Enterprise Systems Maturity: A Practitioners' Perspective

Sanjay Mathrani
School of Engineering and Advanced Technology
Massey University
Auckland, New Zealand
s.mathrani@massey.ac.nz

Dennis Viehland
Department of Management
Massey University
Auckland, New Zealand
d.viehland@massey.ac.nz

M. A. Rashid
School of Engineering and Advanced Technology
Massey University
Auckland, New Zealand
m.a.rashid@massey.ac.nz

Abstract

Organizations continue to adopt enterprise systems (ES) technology to reduce costs and improve processes with the aim of achieving business benefits. The purpose of this study is to examine the utilization of ES technology and its information by New Zealand (NZ) organizations and their ability to derive benefits. The study does so by exploring (a) how ES data are transformed into knowledge, (b) how this knowledge is utilized to achieve benefits within NZ organizations, and (c) critical success factors for this process. This study gains insights through a "practitioners' perspective" of ES vendors, ES consultants, and IT research firms in a NZ context. Key findings indicate that although many ES implementations in New Zealand are several years old, companies have only recently started tracking benefits through analytical processes to optimize and realize business value from their enterprise systems investment.

Keywords: Enterprise Systems (ES), Enterprise Resource Planning (ERP), Business Benefits, IS Maturity

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Introduction

Enterprise systems (ES), also known as enterprise resource planning (ERP) systems, are large, complex, highly integrated information systems implemented to improve organizational effectiveness (Davenport, 2000; Hedman and Borell, 2002; Markus and Tanis, 2000) principally by meeting the information needs of the organization. These are comprehensive, fully integrated software packages including extended modules such as supply chain management (SCM), customer relationship management (CRM), and business intelligence (BI) supporting automation of most standard business processes in organizations. In an interactive global marketplace, extended ES as well as Web-based technology offer new ways of configuring systems and new functions to establish the integrated, inter-company business enterprise (Shanks et al., 2003). For the purposes of this study, ES is considered the same or equal to ERP systems and includes any extended modules to the ERP system that might include SCM, CRM, or BI modules, for example.

ES applications connect and manage information flows across complex organizations, allowing managers to make decisions based on information that accurately reflects the current state of their business (Davenport and Harris, 2005; Davenport et al., 2002). A number of research studies have been conducted to establish and understand the critical success factors for ES implementations (e.g., Allen et al., 2002; Bancroft et al., 1998; Holland and Light, 1999; Parr and Shanks, 2000; Plant and Willcocks, 2006; Yang and Seddon, 2004). However, there has been little research (Hedman and Borell, 2002) to understand the effectiveness of ES in the post-implementation phase, which makes it difficult to draw explicit conclusions on the impact of ES on organizational performance (DeLone and McLean, 1992; Hedman and Borell, 2002). Although, when evaluating the cost benefit analysis of an ES implementation, the company's previous experience with ES should be considered (Hawking et al., 2004; Nolan and Norton Institute, 2000). Viehland and Shakir (2005) note that despite the huge risks and possibility of greater benefits, there has not been much research globally that evaluates the process of establishing strategic decisions for ES implementations.

The purpose of this study is to examine the utilization of ES technology and its information by New Zealand (NZ) organizations and their ability to derive benefits from their ES investment. The study does so by exploring (a) how ES data are transformed into knowledge, (b) how this knowledge is utilized to realize benefits, and (c) the critical success factors for this process. The results provide insight into the post-implementation ES practices in a New Zealand context.

The study gains insights to these issues through a practitioners' perspective, with interview data collected from ES vendors, ES consultants, and IT research firms who are actively engaged in ES implementation and are experts in this field. This approach is different from the organizational approach usually found in literature, which focuses on the viewpoints of users in organizations that have implemented these systems. The knowledge of such users is restricted due to their limited experiences within those organizations. The ES vendors' and consultants' perspective yields new insights into the current ES implementation practices based upon their recent implementation experiences and knowledge in this field. The specialist knowledge this community has is shared with the reader, which is a distinctive contribution of this study.

This paper is organized as follows. This first section introduced the focus of this paper with a brief background on ES. The next section reviews the literature and structures the discussion of the findings. The third section outlines the research methodology. The fourth section presents the empirical findings from interviews with key players in the New Zealand ES market. The fifth section summarizes and discusses the findings. The sixth section offers conclusions about the

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current status of ES post-implementation practices in New Zealand.

