ERP software implementation: an integrative framework

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ERP implementation is a socio-technical challenge that requires a fundamentally different outlook from technologically-driven innovation, and will depend on a balanced perspective where the organisation as a total system is considered. ERP implementation is considered to rely on behavioural processes and actions. It is a process that involves macro-implementation at the strategic level, and micro-implementation at the operational level. This therefore means that implementation in the context of ERP systems is not possible through an ON/OFF approach whereby deployment of the new systems will necessarily yield the desired and expected results. Understanding the implementation process through a balanced perspective will therefore prevent any unpleasant surprises, and will ensure and guide the change process to be embedded in a painless fashion. The balanced perspective means that socio-technical considerations must be borne in mind; the strategic, tactical and operational steps clearly defined; and the expected benefits evaluated and tracked through creating seamless and solid integration. This paper proposes an integrative framework for ERP implementation based on an extensive review of the factors and the essential elements that contribute to success in the context of ERP implementation. *European Journal of Information Systems* (2001) **10,** 216–226.

Introduction

As the pace of change accelerates in the twenty-first century as a result of technological opportunities, liberalisation of world markets, demands for innovation, and continually decreasing life cycles, organisations are finding that they have to continuously re-adjust and re-align their operations to meet all these challenges. This pace of change has increasingly forced organisations to be more outward looking, market-oriented, and knowledge driven. A useful tool that businesses are turning to, in order to build strong capabilities, improve performance, undertake better decision-making, and achieve a competitive advantage is Enterprise Resource Planning (ERP) Software.

Overall, ERP is a relatively new phenomenon, and the research related to it is not extensive (Parr *et al*, 1999; Nah *et al*, 2001; Somers & Nelson, 2001). Sor (1999) suggested that the questions regarding ERP systems are being raised faster than they can be answered. In general, most researchers on ERP systems deal with the question of how to implement it successfully in an adopting organisation (Brehm & Markus, 2000). Consequently, its implementation methodologies are still developing with experience. ERP implementation involves a mix of business process change and software configuration to align

the software with the business processes (Gibson *et al*, 1999; Holland & Light, 1999). However, implementing ERP systems is not as much a technological exercise as it is an organisational revolution (West & Shields, 1998; Bingi *et al*, 1999; Davenport, 2000). It has become increasingly clear that implementing an ERP system requires extensive efforts to transform the organisation's business processes.

This paper presents an integrative framework for ERP implementation based on an extensive review of the factors and the essential elements that contribute to success in the context of ERP implementation. The essential elements of this framework, its associated critical factors and its deployment levels are all described in the rest of this paper.

Integrative framework for ERP implementation

As ERP is a relatively new phenomenon within the software industry, its implementation methodologies are still developing. However, several approaches and methodologies have been introduced by a number of authors and practitioners (for example see Gibson *et al*, 1999; Holland & Light, 1999; Kelly *et al*, 1999; Volkoff, 1999; Appelrath & Ritter, 2000; Everdingen *et al*, 2000; Markus *et al*, 2000).

Some of the studies on ERP systems have focused mainly on the operational level of implementation activities, with the assumption that company executives have

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committed to support the project and that the ERP system package has already been selected, and have not addressed the overall ERP system implementation project (Bancroft *et al*, 1998; Appelrath & Ritter, 2000). Others discussed critical issues of strategic and tactical levels together as critical factors of implementing an ERP system, without considering issues of project implementation (eg, Bingi *et al*, 1999; Rao, 2000). On the other hand, some authors and practitioners followed a form of an established generic approach, and added some improvements, changes and extensions. For instance, Sieber and Nah (1999) use a recurring improvisational change methodology, which was an extension of the improvisational model; Slooten and Yap (1999) apply a contingency factors model; while Smethurst and Kawalek (1999) and Volkoff (1999) address structured methodology without major modification; whereas Brehm and Markus (2000) apply an extended system life cycle (SLC) to the divided software life cycle (SDLC).

The literature review undertaken revealed a lack of research with regard to some critical factors of ERP implementation (eg client consultation, schedule and plans), and this could be due to the fact that these factors are related to any information system project, not particularly to ERP project implementation. However, and generally speaking, there has not yet been a common comprehensive or integrative approach to ERP implementation.

Successful ERP project implementation is a complex and difficult task. Implementing an ERP system package causes vast change that needs to be managed carefully to get the full advantages (Bingi *et al*, 1999; Sor, 1999). More importantly, it has been stressed by many that it is really a mistake to view ERP project implementation as merely an IT project (Davenport, 2000; Milford & Stewart, 2000; O'Leary, 2000).

