A Comparison of Anticipated and Realised Benefits from ERP Package Implementation

Mr Andrew Barnden
Monash University

School of Information Management & Systems
Monash University
Caulfield East, Victoria
e-mail: andrew.barnden@infotech.monash.edu.au

Abstract

A research project is in progress to investigate the actual realisation of benefits from an ERP implementation. Specifically the research will investigate large Australian companies which have integrated their information systems portfolios with an ERP package. The research will discover whether or not the anticipated benefits of the project are actually realised after implementation. The conceptual framework which will inform this research is under development and considers the Open Systems view of organisational theory, initially, Service Quality theory for assessing benefit, and the literature of ERP implementation. One pilot case study has been investigated and further cases are planned.

Keywords

ERP, implementation, benefits evaluation, service quality, case study

INTRODUCTION

A doctoral research project has been commenced to compare the initial expectation of ERP benefits prior to implementation with the actual realised benefits. ERP packages are expensive to purchase and implement. Their implementation is complex and takes a long time. Management of companies wants to know whether or not they are achieving the expected benefits for the significant price paid for the purchase and implementation of ERP software.

The research is in progress and still in its early stages. A plan of the research project has been developed. Literature searches have been made to identify and establish the justification and firm philosophical foundations for the project. An initial industry partner has participated in a pilot investigation at one of their sites to assist in clarifying the direction and scope of the project.

Comments on the project proposal are invited from the academic and professional communities.

RESEARCH QUESTIONS

Objective

The objective of this research is to increase knowledge of the actual utility of ERP information systems. ERP vendor marketing and, sometimes uncritical, advocates of the ERP concept promote these packages as the whole solution to corporate information systems needs. The documented failures and imperfect implementations indicate otherwise. This research will attempt to identify the actual benefits of an ERP implementation and the organisational factors which facilitate the achievement of benefits. The outcome will be that companies will be able to optimally plan their information systems portfolio to best achieve corporate goals.

The expectations of benefits from ERP implementation are usually associated with the integration of data and processing from several business application systems. In identifying benefits the distinction is made between the benefits of IT management efficiency and the benefits of business process and technology integration. The IT management related benefits of technological integration are often readily recognised. The literature identifies that significant business benefits may only be achieved by an explicit integration of the business's operational procedures with the integrated information technology. Issues around these two types of integration will be investigated.

Specific Questions

The principal research question of this project is: Does a company actually realise the benefits that are anticipated when it integrates its information systems portfolio by implementing an ERP software package? To

Barnden (Paper #179)

be useful the answer must be more than simply yes or no. More specifically the question becomes: What benefits are perceived as having been realised by a company when it implements ERP software, and what expected benefits were not realised?

A pilot investigation at the Australian subsidiary of a large globally operating manufacturing, sales and engineering services company was conducted to provide some initial insight into the research question. The company requested anonymity. This site will become the first case study of the research, followed by a number of other case studies of similar companies in Australia.

In order to answer the principal question and achieve the research objective identified above, the following specific research questions must be answered.

- What benefits does the relevant research literature propose as being achievable from an integration project based on ERP package implementation?
- What benefits were expected from undertaking an ERP-based integration project by each of the complex Australian firms studied?
- What benefits were perceived to have been actually achieved from undertaking an ERP-based integration project by each of the complex Australian firms studied?

Answering these questions will enable the researcher to identify and synthesise, as the case may be, the following outcomes:

- a literature derived general framework of expectation of the benefits that ERP implementation is professed to deliver;
- the specific anticipated benefits expected by the companies in the case studies;
- the specific perceived benefits or otherwise, realised by the companies in the case studies;
- a framework for understanding the circumstances for benefit and disadvantage realisation when ERP software is implemented in complex organisations.

RATIONALE

The rationale for this research is to increase knowledge of the outcomes of ERP information systems implementation projects undertaken in complex organisations. The knowledge revealed will enable businesses to have realistic expectations of both the benefits and disadvantages which can ensue from an ERP implementation project. It will assist intending adopters to produce reasonable estimates of expected benefit, and to help decide the most appropriate composition of the business's IS portfolio.

