<ul style="list-style-type: none"> - Industry sector (ManA, ManB, ManC, ManD) - Government policy (ManA, ManB, ManC, ManD) - IT industry (ManA, ManB, ManC, ManD) - Business environment (ManA, ManB, ManC, ManD)
<p>2. Organizational Context</p>	<ul style="list-style-type: none"> - Characteristics of the work force (ManA, ManB, ManC, ManD) - Financial constraints (ManC) - Inappropriate management expectations (ManA, ManC) - Acquisitions/divestments (ManB, ManD) - Business restructuring (ManA, ManB, ManC) - Change of ownership (ManB, ManC, ManD)
<p>3. Chartering and Project Phases</p>	<ul style="list-style-type: none"> - Motivation for the ERP implementation (ManC) - Choice of ERP software (ManA, ManC) - Other changes associated with the ERP implementation (ManA, ManB) - Software fit to business processes (ManA, ManC) - ERP expertise on the implementation team (ManA, ManD) - Business expertise on the implementation team (ManA, ManC, ManD) - Lack of inter-functional communication (ManA) - Project overrun (ManC) - Limited user education and training (ManA, ManB, ManC, ManD) - Limited change management (ManA, ManC, ManD) - Extensive customization (ManA) - Lack of data quality (ManA, ManB, ManC, ManD) - High risk implementation strategy (ManA, ManC)

The environmental context influenced the extent of business benefits achieved in all of the organizations. However, it was the way each organization reacted to challenges from its environment that determined its success in achieving business benefits from its ERP system. All of these organizations had to deal with the Australian IT industry during 1998-2001, a period when SAP expertise was in high demand. ManB, the most successful organization, put processes in place to keep staff with SAP expertise. ManD lost at least one good staff member, while the less successful organizations, ManA and ManC, had high staff turnover and had planned redundancies of staff with SAP expertise (see Table 4 for sample evidence). Another distinguishing characteristic of the least successful company, ManC, was its business environment. It operated in a very competitive environment where its new products were copied by Asian companies within six months of their release in Australia. Interestingly, this company is currently in receivership.

Table 4. Empirical Evidence Relating to the “Environmental” and “Organizational” Contextual Themes

Organizations that achieved more business Benefits		Organizations that achieved fewer business benefits	
ManB	ManD	ManA	ManC
Environmental Context			
<p>“So the reason why we haven’t lost a whole lot of people is that we have created positions that were project team, and now that IT is all under one umbrella we have business solutions managers that are a fuzzy line between the business and the delivery of the application”. (General Manager Information Technology & Business Solutions)</p>	<p>“We had our, one colleague... Joined Deloitte... Well we just not able to pay the salary”. (Vice President, Information Technology)</p>	<p>“... this company has lost a lot of very, very good SAP experts who we developed but could not hang onto because of market conditions”. (Business Improvement Manager, Corporate Financial Services)</p>	<p>“...walk into [ManC] and you see only one member of the original project team - walk round the finance area and you’ll see - what one - [person’s name] - really the only one now, in that whole finance area that’s still the same”. (Implementation Partner Consultant for ManC)</p>
Organizational Context			
<p>“As part of the, I suppose a key part of the project was information and data gathering on information needs and the focus was very much on what the business needs, not so much what management thinks that the business needs. Actually, they ran a series of interviews right across the business including the USA and that was through all levels, right from pretty much the top, down to the functional operators at the core. It was an extensive exercise”. (Group Project Manager)</p>	<p>“It was an overseas parent company decision to put SAP in”. (Executive Vice President, Chief Financial Officer)</p>	<p>“As early as May last year one of the executive [senior management group of the division] members, and this was three months into SAP, one of the executive members made the comment that they were disappointed that we hadn’t realized the benefits in SAP”. (Logistics and Planning Manager)</p>	<p>“they [senior management] wanted to really have an off the shelf package sort of thing which we wouldn’t do any modifications to, and really just let the system run off the shelf and have no cost of programmers or people like that”. (Commercial Manager – Logistics)</p>

5.1.2. Theme 2: Organizational Context

The middle row of Table 3 provides six examples of organizational influences that were present in the four organizations during the post-implementation periods. All four organizations had to deal with the fact that in Australia “manufacturing has generally lower levels of education than other sectors of the economy” (Productivity Commission, 2003, p. xxv). Therefore, the extent of education, training, and support each organization provided during post-implementation was an important enabler in achieving business benefits from the ERP system (see Figure 1, theme 5).

The four organizations implemented ERP systems within differing organizational contexts. Before choosing an ERP system, ManB conducted a comprehensive study to formulate its future information systems strategy. That study involved interviews with 140 senior managers and users. It identified the need for a common, fully integrated system that would provide a graphical user interface (GUI) and flexible reporting and would be configurable to meet changing business needs. For its part, ManD’s ERP system mandated from corporate headquarters. In contrast, in the two least successful organizations, ManA and ManC, there was a lack of understanding of the complexities involved in the implementation and achievement of business benefits from ERP systems. Senior managers had unrealistic expectations. Table 4 provides supporting evidence of the differing organizational contexts in the four organizations.

5.1.3. Theme 3: Chartering and Project Phases

The number and extent of business benefits achieved by each organization in the post-implementation period was influenced by problems and issues remaining at go-live from the previous phases in the ERP life cycle (Markus et al., 2000; Markus & Tanis, 2000). The bottom row

of Table 3 shows the 13 problems and issues from the Chartering and Project phases that affected benefit realization in the four organizations. Examination of Table 3 shows that ManA and ManC had the most issues remaining from the planning and implementation phases. In contrast, ManB and ManD, the two organizations that achieved more business benefits, had fewer issues to resolve during the post-implementation period. Table 5 provides supporting evidence of the different state that each organization was in when the ERP system went live.