A major difference between ERP systems and traditional information systems comes from the integrated nature of ERP applications. Implementing an ERP system causes dramatic changes that need to be carefully administrated to reap the advantages of an ERP solution. Holland and Light (1999) cite that the implementation of an ERP software package involves a mix of business process change and software configuration to align the software with the business processes. In that sense, it has become clear through the literature review, and studying the experiences of leading organisations, that the implementation of an ERP system is radically different from traditional systems development. In an ERP system implementation, the key focus has shifted from a heavy emphasis on technical analysis and programming towards business process design, business-focused software configuration (Kelly *et al*, 1999), and legacy data clean-up (Smethurst & Kawalek, 1999).

In essence, there are several critical and inter-related issues that must be carefully considered to ensure suc-

cessful implementation of an ERP system project. The framework (Figure 1) presented in this paper is the result a major research study undertaken to propose an integrative 'Critical Success Factors' view of ERP. The study has so far been based on an extensive literature review, analytical review of published case studies, and an in-depth analysis of selected leading organisations. The validation of this framework is under way, and the first step is a global survey of leading organisations, followed by interviews with organisations that have applied ERP.

As the figure shows, there are dominant critical factors hypothesised to play a more over-riding role in the implementation of ERP projects, and they should be ongoing throughout all implementation levels. These factors are top management commitment, business case, change management, project management, training, and communication. Clearly, the Dominant Factors are the ones that will shape the overall project culture, and subsequently the organisational culture, as ERP is far-reaching in nature. Moreover, it should be noted that within these Dominant Factors, neither IT development nor IT improvement feature, and this stresses that ERP success is all about the business change, and this is the main theme here.

ERP system implementation has been subdivided into three levels: strategic, tactical, and operational (Figure 1). Each level contains a number of critical factors. These levels of implementation, however, are not independent of each other, and each level should be used to derive the next level. Moreover, each level requires differing inputs; for example, there is a direct relationship between the implementation level at which a decision is being taken and the characteristics of the information required to support decision making (Bocij *et al*, 1999).

Dominant ERP factors

After the review of the Critical Success Factors, the following is an overview of what are hypothesised to be the Dominant Success Factors for ERP project implementation.

Top management commitment/support
Top management support has been consistently identified as the most important and crucial success factor in ERP system implementation projects (Davenport, 1998a; Bancroft *et al*, 1998; Bingi *et al*, 1999; Sumner, 1999; Welti, 1999; Gupta, 2000; O'Leary, 2000; Rao, 2000; Somers & Nelson, 2001).

Slevin & Pinto (1987) define top management support as the willingness of top management to provide the necessary resources and authority or power for project success. Welti (1999) suggests that active top management is important to provide enough resources, fast
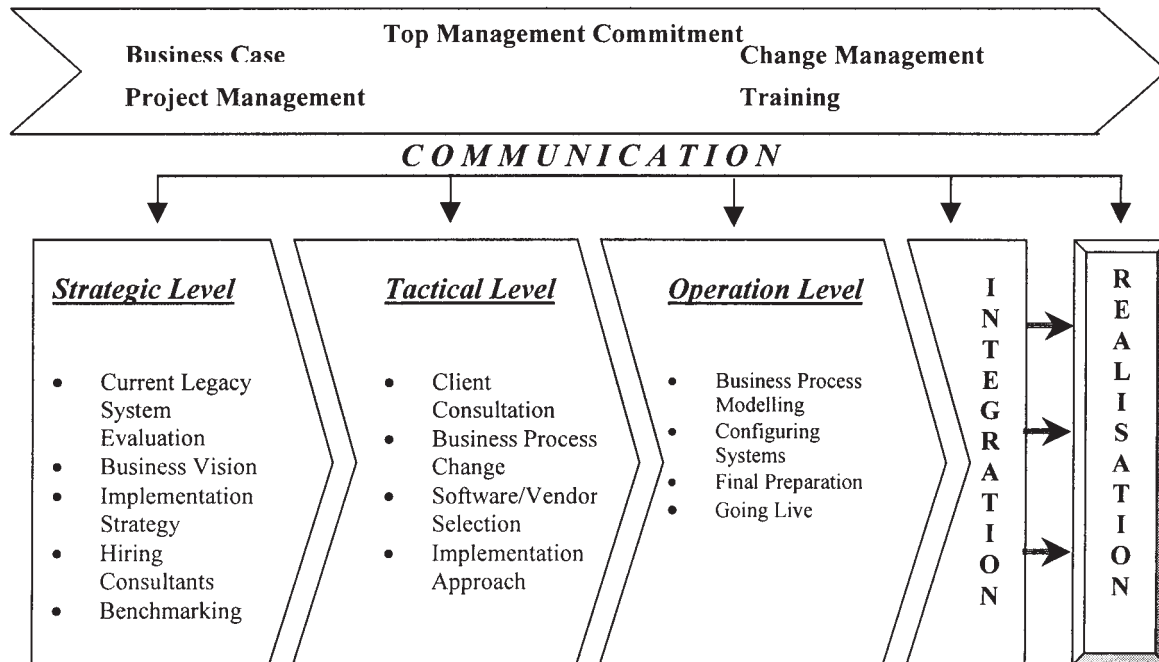
Top Management Commitment

