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ERP Implementation: An Integrative Methodology

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Abstract: Though ERP systems are being widely implemented in many organisations, there is a lack of unified implementation methodologies that reflect the essential critical factors of success. Research developing such methodologies has been scarce. This paper fills this gap by proposing an integrative methodology based on an extensive review of the essential critical factors of success. Following the generic proposed methodology and framework, it is argued that success can be yielded in implementing ERP systems.

1.   INTRODUCTION

Many companies are radically changing their information technology strategies to maintain a competitive advantage, become more responsive to change markets, and deliver better service at lower cost by purchasing off-the-shelf integrated ERP software instead of developing IT systems in-house (Davenport, 2000; Holland and Light, 1999).

Overall, ERP is a relatively new phenomenon, and the research related to it is not extensive (Al-Mashari, 2000; Nab et al., 2001; Parr, et al., 1999), and its implementation methodologies are still developing. Several approaches and methodologies have been introduced by a number of authors and practitioners (e.g. Al-Mashari, 2000; Gibson, et al., 1999; Bancroft, et al., 1998; Computer Technology Research, 1999; Welti, 1999, Holland and Light, 1999; Bingi, et at., 1999; Markus, et at. 2000; Al-Mashari and Zairi, 2000). However, and generally speaking, there has not yet been a common comprehensive or holistic approach to ERP implementation.

This paper proposes a holistic 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 following sections provide an overview of the proposed framework and a detailed discussion of its elements.

2.   INTEGRATIVE FRAMEWORK FOR ERP IMPLEMENTATION

In essence, there are critical issues that must be carefully considered to ensure successful implementation of an ERP system project. Based on the vast literature review conducted on ERP system implementation, this research has derived a framework of ERP system implementation depicted on Figure 1.
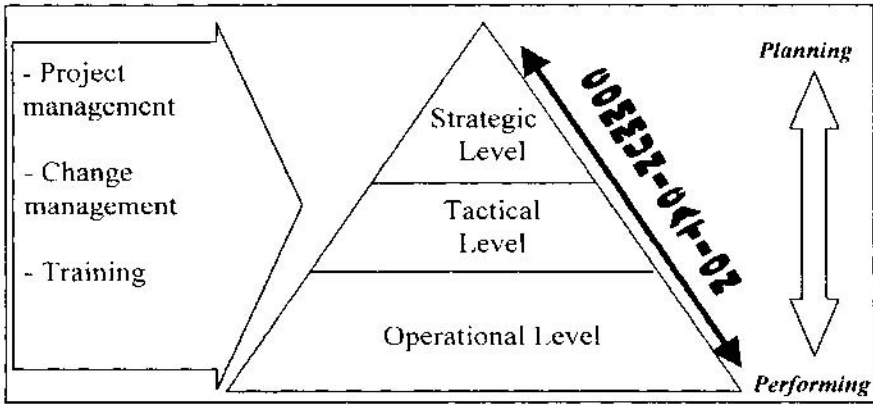

Figure 1. Holistic ERP System Implementation Project framework

As the figure shows, there are critical factors hypothesised to play a more overriding role in the project of ERP implementation. On the other hand, they should be ongoing throughout all implementation's levels. These factors are project management, change management, training, and communication.

The figure also shows that the implementation ERP system has been subdivided into three levels: strategic, tactical, and operational. Each level contains a number of critical factors. The factors of strategic level are current legacy system evaluation, project vision and objective, ERP implementation strategy, top management support and commitment, business case, and benchmarking. The factors of tactical (managerial) level are client consultation, hiring consultants, business process reengineering (BPR), ERP software and vendor selection, and implementation approach. Operational level contains business process modelling, configuring system, final preparation, and go live.

These levels of implementation, however, are not independent of each other and each level should be used to drive to the next level, for example, strategic level should be used to drive to the tactical level, and each level has to be well managed. Moreover, there is a direct relationship between the implementation's levels at which a decision is taken and characteristics of the information required to support decision making (Bocij, et al. 1999).

The following sections will discuss all the levels of successful ERP implementation and its factors. Moreover, the discussion will be based on a comprehensive review of the literature.

3.   FRAMEWORK ELEMENTS

3.1   Project Management

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. Hoffer et al. (1998) argue that the project management activities span the life of the project from initiating the project to closing it.

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 (Peak, 2000). The project management is a practised system necessary to govern a project and to deliver quality products.

Initially, the project manager, in conjunction with the steering committee, will select the project team. Due 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 decision regarding how a process will be completed (Computer Technology research Corporation, 1999).

The project manager must have skills to govern the project successfully (Welti, 1999; Bancroft, et al., 1998) including being a coach, cheerleader, flexible, confidante, mentor, stress resistance, communicative, and visionary.