Table 5. Empirical Evidence Relating to the “Chartering and Project Phases” Contextual Theme

Organizations that achieved more business benefits		Organizations that achieved fewer business Benefits	
ManB	ManD	ManA	ManC
Chartering and Project Phases			
<p><i>“By the time we finished, we had run for the best part of 3 odd years, spent around 25 million dollars and brought up 65 locations across five countries - Australia, New Zealand, Canada, USA and Puerto Rico. It was quite an extensive rollout and what that replaced was about 7 different systems. It transitioned [ManB] from basically a whole disparate, almost dysfunctional at times, organization to a single instance, based here in Melbourne, and that serviced us globally”.</i> (General Manager Information Technology & Business Solutions)</p>	<p><i>“But this one [legacy system] which was batch driven I would call it system not integrated, data not consistent, we had the benefit from the start”.</i> (Vice President Information Technology)</p>	<p><i>“. . . we made a decision to go-live knowing that there were some uncompleted design elements of SAP and they cascaded into some fairly serious problems when we did actually go-live”.</i> (IT Manager, Division)</p> <p><i>“We weren't too concerned about what was happening in 12 months time. We didn't believe all of the propaganda that was being spread about the importance of getting data right and business processes and all of those sorts of things. We felt that there would be a seamless change and that we would really be doing things fairly similarly to the way we did things prior to going live with SAP. So it was not a very good attitude to start with”.</i> (Logistics and Planning Manager, Business B, ManA)</p> <p><i>“What we did was we said, no, no, no the software has to change to fit the current process. Whether our process is right or not that's what we know so that's what we are going to do. So in essence if the process was wrong all that SAP enabled us to do is do the wrong things more quickly, which was, it's a bit of a cynical view I know, but ideally when you are implementing software you get your processes right before you get the software put in place so that you can take advantage of the software early on.”</i> (Logistics and Planning Manager, Business B, ManA)</p>	<p><i>“it did get a bit ugly towards the end - as a lot of projects do unfortunately, just because of the nature of it where businesses are spending a lot of money and at the same time you do have an agreed scope - but there's always difficulties – you know businesses understanding what the true implications of the scope means because they're new to it”</i> (Implementation Partner Consultant for ManC)</p> <p><i>“It certainly wasn't completed - the original on-time plan - I think we delayed - ended up delaying about three times for a month each - so I think originally it was aimed at being 7 months and it ended up taking 10 maybe 11. So, it certainly wasn't on time”.</i> (Implementation Partner Consultant for ManC)</p> <p><i>“. . . because of the rush to get things in and the fact that their key users were involved in other things—in terms of data conversion and all that—training was very, very thin—and that—just the bare minimum and that of course, caused some troubles out in the field when they went live”.</i> (Implementation Partner Consultant for ManC)</p>

5.2. How Do Organizations Achieve Business Benefits from Their ERP System During the Post-Implementation Period?

Six themes emerged from the analysis of the four cases explaining how business benefits were achieved. These are themes 4-9 in the process section of Figure 1. We identified three themes, classified jointly as business benefit enablers, as necessary for changing human action to achieve business benefits from the ERP system. That is, these themes facilitate the change from the use of the legacy systems to the new work practices required for the use of the ERP system. They are technochange management; education, training, and support; and people resources. We identified three additional themes, classified jointly as business benefit drivers, that indicated whether or not the types of changes required to achieve business benefits from ERP systems had occurred in the organizations studied. That is, the extent to which these themes were present in the organizations indicated whether the organizations exhibited the changes required for realizing benefits from the ERP system. These are efficient and effective use of the ERP system, business process improvement, and new projects to leverage off the ERP system. We discuss each of these themes in turn below.

5.2.1. Theme 4: Technochange/Change Management

Row 1 in Table 6 shows the technochange/change management tasks identified across the four cases as important influences in achieving business benefits from the ERP system. There was evidence in all organizations of some degree of change management during the Project phase. However, only the two more successful organizations were proactive in ongoing technochange management during the post-implementation period.

Table 6. The Three Business-Benefit-Enabler Themes that Influenced the Achievement of Business Benefits in the Four Organizations

Business Benefit Enablers	Example Tasks/Issues (Organization)
4. Technochange/ Change management	<ul style="list-style-type: none"> - Identify where new process controls are needed, and redesign, document and support new work tasks (ManB, ManC, ManD) - Identify and document changing work roles and arrange education and training for the original implementation, any additional implementations, upgrades, business process improvements, and new projects (ManA, ManB, ManC, ManD) - Identify ongoing education, training, and support needs for existing and new staff (ManA, ManB, ManC, ManD) - Provide incentives for change (ManB, ManD)
5. Education, training, and support	<ul style="list-style-type: none"> - Education about the integrated nature of ERP software, the importance of data quality and the capabilities of the ERP system (ManA, ManB, ManC, ManD) - Training throughout the post-implementation period (ManB, ManD) - One on one support is the ideal (ManA, ManC)
6. People resources	<ul style="list-style-type: none"> - Skills and abilities of business managers and users (ManA, ManB, ManC, ManD) - Attitudes of business managers and users (ManA, ManB, ManC, ManD) - Availability of business and technical ERP expertise (ManA, ManB, ManC, ManD)

Both ManB and ManD provided support and incentives to encourage staff to use the new ERP system as shown in the quotes in Table 7.

Table 7. “Technochange/Change Management” as a Business Benefit Enabler

Organizations that achieved more business benefits		Organizations that achieved fewer business Benefits	
ManB	ManD	ManA	ManC
Technochange/Change Management			
<p>“Some sites it took quite a bit of a cultural change to push that across because suddenly production had become a very important part of the whole process, whereas prior to SAP there was limited involvement, in terms of maintaining stock. I know in that example, there’s a case of the accountants would perform the stock count, the production guys, because they didn’t have ownership of it, didn’t really care what was coming out at the back-end because the responsibility sat with the accountant.... That was a transition over about a year post implementation and that was a bit of an achievement I think, on the part of the system to be able to make sure that the stock is accurate”. (Group Business Solutions Manager - Finance)</p> <p>“Basically, it hit the fan, where there were poor management practices. They were flushed out in the early days. SAP was accused of actually having wrong numbers. We went through, did a whole lot of work as to whether the configuration was right, whether the reporting was right, all those sorts of things. Time and time again it was proven that the system was doing what the system should do and that the poor practices were very much made visible and led to improved practices over time”. (General Manager Information Technology & Business Solutions)</p>	<p>“We had, we had the question of people not using the system just in moving a material from one aspect to another you have to book it out ... You do a stock take and you find you’ve got so much more stock down in one end and missing stock at the other... So we changed the way we work to enforce the use of the system”. (Section Manager Electronics Final Assembly)</p> <p>“There are still, similar roles, we’ve got a change coordinator who’s looking at data, at data transfer, data integrity, constant change coordination, specifically with our ERP and the engineering side of things”. (Section Manager, Electronics Final Assembly)</p> <p>“We’ve got our administration very low due to SAP and we’re probably running as I said at the bone at the moment . . . we reduced the heads and then we worked out how we’d work with lower heads”. (Vice President Trading & Aftermarket Division)</p> <p>“There’s a campaign which has come from [head office]...everyone in the company has to put in a suggestion a month for improvements to the business. And when they put their suggestions in they’re not just allowed to throw their suggestion in and walk away, they’ve got to implement the change. If...the suggestion is...implemented they get a \$20 [shopping] voucher from the company. [For] a cost reduction they actually get a percentage of the cost reduction when it’s implemented”. (Vice President Trading & Aftermarket Division)</p>	<p>No evidence of the use of technochange/change management as a business benefit enabler.</p> <p>”...I think the post SAP implementation was where we were lacking what we really didn’t do enough of was say how it linked to the job and how the job linked to the wider organization and that if you make a mistake here are the ongoing implications downstream or if there is an issue with your business this is what could have caused it from before ... someone before you is actually putting data in”. (IT Manager)</p>	<p>No evidence of the use of technochange/change management as a business benefit enabler.</p> <p>“It was more in the costings and the manufacturing variances where we lost control. We knew what the total was but we had no analysis of those variations”. (Commercial Manager – Logistics)</p>

5.2.2. Theme 5: Education, Training, and Support

Closely related to change management (row 1 in Table 6) is Education, training, and support (row 2 in Table 6). Education, training, and support is the second business-benefit-enabler theme in the post-implementation period.