The economic importance of this research question is significant. The cost of purchasing and implementing an ERP software package is characteristically in the tens of millions of dollars, and the implementation time frame is often in excess of 24 months. (Davenport. 1998, Motwani et al. 2002) The vendors of ERP packages naturally have the motive to promote in wholly positive terms the benefits which may be available from an ERP implementation. Companies may expect to realise all of the promoted benefits but subsequently find that not all were actually realisable. If indicators for what benefits could be realisable in any given ERP implementation were available, then complex companies would be better placed to evaluate a decision to integrate their information systems portfolio through the mechanism of an ERP implementation project.

For the purpose of this research the concept of benefit will be divided into two categories: Operational and Technical. (Markus & Tanis, 1999). Operational benefit helps the company in achieving its organisational goals. This could be realised as more timely business information, higher quality business information, ability to offer new or improved products and services, or expanded market penetration. Technical benefit helps the company improve the efficiency of the management of its information technology infrastructure. This could be realised by a reduced diversity of software technologies needing support, reduced IT staffing requirements, reduced technology training requirements, reduced numbers of licensing agreements to be managed, or simplified maintenance procedures. This research will consider both categories of benefit.

An underlying premise of this research is that ERP scale packaged software is so complex that its coded logic cannot be altered in any material way. The operation of ERP packages is able to be modified to suit many different industries through the use of parameterisation. Parameter settings control the selection of logic paths through the code modules of a given application area. A range of different business processing templates are available for application areas within industry sectors. Particular templates are chosen by setting the appropriate parameters. The ERP software vendors imply that their research has identified the best practice business models (the templates) for many industries and that their ERP software products embody the logic of that best practice.

The information systems development literature shows, inter alia, that the likelihood of creating logic flaws in the source code of a program increases as the number of relationships which must be maintained within the program logic increases. (Humphrey. 1995, 1989, Jackson. 1975, Yourdon. 1975) The high level of inter-connectedness of data and processing within an ERP package necessarily means that the number of logic relationships is very high. It has been shown that source code modification projects in such an environment are highly likely to fail, and to take such time and resources as to be uneconomic. It is clear then that the ERP product as delivered purports to deliver certain benefits to a business and that attempting to modify that product to do anything additional is a high risk activity. ERP adopters are effectively constrained to accept the ERP advocacy at face value.

Thus a decision to implement an ERP package is a decision to stabilise the business model of the organisation on one of the templates available within the ERP package for the life of the software implementation. This research will identify both the benefits which come from the integration of different business application systems into a single ERP package, and the constraints that will be imposed on the company by that implementation decision.

Contingency Theory (Lawrence & Lausch, 1967) supports the notion that companies which can adapt their processes to meet the changing demands and challenges of their business partners (customers, suppliers, competitors, regulators) will be more successful than companies which cannot adapt well. W. Richard Scott (1998) succinctly describes this concept:

> "*Contingency Theory is guided by the general orienting hypothesis that organisations whose internal features best match the demands of their environments will achieve the best adaptation. ...adaptation should entail effective performance (in the market).*" (Scott, 1998, p96)

In implementing an ERP information system the company adopts its personalised variant of the so-called "best practice" models of business which are inherent in the design of that ERP system. Therefore, unless there is a corresponding best-practice template, the adopting company effectively cannot make a significant change to its business operations in response to its market (environmental) conditions. The market may be indicating that such a substantial change might be in the interests of the company.

From the business function perspective, the decision to integrate the information systems portfolio through an ERP package is a decision to aggregate several distinct application systems onto a single software platform. This aggregation removes the ability of the company to significantly modify any single application in order to take advantage of a changed market circumstance. This may result in a detriment to the company which is deemed to be greater than the perceived benefits of application integration.

PREVIOUS RESEARCH

Investigation of organisational benefit requires a theory of organisations to understand the context in which the research is taking place and to allow interpretation of the findings. A complex company is not a homogenous entity. The theories of Thompson (1967) and Parsons (1960) will provide a framework for understanding complex companies as natural systems subject to varying criteria of rationality and having differing levels of control wherein the criteria of rationality differ.