Related Works

Enterprise systems are packaged information systems software applications that can be configured to meet the functional requirements of an organization. These systems integrate information from various disparate sources such as customers, supply chain, human resources, and financial accounting to make up the value chain of the enterprise allowing an organization to become significantly flexible and efficient (Davenport, 1998). ES vendors such as SAP and Oracle offer these systems as standardized software packages which allow organizations to procure them off-the-shelf and align to their individual needs replacing earlier in-house legacy systems (Allen et al., 2002).

The focus of ES has not only been on addressing the manufacturing requirements but on seamless integration of the entire value chain. In this respect, ES helps businesses to refine business processes and leverage information. The ES functionalities lead to benefits as expected outcomes when implemented. The benefits include "not only increased decision-making speed, improved control of operation and costs, and cost reductions but, more importantly, improved enterprise-wide information dissemination" (Allen et al., 2002, unpaged). These systems "present a holistic view of the business by permitting the sharing of common data and practices in a real-time environment" (Ifinedo and Nahar, 2006, p. 1554).

The process of attaining additional benefits in the post-implementation phase, after the initial ES implementation, is known as second wave implementations (Deloitte Consulting, 1998). ES implementations comprise several phases or "waves" beyond the initial implementation (Hawking et al., 2004). The "first wave" occurs when the ES is implemented for the first time in an organization and the system goes live. Thereafter, the "second wave" begins. Typically, there are three stages of ES implementation maturity in the second phase. First is the "stabilize" stage in which organizations get accustomed to the new system and familiarize with the business process changes. Second is the "synthesize" stage in which organizations look to further improve business functions, install any bolt-on applications as supporting tools such as BI, and encourage staff to implement the new changes. Finally, in the "synergize" stage organizations achieve optimization of business processes that lead to enterprise transformation (Hawking et al., 2004). Organizations that have completed "second wave" ES implementations or entering this phase are reasonably mature with the system. It would be reasonable to expect that companies involved in second wave of implementations would be in the consolidating or mature stages (Hawking et al., 2004). There are three factors which are essential for a company to achieve second wave benefits: firstly, the organization must have had several years experience with enterprise systems; secondly, the systems should have been used extensively throughout the organization, and; thirdly, significant resources should be allocated for future implementations (Davenport et al., 2002).

To be able to utilize the information from enterprise systems, organizations deploy business intelligence tools that assist in extracting relevant data for analytical decision making. BI systems, referred to as "data-driven DSS" (Power, 2007), is described as a rational approach to management, which is fact-based and analysis-based, converting data into information, and empowering organizations to "make better decisions faster" (Vitt et al., 2002).

The BI process includes transformation of data into valuable information, insightful analysis by humans leading to action, and finally evaluation and distribution of results. In this process, organizational knowledge is created, transferred, shared, stored, and managed for current and future requirements. Data transformation into information occurs when a particular analytical viewpoint is taken.

Analysis is a way of processing raw data into information that is useful for a particular purpose. Information is transformed into knowledge when it is incorporated into business rules, adding experience, context, interpretation, and reflection so that it can be used to facilitate decision-making. Organizations have deployed enterprise systems to create data sources which provide valuable information to meet their business intelligence and knowledge requirements (Vitt et al., 2002).

Transformation of ES Data into Knowledge and Results

A model (Davenport, 2000) for turning ES data into knowledge is shown in Figure 1. The model comprises three major stages. The first is establishing the context. This includes the pre-existing factors that are present for transformation of ES data into knowledge and results. The second stage is the transformation of ES data into knowledge, which takes place when the data are used to support a business decision. The final stage is the realization of outcomes, which describe what changed as a result of the implementation of the decisions.

As the model shows, the process of transforming ES data into knowledge inevitably leads to organizational changes. The most basic potential outcome of this process is changes in behaviors of individual managers, employees, customers, suppliers, and all stakeholders in the value chain. Another outcome from the decisions or the behavioral changes may be new initiatives to bring about improvements in business or make changes in existing projects. The results of decisions can also include process changes. Determining that an existing process is not working effectively can lead to changes in the existing process or design and implementation of an entirely new process. The ultimate expected outcome of ES-based decision making is positive financial impacts for the organization. "Decisions lead to new behaviors, new initiatives and processes, which do not matter unless they improve the bottom line and the return to shareholders" (Davenport, 2000).