Row 2 in Table 6 identifies the types of education, training, and support that were most effective and which contributed to the achievement of business benefits in the post-implementation period. We provide some examples in Table 6 of specific training needs identified across the four cases and recommendations for the type of support that is needed in the post-implementation period. Support was the most common form of assistance that users received during the post-implementation period, usually telephone support. The major weakness of this type of support is that it requires the user to request it, so it is only useful for some problems. Remote support does not help a user who “doesn’t know what

they don't know". Other than telephone support for a relatively short period (e.g., 2-6 weeks) after go-live, there was evidence of accidental and ad hoc education, training, and support. For example, at both ManA and ManC, when meetings were held for another purpose, questions about the use of the ERP were raised and addressed. At ManC, a consultant present in the company for another purpose answered questions about the use of the ERP system.

The implementation partner consultant at ManC stressed the importance of ongoing one-on-one support during the post-implementation period, as he had seen this approach used successfully in other companies. In contrast, ManB made good use of power users in different parts of the organization, and ManD stressed understanding the purpose of changed work tasks with the new ERP system. At all four organizations, the importance of education, training, and support throughout the post-implementation period was acknowledged. However, we identified more instances of deficiencies in education, training, and support at ManA and ManC. Table 8 provides some quotes that indicate the differing extent of education, training, and support conducted at each organization.

Table 8. "Education, Training, and Support" as a Business Benefit Enabler

Organizations that achieved more business benefits		Organizations that achieved fewer business benefits	
ManB	ManD	ManA	ManC
Education, Training, and Support			
<p>"I spend a lot of my day just connecting people between plants and saying, well this plant does it this way, why don't you talk to this person. They might be completely different business units, but they can share information and they can talk the same language". (Group Business Solutions Manager - Manufacturing)</p> <p>"...we actually started to do some training post go-live, because there was no sense in training people on reporting when we were using training database information that was maybe foreign to them. We quickly learnt that there was actually some training you could leave to post go-live and actually use their information and they'd go, "Oh, is that how it works?" (General Manager Information Technology & Business Solutions)</p> <p>"...some of it sunk in and most of it didn't of course so it was one-on-one coaching from the start up of processing on day one." (SAP Applications Manager)</p>	<p>"So it was showing them 'what's in it for me' side of things I think is very important. Not that you need to do this but why you, why you need to do this. And I mean that's a philosophy that we've really adopted probably since the implementation in all facets of training. Not the, not the how's but why's, and that tends to make it a little bit easier". (Section Manager, Electronics Final Assembly)</p> <p>"...we haven't perhaps spent as much money on training as we could have or should have perhaps to get this one going. At the moment it runs fairly well, it could be better and we always believe this". (Executive Vice President, Chief Financial Officer)</p>	<p>"The system support was for the start-up period and it was here on site. They were on site for about two weeks. They probably needed to be on site for 12 months.... There was system support through telephones, etc. We regularly obviously advised that we needed to have support on the shop floor, you know to help people manage through the change... So we had support over the phone but that is less than acceptable to be honest". (Materials Manager)</p> <p>"I'd say we only did enough training to cope with going live. We didn't do enough work to say how do we sustain keeping that knowledge within the business, how do we continue to capture knowledge and not lose it". (IT Manager)</p> <p>". . . we've not had a dedicated ongoing training team, because the logic being you've got your help manuals and your self help that you have there, but unless you know what you're looking for how to get the self help is not much help actually." (Business Improvement Manager, Corporate Financial Services)</p>	<p>"...we've gone through by chance more so than education". (Market Manager)</p> <p>"I think a lot of the users would come up a lot higher level just with some good quality one-on-one training or even one-on-two or -three type training or have a key business user who sees them regularly and helps mentor them along". (Implementation Partner Consultant)</p> <p>"in an area that was particularly screaming or you know - the General Manager of that area was using that as an excuse for his area not performing - so - the IT division would say OK - well we'll give you some training and shut you up". (Implementation Partner Consultant)</p>

5.2.3. Theme 6: People Resources

The type and availability of people resources influenced how business benefits were achieved in the post-implementation period (see row 3 of Table 6 above). The organizations that put processes in place to retain staff with ERP expertise were more successful in achieving business benefits (ManB and ManD).

For business managers and users to learn the capabilities of the ERP system, they needed to have access to ERP expertise, that is, both key business users and ERP experts. This meant that during the post-implementation period, the business managers and users needed time during working hours to interact one-on-one with key business users and ERP experts. The ERP experts needed to be available to work with business managers and users. In the four organizations studied, there were various reasons why this availability was limited. In ManC, there was a major loss of SAP expertise (both business and IT staff) within six months of going live and, due to cost constraints, the access to external expertise was limited. At ManB, the team providing support was also involved in ongoing implementations and new development projects. At ManA, the implementation team went on to another implementation early in the post-implementation period, and due to the geographical location of shared services, it was difficult to get on-site support. At ManD, the incremental implementation tied up ERP expertise, as did new development projects when the implementation was finished.

In addition, all four organizations had issues with people resources in that skills, abilities, and attitudes varied between functional areas, with finance users on the whole requiring less education, training, and support than other users. None of the organizations varied their training programs according to the needs of users in different functional areas. Table 9 provides evidence of the need for the availability of people resources to achieve business benefits from ERP systems.