> "we will conceive of complex organisations as open systems, hence indeterminate and faced with uncertainty, but at the same time as subject to criteria of rationality and hence needing determinateness and certainty" (Thompson. 1967, p10)

Perception of benefit is a subjective assessment and is at times constructed according to political exigencies within an organisation. In order to make comparable assessments of benefit for the purpose of this research a recognised framework is required. The Service Quality literature is being investigated as a source for a framework for assessing satisfaction on the basis of Gap Theory (Parasuraman, Zeithaml, Barry. 1985, Gronroos. 1983).

There is a significant body of literature on topics related to ERP software systems. It addresses critical success factors (Hong & Kim. 2001), implementation issues (Davenport. 1998, Sumner. 2000, Hanseth, Ciborra & Braa. 2001, Bernroider & Koch. 2001), ERP failures (Vogt. 2002, Adam & O'Doherty. 2000) and, more recently benefit evaluation (Markus, Tanis & Fenema. 1999, Al-Mashari & Zairi. 2000, Chen. 2001).

An element of the evaluative literature that is missing is an analysis of realised benefits compared to anticipated benefits. This research plans to make a contribution to filling that gap.

Conceptual Framework

The information systems literature manifests the technological imperative to integration of information systems. This can be at the expense of consideration of the business or organisational rationale for a diversity of information systems. This is the starting point for analysis of benefits by this research.

The benefits of ERP-based integration are often presented as being unproblematic. This research, in identifying what benefits are perceived to be actually realised, will also identify if there are any negative effects that are a consequence of ERP implementation. The anticipated benefits and their necessary circumstances will be derived from the ERP implementation literature mentioned above.

While issues of benefit evaluation have been widely discussed in the Information Systems literature (Farbey et al, 1993, 1994) the service provision interpretation of ERP implementation has prompted the researcher to initially investigate the Marketing literature for relevant frameworks. Formal methods for evaluation of benefit in terms of service delivery are well discussed in that literature (Parasuraman et al, 1984. Gronroos, 1983. Normann, 1983. Rust & Oliver, 1994). The provision of computer-based software to support operational business processes can be construed as service delivery for the purposes of this research. This is argued to be an appropriate construction because the characteristics of service provision are met even though the software may be provided on a tangible software storage medium and be sold as effectively a finished product. In fact, the execution of the software is an enabler of business activities through the provision of the means to enforce business policy and record transaction activity. One of the defining characteristics of a service is that it is a process created at the point of delivery with the involvement of the recipient. (Langeard, 1980 cited in Gronroos, 1983). The execution of software is the enabling of a process delivered to the user at the point and at the time when it is required to enable the business transaction. By this logic the application of software to a business process is argued to be a service.

It does not matter whether the software service is provided by a third party outsourcing company or by a division within the company under investigation. From the operational user's perspective of being the consumer of a service, the distinction is not relevant.

Benefiting from the reviewers' inputs and having further investigated the field, the researcher is reassessing the appropriateness for this project of the Service Quality approach to benefit evaluation.

To understand the findings of this research within the context of large and complex companies it is necessary to have a framework for understanding complex companies. There is an extensive literature on the systems theory of organisations which is brought together and explained in Scott's (1998) text while Perrow (1986) provides a critique specifically of complex organisations.

Talcott Parson (1960) describes a theory of organisations as being differing loci of control and responsibility based on the nature of the operations undertaken in those locations. This theory is integrated with the theory of James D. Thompson (1967). Thompson describes the varying criteria of rationality (determinism) which are required of the different functions of the organisation when reacting to varying external contingencies. These two views are used to frame the conceptual understanding of the behaviour of organisations. They enable a critique of the application of a conceptually uniform rationality (the ERP software system) to provide an information systems architecture for the requirements of an organisation's distinctly different parts and responsibilities.

OUTLINE OF THE RESEARCH DESIGN

A project to address the research questions has been designed. Because the objective of the research is to compare and analyse expectations with the eventual perceptions of companies, qualitative methods are indicated. The case study research strategy presents itself as being appropriate. Some indications of the more general applicability of the findings will be sought through examining multiple cases of like companies.