It may be difficult to draw a direct chain of influence from prerequisites to transformation to non-financial outcomes to financial results, but establishing that linkage should be the objective of an organization that invests effort and resources in ES data transformation (Davenport, 2000). The pursuit of business benefits from ES is conceptualized as a series of steps that begin with goal seeking and conclude with realization of benefits. The stages mirror the typical decision-making process.

Critical success factors (CSFs), defined as the few key areas where things must go right for the implementation to be successful, for enterprise system implementations have been explored and widely published by a number of researchers in the ES implementation literature. However, very little is known from published literature about success factors for the process of ES data transformation into knowledge to results. In a working paper Davenport et al. (Davenport et al., 2001) presented a few critical success factors that must be present based on experience of over 20 companies that were successful in their data-to-knowledge-to-results efforts. The important factors emphasized in the paper are a suitable transaction data environment, alignment of business strategy into departmental or divisional strategies and visions, active senior executive commitment, and management of the organizational drivers. Our focus in this study is to identify the success factors that must go right for the transformation of ES data into knowledge to business benefits to be successful. Although our results are based on New Zealand based organizations, we believe that the findings will be similar in other regions of the global ES experiences.

Research Methodology

The primary purpose of the study is to seek insights from experienced ES professionals in answering the research questions of the study which are:

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1. How do organizations utilize their ES technology to convert ES data into ES knowledge?

2. How is ES knowledge applied to decision making to maximize benefit realization?

3. What are the critical success factors for this process to be successful?

The underpinning epistemology uses a positivist approach for reliable and consistent findings to conduct semi-structured interviews with key ES experts in the ES implementation industry. The ontology assumption is based on the approach that the phenomena under study are singular, objective, and independent from the researcher. Rigor is attained with development of clear research questions, *a priori* specification of constructs, an explicit focus for the context of the study and its analysis. The *a priori* specification of constructs is utilized, based on the contextual and transformation phase in Davenport's model for turning ES data into knowledge and results, as shown in Figure 1.

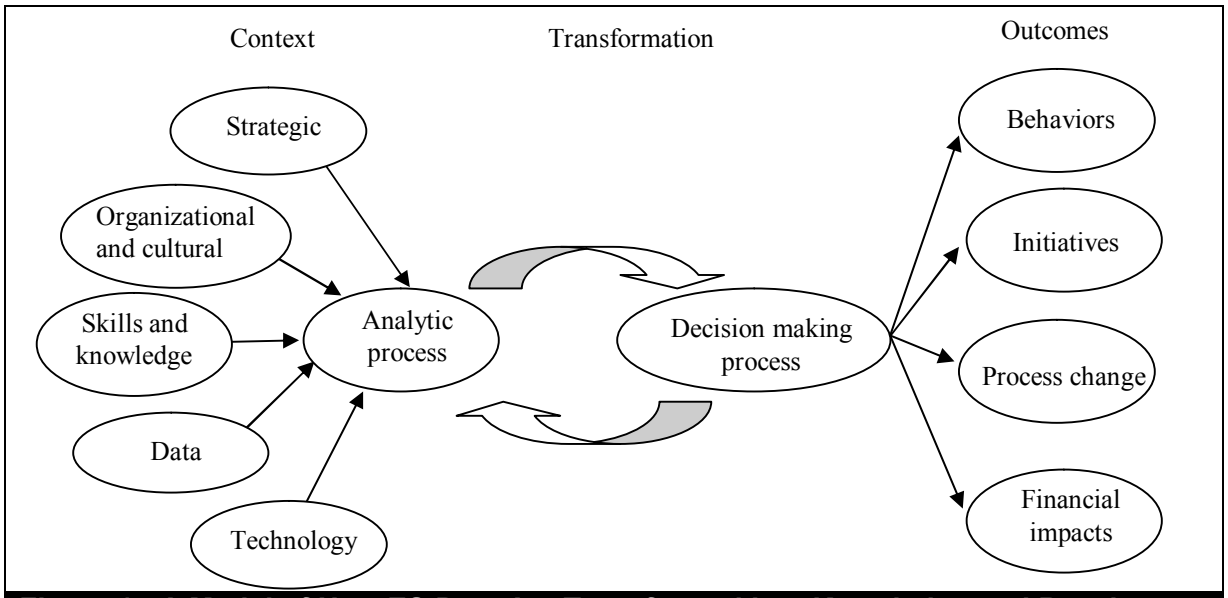

Figure 1 - A Model of How ES Data Are Transformed into Knowledge and Results (Davenport, 2000)

Using a qualitative research methodology, data were collected by way of semi-structured interviews with ten practitioners in the ES implementation industry. The interviews were carried out between February and August 2006. The respondents were senior ES consultants or senior managers in ten organizations which are key players in the field of ES in New Zealand, principally major ES vendors, ES consultants, and IT research organizations (see Table 1).

