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Deborah Bunker

University of New South Wales, d.bunker@unsw.edu.au

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Enterprise Resource Planning (ERP) System Tools: The Context of their Creation and Use Within the Technology Transfer Process

Deborah Bunker, School of Information Systems, Technology and Management, University of New South Wales d.bunker@unsw.edu.au

Abstract

This paper represents a discussion of research-in-progress which deals with the creation of information systems (IS) tools within a given context (environmental, cultural, historical, social) and their transfer to and implementation within another context. The mutual contingency of skills and tools is highlighted as a major contextual factor for the successful transfer and implementation of an IS. Enterprise Resource Planning (ERP) systems are a relatively new and strategic class of IS which are gaining in importance for the function and competitive advantage of the modern organisation. Which ERP contextual skills issues need to be addressed in order to facilitate the successful transfer and implementation of these IS into varied organisational contexts? This paper poses a number of research questions within the area of ERP transfer and implementation using the University of NSW as a case example.

Introduction

Enterprise resource planning (ERP) systems have become big business in Australia. The sales of SAP/R3 for example were \$33M in 1995 and then jumped to \$175M in 1997 (Gable [1998]). Other ERP vendors (Oracle, Baan, Peoplesoft) have also seen an increasing demand for their products. As demand falls for these systems in large organisations, many commentators see the inevitable targetting of the small/medium enterprise (SME) market (Binning [1999]). It would appear that ERP companies are looking to saturate the Australian market place with these systems.

What are the implications for Australian organisations undertaking the implementation of these large, integrated and complex systems? Gable et al [1998] assess that “ERP is for many organisations the largest project that they have ever undertaken, entailing the largest potential benefits and possibly the largest potential risks”. Davenport [1996] states that “meta-packages require a higher level of organisational change than for other types of systems”. The way that an organisation is structured, the way that it does business and its general strategic direction may all be called into question as a result of an ERP implementation. Gibson et al [1999] tell us that that there is an organisational and technical complexity that is associated

with an ERP implementation. This is due to its integrated nature which necessitates the re-engineering of enterprise core business processes so that they are aligned with “the model implicit in the software” and yet they highlight that 90% of ERP implementations are late or over budget.

University of New South Wales, in Australia, are currently undertaking a PeopleSoft ERP implementation which comprises student administration, human resources management and financial management functions within an organisation of 30,000 students and 5,000 staff over various geographic locations and organisational structures (faculties, administrative departments, research institutes, teaching hospitals etc). The UNSW IT Director has stated that “PeopleSoft will interact with our entire community through the web - students will access their records and registrations, faculty and staff will connect with the HR and student systems” (<http://checkers.peoplesoft.com/ourcust>).

As is evidenced by the magnitude of this ERP implementation, UNSW is undertaking a major system and program of organisational change that requires the where with all and skills to be completed effectively. The technology transfer literature, however, also highlights the fact that successful transfer of technology from one culture to another is dependent on the level of indigenisation of the technology i.e the ability of the recipient culture to change attributes of the technology to suit their local needs (Robinson [1988]). Documentation of some ERP implementations indicates that there is a “tension” between ERP system creators (makers) and their need for organisational re-engineering and the system recipients (users) and their need for adaptation and indigenisation of the tool. This problem is interestingly highlighted by Seiber et al [1999] in their teaching case that discusses an implementation of SAPR/3 at the University of Nebraska in what they term “critical gaps”.

Tool Creation in Context

The process of tool creation ensures that features are designed into a tool which make assumptions about its intended use. Assumed skills, outcomes, conceptual expression, building techniques and cultural context become important in understanding how and why the tool was made and should be used (Young [1971]).