The research methods to be employed will be a conceptual study, interviews and document analysis. The method of analysis will be inductive reasoning to create a framework for analysis of anticipated benefits in varying organisational contexts.

The conceptual study is to establish a conceptual framework for understanding large organisations, and for understanding their expectations of benefit from ERP implementations. Interviews and document analysis will be used to gather empirical data about intentions, behaviours, expectations, outcomes and processes in the companies under investigation.

However, given the rethinking of an appropriate framework for investigating perceived benefit the research design is problematic. A more quantitative evaluation framework for benefit will affect the data gathering and analysis methods. Peer input to these deliberations is welcomed.

The organisational theory literature has provided a framework for understanding complex organisations as open systems, subject to varying criteria of rationality. The rationality criteria vary depending on the nature of the organisational function being undertaken. The information systems literature is being surveyed to obtain a framework for understanding the rationale for integration of information systems. From this and the body of work describing ERP implementation will be obtained the identified benefits and detriments of information systems integration using ERP software packages.

A pilot case study of a complex organisation (the Australian subsidiary of the globally operating company) which has undertaken the integration of its information systems into an ERP packaged information system was conducted to assist with setting the scope of the investigation and to confirm the validity of the organisational framework. Empirical data were obtained from semi-structured interviews of senior and middle level managers. The interview themes were informed by the initial understanding of ERP implementation benefits derived from the IS literature. The interview data were illuminated and contextualised by the company documents made available to the research.

PILOT STUDY OUTCOMES

Interviews conducted at the Australian subsidiary of a global manufacturing, distribution and professional services company have supported Thompson's notion of varying levels of criteria for rationality in the different functions of the company. In addition, Parson's concept of three levels of control and responsibility were observable in the operations of the company. The most focussed level of control, manufacturing, is not undertaken in Australia. All products for sale are imported from the parent's manufacturing plants in the United States. However, engineering service delivery in the local company is concerned with creating development project outcomes for their customers. In that the company is creating software to support its customer's direct manufacturing operations where the specifications for the service delivery are explicit, and to some extent, non-negotiable, this may be construed as representing Parsons' manufacturing level of control. I am still thinking about this.

Benefits and issues were the theme of the interviews conducted with the IT Manager, The Financial Controller, The Warehouse and Distribution Manager, the Regional Engineering Services Manager and the General Manager and Regional Sales Manager. From their titles it can be seen that some of the interviewees held Asia-Pacific Regional management roles as well as Australian Subsidiary Company management roles.

The General Manager represented Parsons' institutional level of the organisation and the issues which concerned him most were related to the ability to get information from the ERP system which would give him greater intelligence of the market, and of his company's responses to market situations.

The IT Manager was quite explicitly concerned with issues of technological efficiency as well as effectiveness but did address the business process/technology integration possibilities to the extent of identifying why certain integrations of process and technology were quite consciously not proceeded with.

The Warehouse and Distribution Manager, The Financial Controller and the Engineering Services Manager were concerned with issues of efficient supply, processes for balancing supply and demand, processes for reporting performance and processes for accounting for professional time. All of these fall into Parsons' management level of control and responsibility.

The pilot study will not be any more extensively reported in this report. The observations above were conducted in order to obtain scoping and general confirmation indicators of the conceptual bases for the substantive studies. This site will participate as a full case study in the project.

FURTHER WORK

By the time this work is presented at the ACIS Conference the research will have progressed beyond this early state. Further analysis of the empirical data will have allowed adjustment of the framework which describes the several rationales for ERP-implementation. Further case studies of organisation(s) which have completed integration of their information systems onto ERP software platforms may be in progress to validate the descriptive capability of the adjusted framework.

The outcome of the research project will be a conceptual framework for analysis and understanding of the expected realisable benefits from IS integration under the circumstances which obtain in the case study organisations. It is expected that the framework will identify specific areas of unanticipated detriment and unanticipated benefits which would be worthy of further, more detailed investigation. The framework may also indicate areas of potentially generalisable outcomes which would benefit from further detailed research.