The positions of the respondents included: director professional services, consulting manager, managing director, consulting practice director, partner group manager, vice president, consulting partner, general manager, and two business consultants.

Contact was first established with the respondents through email and by phone. An introductory letter briefly explaining the study and seeking an appointment for an interview was then sent to potential respondents. When the appointment was confirmed, a research information sheet and the interview questions were sent. In the interview, questions were asked to extract information such as how NZ organizations convert ES data into knowledge, how this knowledge is used to realize benefits, what are the critical success factors for this process. Finally, any issues relating to ES adoption in NZ organizations were enquired

from the study participants to evaluate the implementation and post-implementation practices in NZ industry.

The respondents discussed ES implementations based upon their experiences in terms of their ES applications, clients, and implementation methodologies. Ten face-to-face meetings took place at the respondent's organizations with one respondent from each firm. The interviews lasted between 60 and 90 minutes each. The interviews were tape recorded and transcribed immediately after each interview. The Nvivo 7.0 qualitative software tool was used for data analysis. The empirical findings were analyzed and the inferences reported.

This methodology follows a similar approach used by Shakir (2003), who also investigated aspects of ES implementation in the NZ vendor-and-consultant community. The focus of that study was to identify key drivers influencing ES adoption and implementation (e.g., Shakir and Viehland 2004) whereas the focus of the current study is on the realization of business benefits from ES.

Results and Discussion

How Organizations Convert ES Data into ES Knowledge

The respondents in this study confirmed that creation of knowledge for decision making was a key motivation for ES implementation, especially in the second wave of implementation. In second wave (or phase 2) implementations, companies implement supplementary modules for collaboration scenarios (e.g., supply chain management, supplier relationship management) and advanced management services (e.g., business intelligence) (Mathrani et al., 2007; Shakir, 2003). A typical complaint from organizations about first wave implementations was that although a lot of data was available within the ES, only standard reports and standard query forms were provided in the software, with a limited capability for data mining and data analysis. In second wave implementations, which almost always occur when the initial ES implementation has reached the mature stage, organizations seek more from their ES than simple standard reports.

Microsoft explained that user organizations considering a move to phase 2 ES implementation posed questions such as what does the system offer in terms of integrated reporting or integrated query to better use the data in the ES. For example, if an organization sought information on raw material availability, do they need to run a report or is there a dynamic on-line query that can be used to show how much raw material is available to meet their needs. Organizations are looking for systems that have an inherent capability to give them that kind of information. Organizations want to extract data, manipulate it and then present the information in the form of a report, dashboard, scorecard, or key performance indicator (KPI). The traditional reporting mechanism in a phase 1 implementation is a paper-based report with a list of deliverables. The KPI reporting mechanism in phase 2 implementations provides information on how the organization is performing against pre-defined key metrics, and the typical operational reports provide information such as how many products were produced when and where.

To make better decisions, business executives need relevant and accurate information at their fingertips. But there is often a large gap between the information that decision makers require and the large amount of data that are available in the system that businesses collect every day. This is called the "analysis gap". Business intelligence systems access large volumes of data and deliver relevant information instantly to decision makers in a form to which they can relate. This makes possible a huge improvement in the quality of analysis that can be performed, which leads to a better understanding of the business. But the hardest aspect is being able to define what information is useful and relevant to a decision. BI systems at the enterprise level collect and report a company's most important metrics or the KPIs that guide

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Table 1 - Key Respondents for the Study

ES Vendors (Flagship ES Products)	ES Consultants	IT Research
SAP NZ (SAP)	PricewaterhouseCoopers NZ	Gartner Limited NZ
Oracle NZ (Oracle, J.D. Edwards, PeopleSoft)	Ernst & Young NZ	IDC NZ
Microsoft NZ (Dynamics (earlier Navision))	KPMG Consulting NZ	
Infor NZ (Mapics, SSA Global (earlier BaaN))	EMDA NZ	