Business Case   Change Management

Project Management   Training

COMMUNICATION

Strategic Level	*Tactical Level*	*Operation Level*	INTEGRATION	REALISATION
• Current Legacy System Evaluation • Business Vision • Implementation Strategy • Hiring Consultants • Benchmarking	• Client Consultation • Business Process Change • Software/Vendor Selection • Implementation Approach	• Business Process Modelling • Configuring Systems • Final Preparation • Going Live		

Figure 1 Framework of ERP system project implementation.

decisions, and support for the acceptance of the project throughout the company.

The top management must be involved at every step of the ERP implementation. They must be willing to allow for a mindset change by accepting that a lot of learning has to be done at all levels, including themselves (Rao, 2000).

Jarrar *et al* (2000) point out that the top management support and commitment does not end with initiation and facilitation, but must extend to the full implementation of an ERP system. They should continually monitor the progress of the project and provide direction to the implementation teams (Bingi *et al*, 1999).

Business case

A strong business case should control the project's scope. It considers project objective, needs, and benefits. Wee (2000) argues that the business case is an effective tool to the ERP project implementation through its life cycle. A business case can help to convince people of the need for change, and therefore their commitment to it (Industry Week, 1998). Davenport (2000) and Wee (2000) argue that the business case will focus on the expected business value to be achieved from the ERP project and associated business changes. The organisation should go into the business case if it intends to make a better and faster decision with ERP implementation.

Cooke and Peterson (1998) point out that to ensure a business-specific result, the business case needs to be translated down to those who are deploying the actual systems. They also noted that, based on a global survey,

the development of a strong business case is one of the major success factors. Davenport (2000) points out that the business case should be modified continually and be interactive through all project stages to realise the benefits. It may be recommended to change the project scope based on an ongoing business case. For example, Owens Corning's Company decision to back off from some aspects of ERP project implementation after it encountered some financial performance issues.

Project management

As discussed, ERP implementation is challenging, costly, and risky. Consequently, to achieve the desired benefits, the ERP system implementation must be carefully managed and monitored. It is in this respect that project management becomes important, if not crucial for success.

Slevin and Pinto (1987) argued that in order to manage a project successfully, project managers must be capable both in strategic and tactical project management activities. With the ERP system implementation context, Bancroft *et al* (1998) suggested that the ERP system implementation is complex, requiring a combination of business, technical, and change management skills.

Project management deals with various aspects of the project, such as planning, organisation, information system acquisition, personnel selection, and management and monitoring of software implementation (Appelrath & Ritter, 2000; Peak, 2000). Peak (2000) suggests that the project management is a practised system necessary to govern a project and to deliver quality products. Hoffer *et al* (1998) argue that the project management

activities span the life of the project from initiating the project to closing it.

Initially, the project manager, the external face of the project (Norris et al, 2000), in conjunction with the steering committee, will select the project team. Owing to the wide-ranging impact of ERP software, the members of the project team should ideally be from management or supervisory positions (Bancroft et al, 1998), and have the authority to make a decision regarding how a process will be completed (Computer Technology Research Corporation, 1999).

A Best Practice Project Management framework would cover:

- Project Schedule and Plans—Slevin and Pinto (1987) define project schedule and plans as the detailed specification of the individual action steps required for accomplishing the project's goals. Sieber and Nah (1999) suggest that if the project has failed, the fact that not every detail of the plan was pursued can be typically used as the rationale for the project's failure. In essence, the dominant factor, project management, sets and monitors such schedules and plans.
- Monitoring and Feedback—This involves the timely provision of comprehensive control information at each stage in the implementation process. It is one of the project manager's fundamental tasks (Schultheis & Sumner, 1998; Welti, 1999). In essence, project progress must often be monitored by regular meeting and reports. The periodicity of meetings has a direct impact on the effectiveness of control. Moreover, with regular meetings, the project manger is able to discover if there are any missed deadlines (Bancroft et al, 1998).
- Risk Management—Risk management can decrease the number of unexpected crises and deviation from budget and schedule, providing advance warning as problems begin to develop (Peak, 2000). It is the competence to handle unexpected crises and deviations from the plan (Slevin & Pinto, 1987). Any deviation from the implementation project budget, schedule, and defined project goals must be identified and tracked carefully, with appropriate corrective action taken.