3.1.1   Project Schedule and Plans

Slevin and Pinto (1987) define project schedule and plans as the detailed specification of the individual action steps required accomplishing the project's goals. If the project has failed, the fact that not every detail of the plan was pursued be typically used as the rationale for the project's failure.

3.1.2   Monitoring and Feedback

Slevin and Pinto (1987) define the monitoring and feedback factor as the timely provision of comprehensive control information at each stage in the implementation process. This is one of the project manager's fundamental tasks (Welti, 1999).

3.1.3   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 and 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.

3.2   Change Management

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', i.e. the business process and change management (Sumner, 1999).

An ERP systems 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. ALVEO (Welti, 1999) prepared its employees for the coming change through management support, information, communication, and training.

Overall, top management commitment, education and training, communication are critical success factors of any change management (Norris et al., 2000).

3.3   Training

ERP systems are extremely complex systems and demand rigorous training. Installing an ERP software package without adequate end-user preparation could yield to drastic consequences. Inadequate or lack of training has been one of the most significant reasons of many ERP systems failure (Kelley, et al., 1999).

ERP training should address all aspects of the system, be continuous and based on knowledge transfer principles wherever consultants are involved (Davenport, 1998b). Welti (1999) cites that every level in the orgainsation class and the various users require different training.

3.4   Communication

Communication is one of the 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).

3.5   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 (Turban, et al., 1999).

The following sections will discuss these factors based on the literature reviewed.

3.5.1   Current Legacy System Evaluation

Adolph (1996) points out that the legacy system contains the existing information technology (hardware and software), business processes, organisation structure, and culture.

In a sense, Holland and Light (1999) argue that the nature and scale of problem that are likely to be encountered could be defined by evaluating the existing legacy system. If organisation's legacy systems are extremely complex, with multiple technology platforms and a variety of procedures to manage common business processes, then the amount of technical and organisational change required is high. Otherwise, if the organisation has already got common business processes and a simple technical architecture, change requirements are low.

ERP systems depend on sophisticated IT infrastructure. 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).

3.5.2   Project Vision and Objective

Slevin and Pinto (1987) define project vision as the initial clarity of goals and general direction, while Bocij, et al. (1999) define it as an image of a future direction that everyone can remember and follow.

A global survey showed that an understanding of business objectives and clear vision are key success factors (Cooke and Peterson, 1998). However, at this stage in the ERP project, the vision should provide a direction and general objective, and no details are required. Welti, (1999) suggests that the project definition should not contain specific goals or strategy and should determine the purpose of the project. The next step would be to determine the ERP objectives.

3.5.3   ERP Implementation Strategy

The ERP implementation strategy will be reviewed to determine the impact of ERP system implementation on the enterprise, while the strategy of ERP system implementation will be overviewed, with details, within the tactical level.

The company has to have a clear understanding of the business implications to avoid a potential peril of failures. Building an implementation strategy for an ERP system project needs to be strongly based on both the business case developed and the results of the series benchmarking test. It should also ensure a full alignment with overall business strategy (Al-Mashari and Zairi, 2000).

3.5.4   Top Management Support/Commitment

Top management support was consistently identified as the most important and crucial success factor in ERP system implementation projects (Welti, 1999; Davenport, 1998a; Sumner, 1999; Bingi, et al., 1999; Bancroft, et al., 1998).

Welti (1999) suggests that active top management is important to provide enough resources, fast decisions, and support the acceptance of the project throughout the company. 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).

3.5.5   Business Case

A strong business case can control a project's scope (Industry Week, 1998). It considers project objective, needs, and benefits. Moreover, a business case can help to convince people of the need for change, and therefore, their commitment to it (Industry Week, 1998).

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. Moreover, they mention that, based on a global survey, the development of a strong business case was one of the key success factors.

3.5.6   Benchmarking

Benchmarking is a technique for learning from other people. Bocij et al. (1999) suggest that the result of a series of benchmarking exercises could be compared against similar items in order to make the best selection.

Al-Mashari and Zairi (2000) argue that the benchmarking can play a significant role in shaping the strategic direction to be taken for change introduction using ERP package.

3.6   Tactical Level

At the tactical level, also termed managerial level, the medium-term planning of ERP specific organisational issues are largely concerned, where the decisions are made by middle managers (Turban, et al., 1999).

The following sections will discuss a comprehensive list of factors at this level, tactical, based on the literature reviewed.

3.6.1   Client Consultation

Slevin and Pinto (1987) define client consultation as the communication and consultation with, and active listening to, all affected parties, manly the client. They argued that the consultation with clients should occur early in the process, otherwise the chance of subsequent client acceptance will be lowered.

It is essential for an organisation to keep their clients aware for their future project to avoid miss-convince.

3.6.2   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.