Table 2 - How Organizations Convert ES Data into Knowledge

Participants	How Organizations Convert ES Data into Knowledge
SAP	• Organizations convert data into knowledge by using proper tools such as data warehouse and business intelligence systems. • Organizations generally lack clarity on which information is critical to the success of the organization and the data views that are needed to get valuable information.
PWC	• ES products come with predefined reporting tools that provide a generic way of presenting data. To make this into useful business information to suit specific needs requires customization; and organizations do not want to customize because it drives up their lifetime costs.
Microsoft	• Organizations are looking to see what the system (especially at phase 2 implementation) is offering in terms of integrated reporting or query that allows them to use data and whether the system has an inherent capability to give them the required information. • There are organizations that want to extract data, manipulate it, and then present the information in the form of a report, dashboard, scorecard, or KPI. • Some organizations use the inherent nature of the software directly, whereas other organizations have created data warehouses to manipulate data into a format needed for management reporting.
Oracle	• Most of the time ES is just used as a financial system and a storage repository therefore lacks knowledge-producing results. All major ES vendors have business intelligence built into their ES, which companies can use for converting ES data into knowledge. Organizations also use business analytics or reporting tools or a combination of both to extract information and create knowledge. • Organizations put together a data warehouse, bring in data not captured in ES from other heterogeneous environments, mine it, and present the information to user communities on a regular basis. They are also now producing enterprise portals, which are Web interfaces for the senior managers to see financial trend analysis and a whole variety of other key requirements.
EMDA	• Initially an ES implementation can be overwhelming because organizations do not always see that they have information. What they see are data. They have to convert the data into a meaningful form to distil information. That way people think more about their information, start looking for correlations and causal relationships, and look at data with specific questions using business intelligence. • Organizations also use standard reports in the system such as aging or ABC analysis on inventory management, which also provides good information.

managers in making decisions that affect a particular business unit as well as the company at large.

As shown in Table 2, this study found that organizations approach reporting requirements differently. Some organizations use the inherent capability of the software, whereas other organizations have now gone out to multi-dimensional cubes of data warehouses to manipulate large amounts of data.

If the data are located in a single place then the enterprise software is expected to be able to provide the report straightaway, but if the data are in multiple places then the organizations use customized data warehouses to bring those disparate forms of data together and business intelligence systems to manipulate the data into a format

needed for effective management reports and conversion into knowledge for decision making.

The results support the increasing use of ES to support business decisions in NZ organizations. Enterprise systems vendors are recognizing this need by incorporating BI infrastructures, as SAP has done with Business Information Warehouse (Hashmi, 2004).

How Organizations Utilize ES Knowledge to Achieve Benefits

To receive benefit from an ES, there must be no misunderstanding of what it is about, its usability and, even more importantly, organizational decision makers must have the background and temperament for data-driven decision making (Donovan, 1998). In the past decade, an increasing number of companies have been measuring customer loyalty, employee satisfaction, and other performance areas which they believe ultimately affect profitability. But the reality is that only a few companies realize improvements in these because they fail to identify, analyze, and act on the right non-financial areas to achieve strategicobjectives (Ittner and Larcker, 2003). It is therefore important to understand the process of identifying and analyzing the right information for effective decision making to achieve the desired benefits.

Table 3 shows the responses of the interviewed professionals as to how organizations utilize ES knowledge to achieve benefits and results from ES implementations. The results reveal that organizations use balanced scorecard type of performance evaluation techniques to identify the drivers for the success of their business strategy. Kaplan and Norton (1992; 1996) developed the balanced scorecard as a business tool to link a firm's strategic objectives to performance measurements in order to evaluate the enterprise's performance in meeting those objectives. A balanced scorecard explains causal relationships between current activities and the strategic aims of the organization, linking actions with metrics.