Change management

Change management is a primary concern of many organisations involved in ERP project implementation (Somers & Nelson, 2001). Cooke and Peterson (1998) identify change management, in terms of adopting an ERP system, as activities, processes, and methodologies that support employee understanding and organisational shifts during the implementation of ERP systems and reengineering initiatives.

Many ERP implementation failures have been caused by the lack of focus on 'the soft issues', ie the business process and change management (Kelly et al, 1999; Sumner, 1999). Pawlowsiki and Boudreau (1999) point out that almost half of ERP projects fail to achieve expected benefits because managers underestimate the efforts involved in change management. Generally, one of the main obstacles facing ERP implementation is resistance to change. Bancroft et al (1998) and Gupta (2000) point out that the resistance to change is one of the main hurdles faced by most companies. Martin and Ching (1999) suggest that to decrease resistance to change, people must be engaged in the change process and helped to see how the change profits them.

In essence, Norris et al (2000) point out that the tools of management of change are leadership, communication, training, planning, and incentive systems. They argue that these tools can all be used as levers and can move great obstacles with a minimum of efforts when applied correctly.

An ERP system package has a major impact on organisations, especially on their staff (Welti, 1999). Thus, change management is essential for preparing a company to the introduction of an ERP system, and its successful implementation. To implement an ERP system successfully, the way organisations do business will need to change and the ways people do their jobs will need to change too (Koch et al, 1999; Davenport, 2000).

In adopting a new information system, several approaches and methodologies of change management have been introduced by a number of authors and practitioners (eg Bancroft et al, 1998; Martin & Ching, 1999; Welti, 1999; Norris et al, 2000). Sieber and Nah (1999) propose the recurring improvisational change methodology as a useful technique for identifying, managing, and tracking changes in implementing an ERP system. It recognises three types of change:

- Anticipated change: planned ahead of time and occurs as intended.
- Emergent change: arises spontaneously from local innovation, and not originally anticipated or intended.
- Opportunity-based change: introduced purposefully and intentionally during the change process in response to an unexpected opportunity, event or breakdown.

Welti (1999) describes how ALVEO prepares its employees for the coming change through the following means:

– management support,
– information,
– communication, and
– training.

Training

ERP systems are extremely complex systems and demand rigorous training. Installing an ERP software package without adequate end-user preparation could

lead to drastic consequences. Inadequate or lack of training has been one of the most significant reasons for failure of many ERP systems (Kelly *et al*, 1999; Gupta, 2000; Somers & Nelson, 2001). Clearly, training and updating employees on ERP systems is a major challenge. It has been estimated that by lack of training, about 30–40% of front-line workers will not be able to handle the demands of a new ERP system (Bingi *et al*, 1999).

Welti (1999) states that the training starts with the education of the project team in system, line, and project management, and ends with the system's users. Moreover, every level in the project class and the various users require different training. The steering committee members need to get a good project overview and a general idea of the system's functionality. The project members, especially the project leaders, must have an in-depth understanding of the system's functionality and project management. The users need to learn those system functions that are related to their jobs, and they must acquire sufficient theoretical background to be able to understand the new processes and procedures.

ERP training should address all aspects of the system, be continuous, and be based on knowledge transfer principles wherever consultants are involved (Davenport, 1998b). However, it is difficult for trainers or consultants to pass on the knowledge to the employees in a short period of time (Bingi *et al*, 1999). A particular challenge in ERP implementation is to select an appropriate plan for end-user training and education. It is however important to stress that the main goal of ERP training should be the effective understanding of the various business processes behind the ERP applications (Gupta, 2000). In this regard, the costs of training and support are often under-estimated, and these costs may be many times greater than originally anticipated (Sumner, 1999), as Epson also noted (Deloitte Consulting, 2000). Overall, enterprises should provide opportunities to improve the skills of the employees by training opportunities on a continuous basis to meet the changing needs of the business and employees.