Table 9. "People Resources" as a Business Benefit Enabler

Organizations that achieved more business benefits		Organizations that achieved fewer business benefits	
ManB	ManD	ManA	ManC
People Resources			
<i>"...we had agreement from the division general managers that they would contribute a certain amount of resources to give business input, and it was to their benefit—there were some fights around that where some people that were loaned to me eventually became part of the permanent team". (General Manager Information Technology & Business Solutions)</i>	<i>"I know we had this Russian guy at one time because there was a shortage on consultants as well". (Vice President, Information Technology)</i>	<i>"...we really don't have too many what I call overall SAP experts who understand what this is about. We've got a few people like business process experts but not too many what I'd call SAP experts. Again a very difficult one because this company has lost a lot of very, very good SAP experts who we developed but could not hang onto because of market conditions". (Business Improvement Manager, Corporate Financial Services)</i> <i>"...certainly our implementation suffered from some lack of planning, certainly some lack of training, but definitely the lack of support staff bringing continuity post the implementation". (General Manager Finance, IT & Planning)</i>	<i>"Because SAP was in huge demand in industry and these people were offered huge salaries to go and do SAP in other installations, implementations. So we lost them all. We trained them all up for our organization and then we lost them to the industry". (Commercial Manager, Logistics)</i> <i>"the history - from an outsider, the history of the [ManC] project - they always tended to really struggle a lot with the calibre of - it might sound harsh - but I guess, the calibre of people that they had". (Implementation Partner Consultant)</i>

5.2.4. Theme 7: Efficient and Effective Use of the ERP System

Even in the two more successful organizations, there were issues that prevented efficient and effective use of the ERP system. These issues are summarized in the first row of Table 10, which also identifies the cases where the issues were observed.

Table 10. Three Business-Benefit-Driver Themes that Influenced the Achievement of Business Benefits in the Four Organizations

Business Benefit Drivers	Example Tasks/Issues (Organization)
7. Efficient and effective use of the ERP system	<ul style="list-style-type: none"> - Users need basic IT skills (ManB, ManD) - Users need to understand the requirement for data quality (ManA, ManB, ManC, ManD) - Users invent manual workarounds (ManA, ManC) - Management continues using old work practices (ManA, ManB, ManC, ManD)
8. Business process improvement	<ul style="list-style-type: none"> - Business/IT suggests process improvement (ManB, ManD) - Pressure to reduce costs (ManD)
9. New projects/extension of existing projects to leverage off the ERP system	<ul style="list-style-type: none"> - Interorganizational initiatives, shared services (ManA, ManB) - Extension to ERP advanced planning and scheduling, bar coding for warehouse (ManB) - Upgrades (ManA, ManB, ManD)

Some users lacked basic IT skills. There were users who had limited experience using a GUI interface and/or a PC. The resulting reduction in productivity influenced the extent of operational business benefits that the organization achieved. Since rework costs were high, users needed to understand the importance of data quality in an integrated environment, but there was a lack of understanding about this key concept. At ManA and ManB, the problems associated with lack of data quality were compounded by a shared services environment. When users don't understand the capabilities of the system, they may invent manual workarounds, and there was evidence of this at ManA and ManC. These manual workarounds highlight a lack of discipline within procedures at these organizations.

Some managers were still using old work practices associated with the legacy systems. Managers were expected to obtain information for themselves from the ERP system rather than requesting reports from subordinates or the IT department. There were examples of this not happening, and several informants reported that senior managers were the worst offenders. Even in ManA, where the prior introduction of shared services meant that staff were not available to run reports for others, this new way of doing work was resisted. Another example was in organizations where upgrades had been completed. Managers and users continued to dump data into Excel when it was no longer necessary due either to lack of knowledge of the enhanced functionality provided by the new version, or a desire to persist with routine behavior. Table 11 provides evidence to show that all four organizations were challenged when it came to efficient and effective use of the ERP system.

Table 11. “Efficient and Effective Use of the ERP System” as a Business Benefit Driver

Organizations that achieved more business benefits		Organizations that achieved fewer business benefits	
ManB	ManD	ManA	ManC
Efficient and Effective Use of the ERP System			
<p><i>“It’s amazing... There was a thousand items and they were clicking on each one, one by one, matching them all up, whereas they could have just clicked on one item, said select beginning, select end, and it shows all of them, and just being able to—two seconds”. (Group Business Solutions Manager – Finance)</i></p> <p><i>“...there is a strong focus on getting out and training sites and saying well, you really should be using this purchasing information record functionality, maintaining those prices and making sure they are correct because the results of you not doing that flow through to the shared services area”. (Group Business Solutions Manager - Finance)</i></p>	<p><i>“...we have automatic faxing,... they can send automatically just by pressing the button but they don’t trust the system so fifty percent they send automatically the other fifty percent they print...they just say no, last time the vendor didn’t receive it, but this is only because maybe the fax number was wrong and they didn’t check...If it doesn’t work, it’s SAP’s fault”. (Vice President, Information Technology)</i></p> <p><i>“I mean the whole thing is putting accurate data into the system to get accurate data back. And it was made clear and I think on a daily basis people were made accountable, usually a leadership group of backlogs, so it was uncomfortable for them to have to be clearing backlogs. And it more or less forces you to go back to the data entry and do whatever you can to make sure that people are aware that it’s, it’s got to be accurate because it costs money, it costs time, it costs money and the discomfort”. (Section Manager Electronics Final Assembly)</i></p> <p><i>“You’ve got a lot of long term, aging executives that haven’t adopted the system. I think they, like they, I think they’re happy with the system but as a user it’s still a preferred option to have someone else doing the crunching”. (Section Manager, Electronics Final Assembly)</i></p>	<p><i>“...what we really didn’t do enough of was say how it linked to the job and how the job linked to the wider organization and that if you make a mistake here are the ongoing implications downstream or if there is an issue with your business this is what could have caused it from before ... someone before you is actually putting data in” (IT Manager)</i></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”. (Materials Manager)</i></p> <p><i>“...I get very frustrated when you put in manual band-aids when the system will fix an issue...They don’t know, they are not using the system properly because they do not know how to use it properly”. (Customer service representative on the SAP implementation team)</i></p> <p><i>“... people are used to just picking up the phone to someone and saying can you run this for me and you say well actually you know it’s pretty easy for you to do it yourself so I will come up and show you how to run it”. (Finance Business Analyst - Retail)</i></p>	<p><i>“You might have somebody sitting in the corner quietly who never complains, who’s doing something completely inefficiently but because no-one ever questions or sits with them you never know”. (Implementation Partner Consultant)</i></p> <p><i>“I have to deal with an extra couple of entries on the screen but while the difference that makes for all them down there, my extra thirty seconds of plug[ging] in data gives a half an hour saving at the other end. ... People didn’t seem to have that broad knowledge. You’re finance, this is finance. And also when you got in to run it, all of a sudden you go well hang on a minute, you know finance is only part of the whole picture”. (Commercial Manager)</i></p> <p><i>“You get the impression that people are sort of working within the system when it suits them then going outside the system when it doesn’t”. (Financial Accountant)</i></p> <p><i>“I would suggest there is a lot of, also instead of the system perhaps being used to its fullest potential, there’s a lot of manual adjustments and fixes”. (Sales and Marketing Manager)</i></p> <p><i>“...they’re sort of used to and have the desire to just press a button and have the whole thing happen for them”. (Implementation Partner Consultant)</i></p>