However, with new technology, it is often critical to acquire external expertise, including vendor support, to facilitate successful implementation (Sumner, 1999). IT research firm Gartner Group (Computer Technology Research Corporation, 1999) argues that the ratio of consulting costs to software costs could reach up to 3:1. Clearly, it is a critical success factor, and has to be managed and monitored very carefully.

3.6.3   Business Process Reengineering (BPR)

As mentioned before, there are two main options to implement ERP systems: modify an ERP system package to suit the organisation's requirements or the implementation of an ERP system package with minimum deviation from the standard settings (Holland and Light, 1999). However, ERP systems are built on best practices that are followed in the industry, and to successfully install ERP, all the processes in a company should conform to the ERP model (Davenport, 1998a; Sumner, 1999). Therefore, to take a full advantage of an ERP software, business process redesign is seen as a prerequisite.

Davenport (1998a), Bingi, et al. (1999), Al-Mashari and Zairi (2000), Holland and Light (1999), Gibson, et al. (1999), O'Leary (2000), and Davenport (2000) all

agree 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; 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 ERP system package prior to BPR project (e.g. ALVEO (Welti, 1999)) to avoid the trouble of a BPR project. If the corporate structure and processes fit well with ERP system package, this approach is possible (Bancroft, et al., 1998). While, some companies started with BPR prior to ERP package (e.g. Digital Equipment (Bancroft, et al., 1998)). Thus answering this question will depend highly on the company's specific situation and as status quo.

In general, the decision as to when BPR should take place in ERP system package implementation, (before, during, or after) remains dependent on the business situation (Bancroft, et al., 1998).

3.6.4   ERP Software/Vendor Selection

Selecting new ERP system software is a difficult task and one of the most risky decisions that most companies face. Moreover, ERP package is not like other off-the-shelf package such as word-processing, spreadsheet, or database software, but rather sophisticated and complex software for the areas of enterprise processes.

An enterprise should choose an expert and a clear method to help select the software system. The complexity of selecting ERP package software can add a lot of time to the ERP system project (Computer Technology Research Corporation, 1999).

3.6.5   Implementation Approach

The company has to take a fundamental decision regarding the implementation approach and clearly select a focused path. There are aspects, such as organisational structure, resources, attitude toward change, or distance between the various production facilities, that influence the company's decision to select ERP system implementation approach. There are three main implementation approaches: step-by-step, big bang, and roll-out. The roll-out approach, which may be implemented as a step-by-step or big bang, creates a model implementation at one site, which is then rolled out to other (Welti, 1999).

However, small and medium size enterprise (SME) cannot afford to spend years on a software project like large enterprise. Therefore, vendors and consultants of ERP system have responded with methods and tactics specifically designed to keep ERP system projects moving. Most enterprises now use a rapid implementation approach, e.g. AcceleratedSAP, or ASAP, (Computer Technology Research

Corporation, 1999). In this regards, companies should consult with ERP software package vendors and implementation partners to understand more regarding specific details of rapid methodology.

3.7   Operational Level

Although installing an ERP software package is not as diffcult 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 and Zairi, 2000). In essence, there is no development requirement, rather, it is business processes (Bancroft, et al., 1998).

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 conducted.

3.7.1   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. SAP calls this task "business process blueprint".

The business process modelling is the complete description of how an enterprise will implement the ERP system package to support its business activities (Buck-Emden, 2000).

3.7.2   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 system lets it works (Davenport, 1998a).

Configuration does not mean the modification of the ERP package, but rather the set-up and configuration of all usage options that are possible in an ERP software package (Buck-Emden, 2000).

The process of configuration differs fundamentally from programming. Configuration involves adapting the generic functionality of the software package to the needs of a particular company, while programming involves creating new functionality of application (Markus and Tanis, 2000).

3.7.3   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).

It is important in this step to assess the end-user well training (Welti, 1999). In general, all testing must be completely prepared and seriously carried out whether for integration or for migration.

Testing helps companies avoid potential problems that might negatively impact customers (Bancroft, et al., 1998). The project teams should test the user-acceptance to gather the more intangible feedback about ERP system package materials (Computer Technology Research Corporation, 1999).

3.7.4   Go 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).

Going live usually goes off-hours (e.g. weekend, holiday, etc.), to allow project teams to monitor how the system performs (Computer Technology Research Corporation, 1999).

By the end of this step, the project management prepares for the acceptance of the productive environment by the steering committee (Appelrath and Ritter, 2000).

4.   CONCLUSION

This paper has made a unique contribution by proposing a holistic 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 furthermore, the software configuration is geared towards creating seamlessness and an integrated 'value chain'.

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 proposed model depicted in Figure 1. 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 by 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 happens in a seamless, corporate-wide perspective. One additional feature of the proposed model which is very worthwhile pointing 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 effective delivery outcomes.

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