Communication
Communication is one of most challenging and difficult tasks in any ERP implementation project (Welti, 1999). Slevin and Pinto (1987) define communication as the provision of an appropriate network and necessary data to all key factors in the project implementation. Communication has to cover the scope, objectives, and tasks of an ERP implementation project (Sumner, 1999).

The way to avoid the various communication failures is for an open information policy to be maintained throughout the project. For example, a good e-mail system can help promote this policy, but serious problems need to be discussed by telephone or, preferably, face-to-face (Welti, 1999).

The communication plan has to detail several areas, including the following (Bancroft *et al*, 1998):
– Overview and rationale for the ERP implementation.
– Detail of the business process change management.
– Demonstration of applicable software modules.
– Briefings of change management strategies and tactics.
– Establishment of contact points.
– Periodic updates

ERP implementation levels

Strategic level
The decisions made at this level significantly change the manner in which business is being done (Bocij *et al*, 1999), and these decisions are the responsibility of top management (Schultheis & Sumner, 1998; Turban *et al*, 1999). This level can be considered as the process of establishing overall goals and of planning how to achieve those goals. Kelly *et al* (1999) suggested that the strategic level is the premeditated plan for transforming the organisation, enabling it to operate in the new style environment.

Current legacy system evaluation
This includes the existing IT (hardware and software), business processes, organisation structure, and culture. Holland and Light (1999) argue that the nature and scale of problems that are likely to be encountered can be defined by evaluating the existing legacy system (by asking what the status of the enterprise's legacy system is, and how it will affect the transition to ERP and common business processes).

Gable (1998) suggested that the reserve in IS departments, problem integrating systems, the inability of legacy systems to cope with the 'Year 2000' problem, and the introduction of the Euro currency further increased demand for ERP software packages.

ERP systems depend on sophisticated IT infrastructure (Jarrar *et al*, 2000; Gupta, 2000). Jarrar *et al* (2000) and Rao (2000) agreed that adequate IT infrastructure, hardware and networking are crucial for an ERP system's success. It is clear that ERP implementation involves a complex transition from legacy information systems and business processes to an integrated IT infrastructure and common business process throughout the organisation (Gibson *et al*, 1999).

Project vision and objective
It is very important that the organisation has a clear sense of who and what it is before implementing an ERP project (Davenport, 2000). A global survey showed that an understanding of business objectives and clear vision are key success factors (Cooke & Peterson, 1998). Slevin and Pinto (1987) define project vision as the initial clarity of goals and general direction. Welti (1999) advises

on determining the project vision in the planning phase, particularly within the project scope, where the project scope includes the project definition, objectives, and strategy. He argues that all these components of the project scope are compulsory to create a clear project vision. At this stage in the ERP project, the vision should provide a direction and general objective, and no details are required.

ERP implementation strategy
The ERP implementation strategy will be reviewed in this level to determine the impact of ERP system implementation on the enterprise. Trepper (1999) argues that the organisation's executive managers must understand how ERP system implementation will impact on the organisation to ensure a smooth transition.

Davenport (1998a) argues that the logic of an ERP system could conflict with the logic of the business, and either the implementation will fail, wasting large sums of money and causing a great deal of disruption, or the system will weaken important sources of competitive advantage, hobbling the company. Therefore, the company has to have a clear understanding of the business implications to avoid potential perils of failures.

Holland and Light (1999) suggest that the propensity of an organisation for change should influence the choice of ERP implementation project strategy. There are two main technical options to implement an ERP system: modify the ERP system package to suit an organisation's requirements or the implementation of a standard package with minimum deviation from the standard settings. Companies that do not select the second option are liable to face major difficulties (Bancroft, 1998; Martin, 1998; Gibson *et al*, 1999).

Hiring consultants
Due to the complexities of implementing an ERP system, most companies choose to hire consultants to help them select, configure, and implement the system. Welti (1999) argues that the success of a project depends on the capabilities of the consultants, because they have in-depth knowledge of the software. Somers and Nelson (2001) point out that consultants may be involved in different stages of the ERP project implementation.

There are hundreds of companies that provide such ERP services. Those services may include all or a combination of the following offerings (Computer Technology Research Corporation, 1999):
– ERP selection
– Business process planning or reengineering
– ERP implementation
– End-user training
– ERP maintenance and support.

Computer Technology Research Corporation (1999) pointed out that while the growth of the ERP market is fast and huge, there has been a lack of competent consultants.

However, one of the challenges with ERP implementation is that it demands multiple skills covering functional, technical, and interpersonal areas. If these skills are found in a consulting firm, it is another challenge for an organisation to manage such a consultant (Bingi *et al*, 1999).