5.2.5. Theme 8: Business Process Improvement

As business managers and users learned more about the capabilities of the ERP system, business process improvement occurred. At ManD in the post-implementation period, corporate headquarters wanted more done with fewer financial resources, and this drove further business process improvement within the business. Business process improvement required business managers and users to understand the capabilities of the ERP system and for ERP experts to be available to work with them in improving processes. In contrast, at ManC, downsizing of the work force meant that business managers and users were using 100 percent of their time just to maintain “business as usual” so there was no time for anything else. ERP experts must be available from internal IT staff and/or external consultants and contractors. If internal staff are unavailable, this requires financial resources to purchase external expertise. Without the business expertise combined with ERP expertise, business process improvement did not occur. Table 12 highlights the business process improvement that occurred at ManB and ManD and the contrasting situations at ManA and ManC.

Table 12. “Business Process Improvement” as a Business Benefit Driver

Organizations that achieved more business benefits		Organizations that achieved fewer business benefits	
ManB	ManD	ManA	ManC
Business Process Improvement			
<p><i>“There is a lot of work we’re doing around that, [business process improvement] both a combination of our knowledge—three or four years later, and the businesses’ knowledge—and the business is quite forward in coming up with ideas of saying—‘Well I know SAP better now, why don’t we do X?’ And you go, ‘That sounds alright’. We are actually finding there are more and more opportunities as more and more people understand what we have done. Rather than just relying on what we think should be done.”</i> (General Manager Information Technology & Business Solutions)</p>	<p><i>[Business process improvement] “On the one hand coming from the power users, then again also from the head office also new requirements”. (Vice President, Information Technology)</i></p> <p><i>“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”. (Group Leader SAP)</i></p>	<p><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”. (Logistics and Planning Manager)</i></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”. (Materials Manager)</i></p>	<p><i>“I saw one person who went there [ManC]—I knew her from another site I worked at—extreme enthusiasm about—oh you know —this is going to be great, they told me I’ll be able to do a lot—she’d resigned within three months because—I hate it—no money to do anything, every suggestion I put up goes nowhere”. (Implementation Partner Consultant)</i></p>

5.2.6. Theme 9: New Projects/Continuation of Projects to Leverage Off the ERP System

With the ERP system in place it became a reliable backbone from which to launch new business projects such as ebusiness. For example, both ManB and ManD sought closer ties with customers and suppliers through ebusiness initiatives. At ManA and ManC there was no evidence of new projects to leverage off the ERP system (see Table 13).

Table 13. “New Projects/Extension of Existing Projects” as a Business Benefit Driver

Organizations that achieved more business benefits		Organizations that achieved fewer business benefits	
ManB	ManD	ManA	ManC
New Projects/Extension of Existing Projects			
<p><i>“... we were able to really concentrate on projects, like in manufacturing being the bar-code roll-outs, of better control, tighter inventory control in warehouses and production areas. EDI to electronically communicate purchase and sale information between the plants for interplant trading ... where a vendor will be responsible for the financial impact of stock on our system until we use it”.</i></p> <p><i>“Scheduling is one we are going through right now where the plants are scheduling using real-time sales information and then the production recording process strips the schedule real-time as well”.</i></p> <p><i>“So, we’re going through a process now of configuring the scheduling offering within SAP according to a plant’s requirements”.</i> (Group Business Solutions Manager - Manufacturing)</p> <p><i>“We achieved within two and a half to three years of the original implementation, one of our projects was to, having got SAP in, create a payables and receivables shared service which was achieved ... There is quite a concerted and continued move to refine the finance area and there is a lot of work going on at the moment as to taking out a lot of the financial accountants, still having management accountants handling multiple plants”.</i> (General Manager Information Technology & Business Solutions)</p> <p><i>“The way things have grown since '97 to what we have now in an ebusiness sense, we have been able to leverage a lot of value that was never even understood or called for back in '96”.</i> (General Manager Information Technology & Business Solutions)</p>	<p><i>“This software is also used in other just in time factories worldwide and without SAP, or this ERP system, this would not be possible”.</i> (Vice President, Information Technology)</p> <p><i>“...looking at mySAP or the new tools coming and also the EDI integrating with the internet. We actually will have a project soon with our trading business whereby the customers can order via the internet through our SAP system”.</i> (Vice President, Information Technology)</p> <p><i>“Also I mean, there were a few additional projects I would say after the original implementation with taking over [company name], so we had to integrate another company.”</i> (Vice President, Information Technology)</p>	<p>No evidence of new projects to leverage off the ERP system</p>	<p>No evidence of new projects to leverage off the ERP system</p>

6. Relationships Between the Themes in the Framework

All of the 10 themes in the new framework (see Figure 1) were interrelated. Table 14 outlines in detail the relationships between the 10 themes. It explains how and why the first nine themes influenced each other and complements the description above of how and why each theme influenced the business benefits achieved from the ERP system (theme 10). All nine themes and the interrelationships between them contributed to the extent of business benefits achieved from ERP systems (theme 10, the Outcome theme) through a complex web of interweaving influences. As discussed in the first few rows of Table 14, the contextual themes (themes 1 to 3) either enabled or constrained the achievement of business benefits from ERP systems. For example, Environmental and Organizational contexts influenced the other themes right across the ERP lifecycle. Likewise, the Chartering and Project phases influenced actions required in themes 4 to 6 in the post-implementation period of the ERP system.

The second stage of the process of achieving business benefits in the post-implementation period involved achieving good outcomes for the three business benefit drivers (themes 7 to 9). These

directly influenced the business benefits achieved from the ERP system (theme 10). As discussed in the examples in the last few rows of Table 14, good outcomes for the business benefit drivers were facilitated by the business benefit enablers (themes 4 to 6). In addition, as business benefit drivers were achieved, this produced an increased need for the business benefit enablers (see the right-to-left arrow labeled “influence” in Figure 1) to support the ongoing process of achieving business benefits throughout the post-implementation period.