Table 3 - How Organizations Utilize ES Knowledge to Achieve Benefits

Participants	How Organizations Utilize ES Knowledge to Achieve Benefits
SAP	• Organizations use balanced scorecard techniques in conjunction with data mining capability to understand what the problem is and how managers should intervene. • Organizations also use business process simulation techniques and scenario planning when they want to analyze the problem by assessing different possible outcomes. These tools are being used by sophisticated, mature organizations with high-level business strategy analysis in place.
Microsoft	• Information is transformed into knowledge by adding experience, context, and interpretation so that it is used for decision-making to achieve benefits. • There have been very few examples of a company using business intelligence tools strategically. • The issue with balanced scorecards is that, firstly companies need to understand what the balanced scorecard is going to do for them. It is not a reporting tool but it is a point-in-time view of how the business is performing against some pre-set KPIs or measures. • NZ organizations are not yet ready for a high level of strategic analytical tools, at least to the extent that might be expected.
Oracle	• Companies are now asking how to actually optimize and improve. • Although, scorecards are as part of ES, NZ companies are not actually managing scorecards, but are just reporting KPIs. • Benchmarking is done by industry. The software vendors give clients a base line, with possibility to further build upon. This a good place to start because many companies do not even know what it is they want to measure.
EMDA	• More and more of the ES vendors are developing their own business intelligence engine since the business process and the underlying information are not mutually exclusive. • Each of the major ES vendors has some form of scorecard in their software. • The abilities to drill down through layers of data, and do the analysis in any form, then lead to managerial insight.

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The drivers identified through setting up a balanced scorecard are used in tools such as management cockpits that have data mining capability to understand what the problem is and how managers should intervene. Organizations also use business process simulation techniques, scenario planning, and what-if analysis when they want to examine a problem under various scenarios to explore possible outcomes. These tools typically are provided in wave 2 enterprise systems. SAP confirmed that they had strategic enterprise management functionality tools that allow organizations to use balanced scorecard functionality to develop management cockpits for current and accurate reporting, perform business process simulation, try out different budget scenarios, and determine the impact and sensitivities of various models.

A key issue with balanced scorecards is that companies need to understand how the balanced scorecard is going to be used. The balanced scorecard is not a reporting tool; it is a point-in-time view of how the business is performing against some pre-set KPIs or other measures. So the organization's managers have to understand what they want to measure and use it for. Generally, when organizations talk about balanced scorecards, they are often referring to KPI reporting.

However, most respondents suggested that these tools are only being used by sophisticated, mature organizations as using these tools requires high-level strategic thinking about what the true business strategy is and what determines success of the business strategy (see Table 3). Microsoft specifically reported that most New Zealand organizations are not yet ready to employ such a strategic business tool, at least not to the extent one might expect.

Findings from this study also reveal that more and more ES vendors are developing their own BI engine to provide the database foundation to customers. They are trying to provide the middleware that ties the technology layer and the application together because they understand that the business process and the underlying information are not mutually exclusive – businesses need to be in control of both.

Three or four years ago, there were a number of unique BI organizations such as the SAS group, Cognos, and Microsoft Business Objects. They are still there and have a significant market share, but the ES vendors are realizing that they need to take ownership of the database and data layer. PeopleSoft expressed this need-for-ownership: "it needed to be part of the DNA of the software". So, when the computer is turned on the first screen reports how the business is performing. The ability to drill down through layers of data and do the analysis in any form then leads to managerial insight. Actions backed up by good analysis give confidence to the action taker. If those data are not controlled through the software, it is harder to integrate it and it does not perform as a natural part of the software. So the vendors are trying to capture the BI component for decision making. In the context of NZ companies, Microsoft reports that there have been very few successful business intelligence implementations. The implementations work in that the reports come out, but examples of a company using them strategically to make decisions are not evident.

Critical Success Factors for ES Impact to Produce Organizational Benefits

Given the significant risk associated with ES projects, it is essential to examine and understand the factors that determine ES effectiveness and the influence of ES on the decision-making process for organizational benefits. Critical success factors (CSF) are the few key areas where things must go right to achieve success (Rockart, 1979). In this context, one of the key mistakes many companies make is that they view an ES project as complete when the system is turned on, which greatly limits their ability to achieve benefit. They view the output of the system as a set of information transactions and do not take advantage of the information to manage the business differently. Enterprise systems do a good job of

automating, integrating, and optimizing business processes. However, potential benefits also can be captured by proper utilization of the high quality information that an ES provides, to make improvements in, and even transformation of, management and reporting processes (Davenport, 2000).

In this study, most respondents agreed that there certainly were CSFs for the process of transforming ES data into knowledge and its utilization for achieving benefits. Table 4 summarizes the critical success factors for ES data transformation process to achieve benefits, as identified by the various participants. The critical success factors are categorized into the strategic, organizational and cultural, skills and knowledge, data, and technology factors. These categories comprise the contextual factors in Davenport's model for turning ES data into knowledge and results.