IT research firm Gartner Group (Computer Technology Research Corporation, 1999) argued that the ratio of consulting costs to software costs could reach up to 3:1. Thus, the cost of hiring consultants and all that goes with it is very high, and can consume more than 30 percent of the overall budget for the implementation (Bingi *et al*, 1999). Clearly, it is a critical success factor, and has to be managed and monitored very carefully.

Benchmarking
Al-Mashari and Zairi (2000) argue that benchmarking works essentially at capturing both external and internal best practices related to all aspects of ERP system implementation, and enabling the transfer of knowledge across all levels of project implementation. They argue that benchmarking can play a significant role in shaping the strategic direction to be taken for change introduction using an ERP package.

Tactical level
At the tactical level, also termed managerial level, the medium-term planning of ERP specific organisational issues is largely concerned, where the decisions are made by middle managers (Turban *et al*, 1999). In order to make sure that the enterprise is meeting its targets, objectives of top management are accomplished, and it is not wasting its resources, the tactical level provides middle-level managers with the information they need to monitor the performance of the organisation, control operations, and allocate resources and set policies effectively (Schultheis & Sumner, 1998; Bocij *et al*, 1999).

Client consultation
Slevin and Pinto (1987) define client consultation as the communication and consultation with, and active listening to all affected parties, mainly the client. It is essential for an organisation to keep its clients aware of its future project to avoid misconception.

Slevin and Pinto (1987) argued that the consultation with clients should occur early in the process, otherwise the chance of subsequent client acceptance will be lowered.

In general, this factor has not been thoroughly discussed in the literature reviewed.

Business process change (BPC)
As mentioned before, there are two main options to implement ERP systems: modify the package to suit the

organisation's requirements, or implementation with minimum deviation from the standard settings (Holland & Light, 1999). Research has shown that even a best application package can meet only 70% of the organisational needs (Melymuka, 1998). Therefore, to take a full advantage of an ERP software, business process change is seen as a prerequisite (Holland & Light, 1999; Somers & Nelson, 2001). Davenport (2000) points out that the organisational structure and culture, the behaviours of workers throughout the enterprise, and business strategy, all have to be restructured. To this end, Bingi *et al* (1999) point out that the need to change the organisation's business processes is seen as one of ERP's major benefits.

Moreover, Davenport (1998a), Bingi *et al* (1999), Gable *et al* (1998), Holland and Light (1999), Gibson *et al* (1999), Davenport (2000) and Rao (2000), all agreed that the enterprise consensus is required to reengineer a company's core business processes to align them with the model implicit within the ERP package to take advantage of the ERP system. Companies that do not follow this philosophy are likely to face major difficulties (Bancroft *et al*, 1998; Martin, 1998; Gibson *et al*, 1999).

The persisting question at this point is when should a company do business process reengineering? Before, during, or after ERP package implementation? In fact, some companies have implemented an ERP system package prior to a BPR project (eg Welti, 1999) to avoid the trouble of such a project. If the corporate structure and processes fit well with the ERP system package, this approach is possible (Bancroft *et al*, 1998), while some companies started with BPR prior to the ERP package, eg Digital Equipment (Bancroft *et al*, 1998). Thus answering this question will depend highly on the company's specific situation.

However, Cooke and Peterson (1998) have cited that the reengineering prior to SAP selection was found by some companies to be less effective. However, it will be counter-productive, in any case, to search too far into the details of the new business environment without understanding the ERP system package (Bancroft *et al*, 1998).

ERP software package selection
Selecting new ERP system software is one of the most risky decisions that most companies face. It is inappropriate if the selection of ERP software is being driven by the technology experts rather than by the operational experts in the company (Kuiper, 1998), as companies often fail to consider whether the system they are evaluating can match their overall business strategy (Davenport, 1998a), not to mention the system's price tag that could run up into the hundreds of thousands of pounds. Several methodologies and approaches for software selection have been proposed by a number of

researchers and practitioners (Kuiper, 1998; Butler, 1999; Everdingen *et al*, 2000; Soh *et al*, 2000; Verville & Halingten, 2001).

Kuiper (1998) cited common mistakes companies make when selecting an ERP software package:

– Establishing a system requirements' definition without professional expertise: doing it without outside expertise is dangerous unless the company has enough system expertise and current knowledge of the ERP software package marketplace.
– Picking a system without doing a target search: some success stories may be for a different size of company, or could be in the same business as the organisation, but with a drastically different internal operation system.
– Starting talking to software vendors before they define their requirements: it is almost impossible to be objective when individual team members start developing favourites before establishing a definition of requirements.
– Not starting with a large population of vendors.
– Taking too much time in the preliminary analysis phase: the faster the company gets to the action steps of system pilots during software demonstrations and planning the implementation, the easier it is to maintain a high level of enthusiasm and commitment.