Table 14. Interrelationships Between the Nine Themes that Together Influence Business Benefits Achieved from ERP Systems

General Type of Theme	Theme	Relationship to Other Themes
Contextual	1. Environmental	In all phases of the ERP life cycle the environmental context influenced the quality and availability of people resources. For example, the environmental context in Australia at the time of the study influenced that availability of business and ERP expertise for education, training, and support.
	2. Organizational	Poor user skills in the organization influenced the efficient and effective use of the ERP system and required more resources for technochange management to identify and provide for education, training, and support. The cross-case analysis shows that if managers expect business benefits to arise soon after the ERP system goes live then adequate people resources to achieve business benefits are required during the post-implementation period. Acquisitions, divestments, change of ownership and requirements from headquarters all provided additional activities that distracted ERP experts, business managers and users from business process improvement and development of new projects that leverage off the ERP system.
	3. Chartering and Project Phases	Having issues to resolve from these two phases tied up people resources. ERP experts and key business users were needed for technochange management and education, training, and support roles, which, in turn, were needed to achieve efficient and effective use of the ERP system, or to work on business process improvement, or on the development of new projects to leverage off the ERP system.
Business Benefit Enablers (Processual)	4. Technochange Management	Technochange management during the post-implementation period involved identifying where job roles had changed, or process controls were not in place, and where education, training and support was required that was not identified or adequate prior to going live. The extent to which these issues were addressed influenced efficient and effective use of the ERP system. Initiatives such as employee incentive schemes or formal benefit realization programs encouraged business process improvement and the identification of new development projects that, in turn, drove further business benefits throughout the post-implementation period.
	5. Education, Training and Support	Business managers and users needed ongoing education, training, and support once the ERP system went live before efficient and effective use of the system emerged. Ongoing technochange management during post-implementation identified where such support was needed. In addition, ongoing implementations, upgrades, business process improvements, and new projects implemented to leverage off the ERP system during post-implementation all led to the need for additional, ongoing education, training, and support.

Table 14. Interrelationships Between the Nine Themes that Together Influence Business Benefits Achieved from ERP Systems (cont.)

General Type of Theme	Theme	Relationship to Other Themes
Business Benefit Enablers (Processual)	6. People Resources	The skills, abilities, and attitudes of business managers, ERP experts and business users influenced the extent of efficient and effective use of the ERP system. Different skills and abilities of users meant that there were widely varying needs across functional areas for education, training and support during the post-implementation period. ERP experts and key business users were needed during the post-implementation period to work with business managers and users to both improve business processes and work on new projects to leverage off the ERP system.
Business Benefit Drivers (Processual)	7. Efficient and Effective Use of the ERP System	Ongoing technochange management and education, training, and support were required in the post-implementation period to achieve more efficient and effective use of the ERP System. Ongoing technochange management and one-on-one support during post-implementation helped to identify a lack of IT skills, a lack of understanding of data quality, and the use of manual workarounds. Business managers were encouraged to make more efficient and effective use of the ERP system; for example, for decision making, by providing incentives through technochange management and ongoing education, training, and support throughout the post-implementation period.
	8. Business Process Improvement	In ManB and ManD, ongoing technochange management strategies encouraged business process improvement. In addition, ongoing education, training, and support of business managers and users was needed so that they could understand the capabilities of the ERP system. ERP experts included both internal IT staff and/or external consultants and contractors. (Where internal staff were unavailable, financial resources were needed to purchase external expertise.) Without business expertise combined with ERP expertise (i.e., without appropriate people resources), business process improvement did not occur.
	9. New Projects/ Extension of Projects to Leverage Off the ERP System	Having internal IT staff working on these new and existing development projects during the post-implementation period limited the availability of people resources for the education, training, and support necessary to ensure efficient and effective use of the ERP system and business process improvement. To compensate, some education, training, and support was provided by key business users when they were available. However, all of the organizations with the exception of ManB experienced problems to some degree with loss of both technical and business ERP expertise.
Outcome	10. Business Benefits from ERP Systems	All nine themes and the interrelationships between them influenced the extent of business benefits achieved from ERP systems.

7. Business Benefits Achieved

Assessment of the business benefits achieved by each organization with the Shang and Seddon (2000) ERP benefits framework found ManB to have achieved extensive business benefits (see Appendix C), ManD substantial business benefits (see Appendix E), and ManA (see Appendix B) and ManC (see Appendix D) limited business benefits from their ERP systems.

This study provides empirical evidence for O'Grady's (2002) contention that there is a time ordering for the achievement of business benefits in different dimensions of Shang and Seddon's (2000) framework. According to O'Grady (2002), the order that the business benefits from the five dimensions of the Shang and Seddon framework are achieved is: IT infrastructure, operational, and managerial benefits, followed by organizational and strategic benefits. Some operational benefits, such as reduced financial cycle times, were achieved relatively quickly by all organizations in this study. However, the time taken for the achievement of substantial operational business benefits depended in part on the organizational context. For example, the mandated choice of SAP software resulted in different outcomes at ManA and ManD. At ManA, it contributed to substantial operational benefits taking about 18 months to achieve, while at ManD many operational benefits were achieved immediately after go-live.

Managerial benefits in terms of standard reports also were achieved in a short time. However, the use of the ERP system to obtain new insights for managerial decision making was achieved much more slowly. This requires business managers to understand the *ad hoc* reporting capabilities and be prepared to use the ERP system themselves. The organizations needed people resources available post-implementation to provide technochange management, and education, training, and support to encourage and educate business managers to use the new reporting capabilities.

IT infrastructure benefits were achieved early, with the exception of IT cost reduction, which proved elusive for three of the four organizations studied. For example, at ManA dependence on ERP experts from other parts of the organization (environmental context) resulted in an initial, less than optimal hardware configuration that had to be replaced post-implementation. Similar problems were encountered at ManD, but in this case they were due to financial constraints (organizational context). The failure to achieve IT cost reduction may not be that unusual since a survey of US manufacturing firms (Mabert, Soni, & Venkataramanan, 2000) indicated that decreased IT costs were not one of the areas of benefit from ERP systems for many firms.

Organizational benefits were achieved in varying degrees across the four organizations. An interesting example of an organizational benefit was seen at ManD. With efficient and effective use of the ERP system, it became apparent at ManC that one of its divisions that was thought to be the most financially viable, in fact was not. Only ManB and ManD reported substantial strategic benefits due to the use of the ERP system. These were also the organizations that showed most evidence of technochange management and education, training, and support during post-implementation. This resulted in business process improvement and the continuation and commencement of new projects to leverage off the ERP system.

8. Discussion

The new framework in Figure 1, which comprises 10 themes and their interrelationships, provides a rich explanation of the process of achieving business benefits from ERP systems. We discuss many of the themes or parts of the themes in the new framework within the literature review, so it is the process view of the themes in Figure 1, and the accompanying explanation of the interrelationships between them (discussed in Table 14), not the identification of the themes per se, that is the contribution of this paper.