The CSFs are listed based on the priority accorded by the vendors and consultants in the study. The important factors that emerged include having a suitable transaction data environment, alignment of business strategy into departmental or divisional strategies and visions, active senior executive commitment, and the management of organizational drivers.

Table 4 - CSFs for ES Data Transformation Process to Achieve Benefits

Participants	Category	Critical Success Factors for ES to Produce Organizational Benefits
SAP, MS, OR, EMDA	Strategic	• Active executive commitment in the project, including translation into departmental or divisional strategies and visions
SAP, IDC, OR	Organizational	• Effective change management process
SAP, IDC, MS	Skills and knowledge	• User feedback, involvement, and understanding of the process and expected outcomes
SAP, MS	Strategic	• Business strategy is clearly defined, articulated, and aligned
IDC, OR	Strategic	• Clear definition of scope before implementation
SAP	Strategic	• Understand the key drivers, and have the means to influence the drivers
SAP	Data	• Quality of data since unclean data can be very risky
SAP	Data	• Consistent data management and clear data definitions
SAP	Technology	• Technology, although with the development of services oriented business architecture (SORBA), this will be less of an issue in the future
IDC	Organizational	• Proper project management from both vendor and client
IDC	Organizational	• Managing client expectations – do not over commit and under deliver
MS	Organizational	• Design of information retrieval process appropriate to the business
MS	Organizational	• The technical parameters e.g., proper design of the mechanism of delivery
OR	Strategic	• Clear identification of the problems requiring resolution
OR	Strategic	• Expected end results or desirable solution
OR	Skills and knowledge	• Training
EMDA	Organizational	• Information gathering and application is seen as a technical project rather than a business project
Notes: MS = Microsoft; OR = Oracle		

Issues Related to ES Adoption

Issues relating to ES adoption and IT in general were discussed at length in the interviews. Most respondents suggested that ES maturity has occurred at a slow pace in New Zealand organizations and this is mainly attributable to the small size of most NZ

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businesses. However, this trend is now changing and most large organizations and many small and medium-sized enterprises (SMEs) are approaching a fairly advanced level of maturity with ES technology and IT in general. The respondents identified the following four issues that highlight the slower pace of ES maturity within the NZ industry.

First, many NZ organizations do not conduct a proper business justification of their implementation. Although some improvement has been made in the past few years, most NZ organizations do not produce value assessments in their ES proposals. That often leads to weak business cases and insufficient benefit models that cannot be used for benefit tracking in the maturity stage of implementation.

Second, many organizations in NZ believe implementation of ES is a technology challenge. However, according to most respondents, it is more about people, process, and change management, and less about technology.

Third, respondents revealed that typically when a new system is implemented, productivity drops for a period and then goes up. Oracle suggested the depth of the drop depends upon how well the system is implemented, how well the change process is managed, how well the business case is defined, and how well the managers are measuring and managing benefits before and after the implementation.

Fourth, until a few years ago, a majority of organizations did not use the ES in its true capacity. ES was used as a financial system, as a central repository for personnel records, or as a method for generating purchase orders. This was because the organizations had not thought about what they were trying to optimize, what benefits they were trying to bring into the organization, what they were trying to change, how they were trying to manage the business, and whether they could actually get the information they needed to manage the business from the ES.

However, software vendors have reported that they have seen companies seeking ways to get more value out of their ES investment. As their ES implementation has matured, companies have started asking how to establish analytical processes for conversion of ES data into knowledge to optimize and realize business value from their ES investment. Many NZ organizations have already completed their first phase of ES implementation and are now extending into the second phase with CRM, SCM, or BI modules. NZ organizations entering or already in the mature stage of ES implementations are now starting to realize the value of technology and its use to stay ahead of competitors.

Summary and Conclusions

The main objective of this study was to evaluate how NZ organizations utilize their ES technology and its information for realizing business value. The study reported on core areas such as how ES data are transformed into knowledge, how ES knowledge is utilized to achieve business benefits, the critical success factors for this process, and the issues relating to ES adoption that reflect on current ES implementation and post-implementation practices in NZ. The key findings are summarized in Table 5.