These assumed skills and ways of life are transmitted by interpersonal communication (language and social interaction) and tradition rather than genetics - storytelling, group behaviour, social activities and a sense of historical perspective all contribute to the types of skills that are considered "worthwhile" and are therefore developed. The tool creator must, therefore, have foresight as to the use of the tool, as the process of creating the tool involves knowledge as to the desired outcome of the use of the tool. Tools are also created using an evolutionary convention and software and hardware tools are excellent examples of incremental tool building. Above all, tools are made and used in a cultural context where each culture adds their own cultural variations to a tool (Young [1971]).

Johnson [1997] adds to this debate with a discussion of these same issues from the perspective of four types of value meanings we find within technology. These are: moral/metaphysical (past intended use of the technology), support (present intended use of the technology), material (in-built characteristics which influence the use of the technology) and expressive values (motivation for use of the technology), all of which contribute to the assumed skill sets required to utilise the technology. Tool-making is not only technical in nature but is bound by cultural values and an understanding of how the tool has been created for use in an acceptable manner. This relationship between skills and tools is, therefore, critical to our understanding of successful tool creation and use within a given culture and from one culture to another.

“Absolute Mutual Contingency of Skills and Tools” – Ayres [1978]

Ayres [1978] discusses the “absolute mutual contingency of skills and tools” which highlights the relationship between tools and assumed skill sets for their use. This view may prove useful as a way of developing organisational cultural context awareness and resultant strategies for appropriate and successful use of ERP systems on a wider scale. Lien [1994] highlights that as the difficulty and cost of technical transfer increase there is an associated need for an increase in skill development. This is a critical factor, for the recipient of the technology has a much greater investment to make than simply purchasing the technology, if the transfer process is to be successful. Lien [1994] defines eight areas that determine the investment to be made in the successful transfer of technology. These include; characteristics of the technology level and extent of the TT; organisational context; talent and preparation of personnel; modification of the technology; management experience; personnel and organisational resources and financial and time investments.

It is these eight areas of skill within an organisation which are being utilised, by this study to represent the context of ERP tool development and use. If we take ERP technology and transfer it to a new environment (whether that be a new organisation or country), it may be logical to assume that a successful transfer is dependent on how closely the recipient is aligned to the technology creator in each of the eight skill areas. Given that organisations (and their cultures) are likely to be different in each of these areas (in varying degrees) for a variety of reasons (competitiveness, cultural norms, experience etc) it is realistic to expect a level of change and investment from organisation to organisation to facilitate the technology transfer process and make the ERP implementation more successful ?

Technology (Tool) Transfer

The recipient of the tool, in a situation of technology transfer, must have the assumptions on which the tool is based, as a foundation for their value systems (and expression of them) or at the very least a deep understanding of the cultural assumptions underpinning the tool. A lack of understanding of these cultural assumptions can cause problems with tool use that may not be understood or highlighted until well after the tool has been implemented and used for a time. This situation of delayed TT problems has been described as "emergent bias". Friedman & Nissenbaum's [1996] work on bias in computer systems highlights that emergent bias occurs typically after a system design has been completed and societal knowledge, cultural values or population has changed. Collot & Belmore's [1996] work on English as the defacto electronic language, indicates that although we know that it is possible to create Web sites that are non-English language based, the very origin, history and nature of the Internet as a means of globalisation, necessitates the use of a common communications "protocol" (Pargman[1998]). It is only logical that the originators of the technology (Western scientists) utilise their own dominant symbolic communication as this "protocol" i.e. English language.

Are tools created within one culture inappropriate for use in another? Can the same be said for ERP systems ? Are these tools of a certain cultural paradigm? Do the recipients of such tools have to either drastically alter their cultural values and assumptions or can the tools be effectively altered to suit the recipient's skills and value systems? Much of the literature from the History of Science might influence us in reaching the conclusion that some tools are inappropriate for transfer, especially those that impact a culture in a negative fashion. If we view more positive examples of technology transfer such as various medical and communications tools and techniques, however, our opinions might be moderated.