Although some concepts are not directly comparable, a summary comparing the new framework, three prior variance models of factors affecting benefits from ERP/ES post-go-live—namely, those in Study 1 (Davenport et al., 2004), Study 2 (Gattiker & Goodhue, 2005), and Study 3 (Seddon et al.'s (2010) OBES model)—and the “conditions” literature (see Background Literature section), is

provided in Table 15. Blank cells in Table 15 indicate the absence of the theme/factor/condition in a specific model or other literature. We note instances where a match is only partial. Table 15 shows that the grounded analysis in this study has yielded a framework that is at least as comprehensive as the prior literature, and in some respects, goes beyond prior work. For example, some of the influences on benefits have not been identified or as comprehensively discussed in previous research. These include, first, the influence of the environmental (external) and organizational (internal) contexts, and of the chartering and project phases of implementation as context. Second, for the business benefit enablers, technochange management emphasizes incentives to encourage staff to use the ERP system, the importance of one-on-one support post-implementation, and the recognition of all who are involved in achieving business benefits. And third, for the business benefit drivers, where New projects commenced during implementation are evident, operational and strategic benefits are increased.

Table 15. Comparison of Themes in the New Framework with Study 1, Study 2, Study 3, and the “Conditions” Literature

	New Framework (Figure 1)	Davenport et al. 2004 (Study 1 in the Background Literature)	Gattiker and Goodhue 2005 (Study 2 in the Background Literature)	Seddon et al. 2010 (Study 3 in the Background Literature)	The seven “Conditions” (in the Background Literature)
Scope	ERP systems	Enterprise systems (ES)	ERP systems	Enterprise systems	MRP systems ERP systems
Level of analysis	Organization	Organization	Subunit (manufacturing plant)	Organization	
Themes/Factors/ Conditions	Time is implicit	Spend time with ES	Time elapsed since implementation	Multiple projects	
	Environmental context		Interdependence		Changing business conditions
	Organizational context		Differentiation		
	Chartering and Project phases	Implement extensively	Customization		Early phases in the ERP life cycle affect subsequent phases Software fit to business
	Technochange management			Overcoming organizational inertia	Change management
	Education, training and support			Overcoming organizational inertia	Education and training
	People resources	Invest in the ES			People Resources
					Establish metrics
	Efficient and effective use	Informate (part match)	Data quality (part match)	Functional fit (part match)	
	Business process improvement	Optimize Integrate	Task efficiency Coordination improvements	Process optimization	
	New projects to leverage off the ERP system	Integrate (part match)		Ongoing improvement projects	
Assessment of business benefits	Shang and Seddon (2000) ERP benefits framework (Figure 4)	Ten specific organization wide benefits	Three survey items that elicit perceptions about business performance at the plant level	Benefits from the perspective of senior management	Not assessed

But the key contribution of this study is not its list of themes. Rather, the contribution of this study is its explication of the process for realizing benefits, and its demonstration of the inter-relationships between the 10 themes in the new framework. First, we highlighted the role of human agency in achieving business benefits: each of the three ways of achieving business benefits from ERP systems – namely, efficient and effective use, business process improvement, and new projects to leverage off the ERP system (see the box labeled “business benefit drivers” in Figure 1) – requires managers and users, key business users, and ERP experts to work together over an extended period of time during the post-implementation period.

Second, these three means of obtaining business benefits are supported by a continuous process of technochange management and education, training, and support involving managers and users, key business users and ERP experts, that is, people resources, in the post-implementation period (see box labeled “business benefit enablers”, Themes 4-6, in Figure 1). However, even when sufficient people resources are available and there is an adequate skill level, there will be competing interests, since these same resources are required for the other two business benefit enabler themes and all of the business benefit driver themes. Identification of the theme of people resources, and the importance of human agency in the process of achieving business benefits from ERP systems, lends support to the body of IS literature that considers information systems as human activity systems (e.g., Checkland & Holwell, 1998). That is, people are an essential part of the information system, and business benefits are not produced by the technology alone (Orlikowski, 2000).

Third, the contextual themes shown in Figure 1 can also influence the availability of these resources. If, for example, there is a need to rectify problems left over from the chartering and project phases, or additional work is required due to a company acquisition or change of ownership, then resources are taken away from supporting the six processual themes, leading to lower achievement of business benefits. Finally, although the explanatory framework developed in this study (Figure 1) does not explicitly include time, it is implicit in the assumption that achieving business benefits from ERP systems is an emergent process. This is shown in the cyclical-interaction process represented by the left-to-right and right-to-left arrows in the process-model section of Figure 1.

Thus, this study found that the achievement of business benefits from ERP systems during the post-implementation period is the result of a complex web of influences involving the interaction of context and process over time. Although previous research has gone some way toward explaining the use of ERP systems (e.g., Boudreau, 2003), none has examined the process of achieving business benefits within a broader context than the organizational setting over an extensive period of time. Other research has identified problems and issues that may help prevent organizations from achieving business benefits from ERP systems (e.g., Ross & Vitale, 2000; Markus et al., 2000) but, although useful, the earlier results are more descriptive than explanatory.

With respect to the more general applicability to other organizations of the findings in this paper, the key question is whether the underlying mechanisms (Mingers, 2006) that led to the importance of the 10 themes and their patterns of inter-relationship observed in the four case-study firms are also likely to exist in other organizations. That is, are themes such as education, training, and support; people resources; business process improvement; and new projects/extensions of projects to leverage off the ERP system likely to be important in benefit-realization processes in other organizations, and for reasons similar to those in our four manufacturing case studies? Our answer is yes; the arguments underpinning the model in Figure 1 do not appear to be peculiar to the four manufacturing organizations studied, nor to their use of SAP software. So the results reported here are likely to be applicable to other large organizations, manufacturing and non-manufacturing, using ERP software in Western-style organizations around the world. However, because the needs and resources of small organizations are so different, we are not confident that the model in Figure 1 is applicable to small Western-based organizations. Nor are we confident that it applies to large or small organizations in countries such as China with highly collectivistic decision processes (Hofstede, 2001).

Conclusion

The achievement of business benefits from ERP systems during the post-implementation period is the result of a complex web of influences that interact over time. For the four Australian manufacturing organizations discussed in this paper, these influences are summarized in Figure 1. By focusing on the process through which business benefits were realized from ERP systems in the years after go-live, this study contributes to an emerging overall picture of how and why organizations achieve business benefits from ERP systems. The use of a grounded approach has led to the identification of hitherto underemphasized influences, such as context, people resources, support, and efficient and effective use.