It is therefore prudent that the characteristics of an ERP software match the criteria used by an organisation to select an information system. The results of a survey of the criteria used by organisations in selecting their current IS shows that the best fit with current business procedures is the most important one (Everdingen *et al*, 2000).

Moreover, since an ERP system package is different from earlier applications (traditional software), West and Shields (1998) argued that the senior managers must be involved in software selection. They suggested top managers should answer the following questions before selecting a software package:

– What are our business strategy and plans for the future?
– How are we currently using technology?
– How is technology being used by our competitors, customers, and suppliers?
– What new technologies are being used by other businesses and industries?
– What are the capabilities of our current IS department?
– What are the issues for using technology in the organisation?
– What is the vision on how technology should be used by the organisation over the next 3–5 years?
– What are the IS strategies for achieving that vision?
– What projects are needed to implement the IS vision and strategies?

Verville and Halingten (2001) recommend several

major processes to ensure sound ERP system package selection. These processes (Figure 2) have the following characteristics:

– Begin with planning.
– End with negotiations.
– Some of the processes are done concurrently.
– Each process results in deliverables that are used by another process.

Implementation approach
The company has to take a fundamental decision regarding the implementation approach, and clearly select a focused path. Welti (1999) cites three main implementation approaches: step-by-step, big bang, and roll-out. With the step-by-step approach, the modules are implemented continuously, while with the big bang approach all modules are simultaneously implemented across an entire company (Koch *et al*, 1999). The roll-out approach, which may be implemented as step-by-step or big bang, creates a model implementation at one site, which is then rolled out to other sites.

However, unlike large enterprises, small and medium-size enterprises (SME) cannot afford to spend years on a software project. Therefore, vendors and consultants of ERP systems have responded with methods and tactics specifically designed to keep ERP system projects moving. Most enterprises now use a rapid implementation approach, eg AcceleratedSAP (Computer Technology Research Corporation, 1999).

In this regard, Computer Technology Research Corporation (1999) argued that companies should consult with ERP software package vendors and implementation partners to understand more regarding specific details of rapid methodology.

Gallaway (1997) pointed out that the rapid implementation is vigorous, intense, and demanding and is most suitable for companies with the following characteristics:

● Not planning to use the ERP implementation as an opportunity for reengineering.
● Not requiring heavy customisation of the ERP software.
● Willing to bend to fit the software's definition of business processes.
● Willing to sacrifice large-group, consensus-driven

decision making and authorise a small, core team to make crucial decisions in a short timeframe.
● Project team understanding the enterprise's business processes well enough to prioritise exactly what functionality is required from the software.
● Not considering rapid implementation a means to save money but having a strong, driving business need that requires them to complete the project by a specific date.

In general, there are aspects, such as organisational structure, resources, attitude towards change, or distance between the various production facilities, that influence the company's decision to select an ERP system implementation approach (Welti, 1999).

Operation level
Although installing an ERP software package is not as difficult as getting the enterprise soft elements in line with all the change imperatives, its critical role in yielding optimum outcomes from implementation cannot be over-emphasised (Al-Mashari & Zairi, 2000).

For this phase, there are numerous tools used during an ERP package system implementation supported by several ERP package vendors.

The following sections will discuss the steps at this level based on the literature review.

Business process modelling
In this step, the project team determines how the system will work, not in the technical sense, but in terms of the processes the company uses to accomplish different tasks, and how the business will operate after the ERP system package is in use (Computer Technology Research Corporation, 1999). The business process modelling is the complete description of how an enterprise will implement the ERP system package to support its business activities. It is a design document that serves in the next step, configuring the system, as a template for the realisation of the requirements of the enterprise in the ERP system package (Appelrath & Ritter, 2000).