More flexible technology properties which are compatible with more diverse patterns of social behaviour may result in more effective and appropriate use of that technology but it may also result in misuse or unintended use of that technology (Johnson [1997]). Do ERP systems have such flexible properties and how might these properties be utilised to positively facilitate ERP implementation within organisations ?

ERP Systems as Tools

If we view ERP systems in terms of tool creation and use (both technically and socially) within a particular organisational context, we find that certain values and related skill sets are assumed in the design and use of these tools (change in organisational culture, structure, strategy and business processes). The values and skill sets embodied within the ERP may not be in evidence across all recipient organisational cultures. This may make the successful and effective use of ERP systems that are created within one organisational culture and used within another, especially if these organisations are contained within different national cultures, a more difficult and complex (if not impossible) undertaking. Gable et al [1998] readily admit that there is a shortage of skills and knowledge within the Australian marketplace to effectively implement such systems and that ERP vendors and IT consulting companies are working together to leverage the skills required for such implementations over a wider range of clients. Is this shortage merely in the area of technical skills or are there cultural, social and historical (contextual) factors at work ?

A proposed model of tool creation within a context has been developed from the literature (Bunker & Dean [1996] & [Bunker [1998]]). This model suggests that a skill-focussed approach, is the best way to determine which types of systems may be appropriate for a particular organisational culture.

This research study will contribute to our understanding of the technology transfer (TT) process by identifying those skills associated with the successful creation, implementation and use of ERP systems. From this it will be determined whether it is possible (or practical) to educate and skill recipients of the ERP system under all circumstances.

Objectives of This Study

This research study has developed and is applying a skill-based (IS technology transfer) interview approach based on the work of Ayres [1978], Lien [1994], Hofstede [1980] and Schein [1984]. This approach is focussing on the "mutual contingency of skills and tools" in successful technology transfer and the initial interview data gathering

within this study will contribute to theory building in this area. The data from these interviews will be transcribed and analysed for patterns of assumed skills and values (ERP creator and recipient) in order to further develop the tool-based model of Bunker [1998] and also to identify key areas for further and more detailed questioning.

This research will:

- Identify the values and skill sets that are assumed by the PeopleSoft company for the successful and effective implementation and use of the PeopleSoft ERP system tools at UNSW.
- Identify the values and skill sets in evidence in the implementation team and user population at UNSW.
- Identify areas within the technology transfer process in which either the flexible properties of the ERP system tool should be changed to ensure the successful and effective use of the ERP system tools.
- AND/OR identify the values and skills within the implementation team and user population, that should be changed, to ensure the successful and effective use of the ERP system tools.
- Identify the potential costs, benefits and risks associated with ERP system and/or recipient organisational change in the technology transfer process.

Research Contribution

Refinement of an approach to surface skill characteristics would assist in pinpointing the appropriateness of technology transfer in a particular instance. Once identified these skills may then be matched to a list of required skills (identified by the creator of the ERP tool) needed by the organisation or culture to successfully utilise the technology. This would assist in identification of the gap in skills and cultural context, and the development of strategies to overcome these gaps, including the type of changes or indigenisation required to successfully implement and use the ERP. If inconsistencies could be identified then preparations can be made by the ERP recipient organisation, to either change the characteristics of the ERP, the organisation or both, or a decision might be made to abandon the tool if the cost of change exceeds the benefits.

Maitland [1998] has already started work in this area by proposing 5 areas of interest (propositions) regarding the global diffusion of interactive networks. These propositions are based on the work of Hofstede [1980], Herbig [1994] and Markus [1990] and encompass cultural factors and their influence on this technology. Uncertainty avoidance, status and level of power distance, gender equality and level of ethnocentricity are looked at in terms

of their effect on the diffusion of interactive networks. When these types of cultural factors are related to skills required to implement and use ERPs then it is proposed that a different picture of the technology transfer process for these systems will emerge. This study commenced in January 2000 and preliminary results will be presented at the conference.

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