A key finding from this study is that many New Zealand organizations have not provided proper business justification of ES implementations. Plant and Willcocks (2006), in their study on critical success factors for ES implementations, found an increased emphasis upon the determination of clear goals and objectives at the project outset as one of the important factors for ES implementation success. This factor has been missing in many New Zealand implementations. Most organizations do not produce value assessments at the planning stage, and that often leads to weak business cases and insufficient benefit models that cannot be used for benefit tracking. A related finding is that this is changing. Many companies, especially those at the mature

stage of ES implementation, have started asking how to establish analytical processes to optimize and realize business value from their ES investment.

Relating the findings of this study to Davenport's conceptual framework (Figure 1), the contextual factors in the first stage of Davenport's framework – comprising the strategic, organizational and cultural, skills and knowledge, data, and technology constructs – closely match the critical success factors identified in this study (bottom of Table 5).

Although this study was conducted in New Zealand, the findings will be of interest to business organizations and ES vendors in many other regions of the world. There is no reason to expect that the results of this study are different from those that might be found in many countries with a large population of small businesses. The findings of this study are limited to the views of professionals from different ES vendors, ES consultants, and IT research organizations. Assurances of anonymity were given to insure forthright responses, but there still may have been some influence by the commercial interests of the respondent's firm.

However, this was a diverse set of senior, experienced professionals, many of them with international experience and employed by firms with international scope. Further research is in progress to analyze the current practices and the critical effectiveness constructs of ES in New Zealand from the practitioners' perspectives identified by this study.

Table 5 - Key Findings on Usability of ES and its Information by Organizations

How Organizations Convert ES Data into Knowledge • Organizations use data warehouse and business intelligence systems • Organizations extract data, manipulate it, and report it in the form of a report, scorecard or KPI • Organizations use standard reports such as aging or ABC analysis on inventory management • A clear definition of what information is critical to the success of the organization is required • This is an area where NZ organizations are still struggling
How Organizations Utilize this Knowledge to Achieve Benefits • Organizations use balanced scorecard type of performance evaluation techniques to monitor drivers for the success of their business strategy • Organizations use business process simulating techniques, scenario planning, what-if analysis, and management cockpits to identify problems and analyze potential solutions • These tools are provided in ESs but are usually limited to sophisticated, mature organizations with high level strategic thinking about what the business strategy is and what determines its success
Critical Success Factors for ES Impact to Produce Organizational Benefits • Active executive commitment in the project, including translation into departmental or divisional strategies and visions • Effective change management process • User feedback, involvement, and understanding of the process and expected outcomes • Business strategy is clearly defined, articulated, and aligned • Clear definition of scope before implementation

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About the Authors

Sanjay Mathrani is a Lecturer in the School of Engineering and Advanced Technology at Massey University, Auckland, New Zealand. He has more than twenty years of product development and manufacturing experience and has held senior positions in various multinationals including Navman, Alstom, and Greaves Cotton. He has been a practitioner of ERP and business intelligence systems and is a chartered professional engineer to New Zealand industry. He holds a BTech in mechanical engineering, masters in management sciences, and a postgraduate diploma in computer management. He is pursuing a PhD study to evaluate the impact of enterprise systems on organizational functions and processes and its link to business benefits. His research interests are in information and knowledge management, product development and manufacturing operations, and enterprise service-oriented architectures. He has published several papers in international conferences and journals and is an invited speaker at various international Universities.

Dennis Viehland is Associate Professor of Information Systems at Massey University's Auckland campus in New Zealand. His principal research area is mobile business, with secondary research interests in electronic commerce strategy, ubiquitous computing and innovative use of ICT to manage Information Age organizations. He is a co-author of *Electronic Commerce 2008: A Managerial Perspective* and has published in numerous international journals and conferences. His research always has professional relevance and he has presented short courses and seminars to professional groups in New Zealand, Australia, India, Malaysia and North America.

Dr. Mohammad Abdur Rashid is a Senior Lecturer of Computer and Communications Engineering at Massey University in New Zealand. He received an MScEng degree in Electronics Engineering specializing in Engineering Cybernetics Systems from the Wroclaw University of Technology in 1978 and a PhD from the University of Strathclyde, UK in 1986. Dr. Rashid is a co-author of two books*: Enterprise Resource Planning: Global Opportunities and Challenges* and *Handbook of Research on Enterprise Systems* published by Information Science Reference, USA. His areas of research interests are Multimedia over Communication Networks, Embedded Systems Design, Network Protocols and Performance Studies; Mobile Wireless Multimedia Communication, MANET Key management and ERP/Enterprise Systems

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