The new process-oriented framework is firmly grounded in empirical data and is accompanied by an in-depth explanation of the framework's 10 individual themes and the interrelationships between them. It complements existing models by explaining the process through which the phenomena they report actually occur, and therefore, makes a distinct and valuable contribution to ERP research. The framework will be of use to researchers who are studying the post-implementation phase of ERP systems. In particular it provides a detailed explanation of how and why business benefits are achieved. Further empirical studies of ERP implementation and use in different industry sectors will further enhance and strengthen the framework. The framework will be of use to practitioners, as it provides a systematic way of understanding and explaining how and why business benefits have or have not been achieved.

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Appendices

Appendix A

Exhibit A-1. Quality Control in this Study

Design Issues	Appropriate research questions	The “how” and “why” research questions are appropriate for explanatory case study research. The research questions are stated in the introduction section of the paper.
	Rationale for multiple case selection	A multiple case study design was chosen, since an understanding of four different cases had the potential to provide more deeply grounded, multiple sources of evidence and therefore more robust theory (Stake, 1994; Yin, 2003, pp. 46-47; Eisenhardt & Graebner, 2007). According to Pettigrew (1989), comparisons among sites may help show variability in context. A multiple case study design increases the reliability of the study (Yin, 2009, p. 41). See the Method section of the paper.
	Unit of analysis	The unit of analysis was the continuous process of ERP use in the post-implementation period in context in the selected organizations. See Method section of the paper.
	Pilot case	The first case study served both as a pilot study and a full case study. Only small revisions of the interview questions were required after its completion (see Figure 2).
	Longitudinal	The post-implementation periods in four manufacturing companies were examined retrospectively as processes within context over time. Informants were asked to reflect retrospectively on the planning, implementation and use of the ERP systems and the organization's success in achieving business benefits from the ERP system.
Data Collection	Detail on methods	<p>A case study protocol was designed prior to data collection. This included the research questions, the interview protocol based on the adapted Orlikowski framework, and the Shang and Seddon (2000) ERP benefits framework, sites to be visited, roles of informants, documents to be collected, and use of the adapted Orlikowski framework as the outline for the final case study report. Developing and using a case study protocol increased the reliability of the study (Yin, 2009, p. 41). The cases were chosen using a theoretical sampling method in order to maximize the chances of theoretical insight. Cases that increased the likelihood of replication of findings or were likely to provide contrary replication were chosen (Eisenhardt & Graebner, 2007). This increased the external validity of the study (Yin, 2009, p. 41).</p> <p>Multiple sources of evidence were used including interviews, internal company documents, company presentations, company newsletters, data from financial databases, company web pages, and newspaper articles. Using multiple sources of evidence increased construct validity (Yin, 2009, p. 41).</p> <p>The interview protocol was developed based on the literature (i.e., the adapted Orlikowski framework and Shang and Seddon's (2000) ERP benefits framework).</p> <p>Data in the form of interview transcripts, documentary evidence, memos, notes, informant summary forms, and case summary forms were collected and stored in a case study database. The Nudist (N5) software package was used to manage the data in the case study database. Use of a case study database increased the reliability of the study (Yin, 2009, p. 41).</p>
	Triangulate data	Triangulation between different informants and documentary evidence for each case was conducted. This increased the construct validity of the study (Yin, 2009, p. 41). The appropriateness of the background and role of the informant to comment on particular issues was also taken into account.

Exhibit A-1. Quality Control in this Study (cont.)

Data Analysis	Chain of evidence	A chain of evidence was established linking the cross case findings and the individual case stories to evidence in the case study database and back to the case study protocol and the original research questions. The development of the case study protocol and the case study database provided the means to establish a chain of evidence, which increased the <i>construct validity</i> and <i>reliability</i> of the study (Yin, 2009, p.41).
	Use preliminary data analysis techniques	The Nudist (N5) software package was used to manage the data associated with analysis (i.e., coding scheme, coded data, notes and memos). The first step in data analysis involved the preparation of case descriptions detailing the individual “stories” of ERP planning, implementation, and use in each organization. When completed, these were distributed to key informants for review. This resulted in some minor modifications to the description. However, no major revisions, deletion of data, or different interpretations were suggested. Review of the case stories by key informants increases <i>construct validity</i> (Yin, 2009, p. 41).
	Quotes	Evidence in the form of quotes is provided for all the themes in the new framework (see Tables 5, 6, 8, 9, 10, 12, 13, and 14)
	Compare findings with extant literature (both similar and conflicting)	The Discussion section of the paper compares the new framework with the extant ERP literature.

Appendix B

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 <i>Supports business alliances</i> 3.3 <i>Supports business innovation</i> 3.4 <i>Supports cost leadership</i> 3.5 <i>Supports product differentiation</i> 3.6 <i>Supports external linkages</i> 3.7 <i>Enables worldwide expansion</i> 3.8 <i>Enables ebusiness</i>
4. IT INFRASTRUCTURE	4.1 Increased business flexibility 4.2 <i>IT cost reduction</i> 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 <i>Changed culture with common vision</i> 5.5 Changed employee behaviour with a shifted focus 5.6 Better employee morale and satisfaction

KEY: **Benefit category** = business benefit achieved

Benefit category = business benefit not achieved

Exhibit B-1. Business Benefits Achieved at ManA

Appendix C

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

KEY: **Benefit category** = business benefit achieved

Benefit category = business benefit not achieved

Exhibit C-1. Business Benefits Achieved at ManB

Appendix D

BENEFIT DIMENSION	BENEFIT CATEGORIES
1. OPERATIONAL	1.1 Cost reduction 1.2 Cycle time reduction 1.3 <i>Productivity improvement</i> 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 <i>Supports business innovation</i> 3.4 <i>Supports cost leadership</i> 3.5 <i>Supports product differentiation</i> 3.6 Supports external linkages 3.7 <i>Enables worldwide expansion</i> 3.8 <i>Enables ebusiness</i>
4. IT INFRASTRUCTURE	4.1 Increased business flexibility 4.2 <i>IT cost reduction</i> 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 <i>Changed culture with common vision</i> 5.5 Changed employee behaviour with a shifted focus 5.6 Better employee morale and satisfaction

KEY: **Benefit category** = business benefit achieved

Benefit category = business benefit not achieved

Exhibit D-1. Business Benefits Achieved at ManC

Appendix E

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 worldwide 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 common vision 5.5 Changed employee behaviour with a shifted focus 5.6 Better employee morale and satisfaction

KEY: **Benefit category** = business benefit achieved

Benefit category = business benefit not achieved

Exhibit E-1: Business Benefits Achieved at ManD

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