Configuring system
Configuring an ERP system package is largely a matter of making compromises and of balancing the way the enterprise wants to work with the way the ERP package
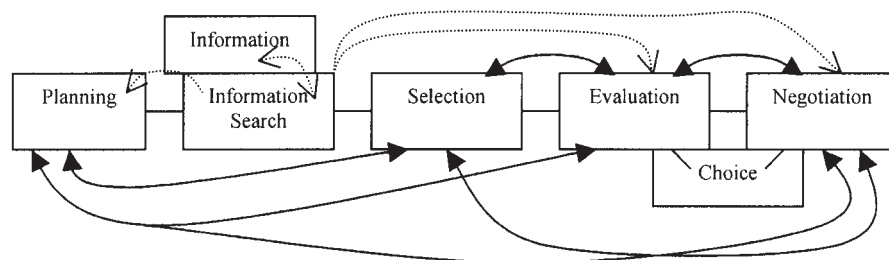

Figure 2 Enterprise software acquisition process (Verville & Halingten, 2001).

system lets it work (Davenport, 1998a). Customisation, also called configuration, refers to the set-up and configuration of all usage options that are possible in an ERP software package to reflect organisational features, and modification refers to changing the ERP software package code to perform unique business processes (Brehm & Markus, 2000; Buck-Emden, 2000).

Final preparation
Before going live on an ERP system, all necessary adjustments, in order to prepare the system and business for production start-up, have to be made. The system must be tested to make sure that it works technically and the business process configurations are practical (Computer Technology Research Corporation, 1999; Davenport, 2000). At this stage, Welti (1999) suggests that it is important to assess the adequacy of the end-user training programme.

Going live
This is the final step of the ERP package implementation; it is also referred to as 'going into production'. It has two major steps: activating the system, and transitioning from the old system to the new system (Computer Technology Research Corporation, 1999). The project team must accompany the productive operation until a sufficient stability of the ERP package has been completed (Appelrath & Ritter, 2000).

ERP integration
There is no single software package that can cover all a company's requirements; therefore a company may have to seek other specific software products that best meet its unique requirements (Adhikari, 1998; Bingi *et al*, 1999). In general, an ERP system package seldom stands alone, therefore the integration of an ERP system package from different vendors is one of the most vexing problems companies meet when they implement an ERP system package (Bancroft *et al*, 1998; Computer Technology Research Corporation, 1999; Everdingen *et al*, 2000).

Companies usually find other systems, whether third-party software, called middleware, or legacy system, that they want to use in addition to their ERP package software (Adhikari, 1998; Computer Technology Research Corporation, 1999). This integration step is clearly not a simple one, and requires a careful approach. Companies must be aware of the potential perils of the errors and take appropriate steps, such as monitoring the transactions and taking immediate steps to correct the problems should they happen. They must also have a formal plan of action describing the further steps to be taken if an error is detected (Bingi *et al*, 1999).

Organisations that underestimate the amount of time and effort involved in ERP integration will exceed their schedule and budget (Computer Technology Research

Corporation, 1999). Companies have to understand clearly the nature of integration and how it affects the entire business (Bingi *et al*, 1999).

Conclusions

This paper has proposed an integrative framework for ERP implementation. Since the field of IT support systems has moved away from stand-alone, dedicated solutions with localised impact to more integrated, flexible, enterprise-wide systems, a fresh approach was needed. In essence, this is the unique contribution that ERP systems bring with them. Not only do they address organisational systems from a business process change perspective, but also, the software configuration is geared towards creating a seamless and integrated 'value chain'.

As far as the relationship between IT and organisation is concerned, ERP systems indicate a radical move from approaches hitherto that tended to have a technical focus towards more appropriately termed 'organisational paradigm shifts'. The current implementation methodologies proposed in the literature are all based on limited experience, and suffer from several deficiencies, including the following:

- Not putting strategic imperatives at the heart of selecting ERP systems,
- Lack of evaluation of current experience with IT usage and inability to map competence in this area.
- Threats resulting from competitors' reliance on IT systems and how they manage to derive competitive advantages out of these modern systems such as ERP.
- Central role that IT plays in enabling core business processes, and therefore the importance of translating the corporate business strategy into an ERP implementation strategy.
- Core skills and expertise available to implement and optimise the use of ERP systems.
- Cultural preparations which are necessary if ERP change programmes are going to yield to successful outcomes.
- Evaluation process for ensuring that optimum benefit is derived from investing in ERP systems, both in the short and long term.

In essence, the paper recognises a series of critical issues that must be carefully considered to ensure successful implementation of an ERP system project. These factors culminate in the framework presented in this paper. The proposed model makes a worthwhile contribution since it has clearly identified factors that are beyond the issues of project management that other authors have been referring to in the literature. Furthermore, adhering to the various levels of application of ERP systems will ensure that organisations can derive maximum benefits from ERP systems, and that the decision-making process and the flow of information

happen in a seamless, corporate-wide perspective. One additional feature of the proposed model, which is very worthwhile pointing out, is that there is a dual process of planning and performing which synchronises the various activities of organisational systems and ensures that there is goal congruence and performance and effective delivery outcomes.

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