REFERENCES

Adam, F. & O'Doherty, P. (2000). Lessons from enterprise resource planning implementations in Ireland. Journal of Information Technology, 15 (2000), pp 305-316.

Al-Mashari, M. & Zaira, M. (2000). Supply-chain re-engineering using enterprise resource planning systems. Intl Jnl of Physical Distribution and Logistics Management. 30, 3 / 4, pp 296-313.

Bernroider, E. & Koch, S. (2001). ERP selection process in midsize and large organizations. Business Process Management Journal, 7, 3, pp 251-257.

Davenport, T.H. (1998). Putting the enterprise into the enterprise system. Harvard Business Review. July-August, 1998. Boston, MA.

Dill, W.R. (1958). Environment as an influence on managerial autonomy. Administrative Science Quarterly. 2 March 1958, pp409-443.

Farbey, B., Land, F. and Targett, D. (1993). How to Assess Your IT Investment: A Study of Methods and Practice. Butterworth-Heinemann, Oxford, UK.

Farbey, B., Land, F. and Targett, D. (1994). The great IT benefit hunt. European Management Journal. 12, 3, pp 270-279.

Gronroos, C. (1983). Strategic Management and Marketing in the Service Sector. Marketing Science Institute, Cambridge, MA.

Hanseth, O., Ciborra, C.U. & Braa, K. (2001). The control devolution: ERP and the side effects of globalization. The DATA BASE for Advances in Information Systems. Fall 2001. 32, 4 pp34-46.

Hong, K. & Kim, Y. (2002). The critical success factors for ERP implementation: an organizational fit perspective. Information & Management, 40 (2002) pp 25-40.

Humphrey, W.S. (1989). Managing the Software Process. Addison-Wesley, Reading, Mass.

Humphrey, W.S. (1995). A Discipline for Software Engineering. Addison-Wesley, Reading, Mass.

Jackson, M.A. (1975). Principles of Program Design. The Academic Press, London, UK.

Langeard, E. (1980). Service Marketing: A State of the Art. Working Paper 209, Institut d'Administration des Entreprises, Aix-en-Provence, France.

Lawrence, P.R, & Lausch, J.W. (1967). Organization and Environment: Managing Differentiation and Integration. Harvard University, Boston, Mass.

Markus, M.L., Tanis, C. (1999). in Zmud, R (ed) Framing the Domain of IT Management: Projecting the Future Through the Past. Pinnaflex Educational Resources, OK.

Markus, M.L., Tanis, C. & van Fenema, P.C. (2000). Multisite ERP implementations. Communications of the ACM. 43, 4, pp 42-46.

Motwani, J., Mirchandani, D., Madan, M. & Gunasekaran, A. (2002). Successful implementation of ERP projects: Evidence from two case studies. International Journal of Production Economics. 75 (2002), pp 83-96.

Parasuraman, A., Zeithaml, V.A. and Berry, L.L. 1984. A conceptual model of service quality and its implications for future research. Journal of Marketing, 49, Fall, pp 41-50.

Parsons, T. (1960). Structure and Process in Modern Societies. The Free Press of Glencoe, New York, NY.

Perrow, C. (1986). Complex Organizations: A Critical Essay. 3rd edn. McGraw-Hill Inc. New York, NY.

Scott, W.R. (1998). Organizations: Rational, Natural and Open Systems. 4th edn. Prentice Hall, Upper Saddle River, NJ.

Sumner, M. (2000). Risk factors in enterprise wide information management system projects. Proceedings of SIGCPR, Evanston Illinois, 2000.

Thompson, J.D. (1967). Organizations in Action. McGraw-Hill Book Company, New York, NY.

Vogt, C. (2002). Intractable ERP: a comprehensive analysis of failed enterprise-resource-planning projects. Software Engineering Notes, 27, 2, pp62-68.

Yourdon, E. (1975). Techniques of Program Structure and Design. Prentice-Hall, Englewood Cliffs, NJ.

ACKNOWLEDGEMENTS

COPYRIGHT