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Project Management Optimisation through the Application of Learning to Consecutive ERP Implementations

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EXECUTIVE SUMMARY

Despite advances in technology, software and planning tools that are available to project managers, information systems (IS) projects continue to fail. Storm (2005, pg 1) has suggested that management issues are a central theme in these failures, recommending more thorough training for project managers and improved management overall.

Enterprise Resource Planning (ERP) implementations, arguably the most complex of IS projects, are particularly costly, high risk endeavors (Davenport, 1998, pg 7). When multiple locations are involved, the projects are even more challenging (Boudreau and Robey, 1999, pg 294; Markus et al, 2000, pg 46). This remains true even when a company has completed the strategic planning, the software configuration and the required infrastructural support, as experience shows companies may still face considerable complexity in getting from the capability to the reality.

Due to a configuration knowledge barrier (Robey et al, 2002, pg 40), extensive use is often made of external consultants whose services add considerably to project cost (Haines and Goodhue, 2003, pg 24). By internalising and realising the benefits of a learning process within the business, implementation teams will become more self-reliant as their experience grows, increasing the possibility of success in subsequent implementations (Chang, 2004, pg 7). The challenge is how to achieve this learning effectively and efficiently (Esteves et al, 2002, pg 3). This dissertation proposes that an action learning approach may hold the key to reducing the variability of success in successive projects.

This research has benefit for all practitioners, and particularly Project and Programme Managers working in Information System projects. It shows how incorporating an action learning approach to projects results in savings through doing things cheaper, quicker and better. It further proposes a practical, workable methodology for ensuring how action learning should take place as part of standard project methodologies.

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1 INTRODUCTION

1.1 Aim and Scope of Dissertation

The key goals of project management are to successfully deliver a set of objectives to a customer within agreed time, cost and quality parameters by engaging the required resources to the task at hand (Meredith and Mantel, 2003, pg 9). Enterprise Resource Planning (ERP) System implementations are little different (Pearlson, 2001, pg 230). Parr and Shanks (2000, pg 301) describe how "large-scale ERP implementation projects are high risk and difficult to implement on time and within budget." Despite these challenges, companies persist with implementing ERP software, because, as Davenport (2000, p. 122) concludes, "ERP is the most important development in the corporate use of information technology in the 1990s".

Since ERP implementations are costly and time consuming projects, their success is of immense importance to an organisation, considering the possibility of high returns that the ERP can possibly lead to (Adam and Sammon, 2004, pg 11; Ragowsky and Somers, 2002, pg 12), although these are difficult to quantify (Ohlsson and Ollfors, 2000, pg 139). Due to their complexity, however, such implementations have much uncertainty, and the risk of failure is consequently high (Umble and Umble, 2002, pg 26; Huang et al, 2004, pg 101).

Much research has been done into critical success factors (CSFs) in ERP implementations, as well as into reasons for project failure. At the heart of all of this research is the role of project management (Umble et al, 2003, pg 245; Akkermans and van Helden, 2002, pg 36; Bradley, 2003, pg 1023; Gunson et al, 2004, pg 15; Holland and Light, 1999, pg 34). It would appear that many projects repeatedly experience similar reasons for failure, which suggests that there is little effective learning from the past (Stein et al, 2003, pg 2).

Because the various ERP systems (software packages) offered by vendors are similar in their technical design and functional structure, it has become common for implementation consulting partners to develop template methodologies as a way of standardising implementations to reduce the risks involved (Huang et al, 2004, pg 102). These templates attempt to encapsulate "best practice" as gleaned from experience. There is seldom, however, a structured set of activities to ensure that in a multi-project environment, continued learning is achieved and applied to ensure optimisation of subsequent implementation projects (ibid).

Project templates, incorporating Rapid Application Development (RAD) thinking (Pearlson, 2001, pg 232), that form the base for new implementations, usually consist of:

- a standardised set of project plans detailing -
    - activities/tasks to be performed
    - a time line
    - critical end tasks (milestones)
    - resources required for each task
    - cost of resources
    - quality standards
- a detailed description of deliverables (often including template documents on which outcomes need to be recorded in a pre-defined format) and
- standardised processes and procedures.

In order to be comprehensive in allowing for variations between different projects, these templates are not optimised[1], as this would only be possible in hindsight (after the application of learning from a specific context), due to the high levels of uncertainty and variability in projects.

The inherent complexity of implementation methodologies and the highly technical nature of configuration also create a learning barrier for both the business and project teams, and this results in ongoing reliance, at significant cost, on external consultants who actively participate in ERP implementations (Haines and Goodhue, 2003, pg 34).

This study is based on the largest ERP implementation programme conducted in South Africa to date (entailing direct costs in excess of R650 million over a 4 year period). It focuses on a sub-set of four consecutive implementations within the same cluster of companies in this large multi-national packaging group. An action learning approach was adopted by project management within these projects in order to fulfill the mandate to achieve project success faster., cheaper and with greater quality for each successive implementation. This action learning approach forms the basis of the action research for this dissertation.

Template project plans are developed to be generic and thereby applicable to any ERP implementation. Consequently, in order to offer a comprehensive set of tasks and deliverables, they include many invalid and superfluous tasks for any given project context. It is imperative that project managers who use the template plans as a base spend effort in customising these to fit the specific circumstances of the project to be undertaken, removing unnecessary activities and adding in those that may be required, but not part of the template plans..

This dissertation thus examines the action learning methodology implemented for each project, and assesses to what extent this had a direct impact on improvements in terms of time, cost and quality for successive implementations. This is measured via:

- actual time spent on each project
- actual spend on pre-determined cost elements
- actual quality ratings performed via external, audited implementation quality assessment reviews.
- the proxy of reduced reliance on external consultant resources (and hence reduced cost) due to the successful application of learning in subsequent projects.

1.2 Research Objectives

In a review of information technology and organisational learning, Robey et al (2000, pg 150) identified action research as a possible means for overcoming knowledge barriers, in addition to formal training and the use of consultant intermediaries. Action research would seem to have potential applicability to the problem of increasing learning during **ERP** implementations. The goals of action research, to provide a scientifically sound basis for improving an organisation's practices, are consistent with the objective of improving ERP implementations. Action research thus potentially contributes valuable knowledge to organisations engaged in a specific ERP implementation.

This dissertation has three main research objectives in terms of the implications of findings for project management theory and practice relating to ERP implementations:

1. To investigate how the capture and application of project learning can lead to improvements in ERP implementations.
2. To determine the extent to which an Action Learning approach should become a standard part of multi-project methodologies.
3. To establish how using an Action Learning approach results in Project Management learning being translated into improvements through savings in time, cost and/or quality

1.3 Chapter Outline

The structure of this dissertation is as follows:

Chapter 2 is a full literature review which provides the theoretical framework and grounds for this research, focusing on enterprise resource planning projects and action learning as discussed in the available literature. Sections include:

2.1 The Project Environment, including definitions of projects and project management, their goals, complexities and positioning within organisations.

2.2 Enterprise Resource Planning (ERP) System Implementations, focusing on definitions, implementation approaches and challenges.

2.3 Critical Success Factors and the Measurement of Success, which underpin the learning process under investigation.

2.4 Use of Consultants, in terms of their contribution to projects, the knowledge barriers inherent in their involvement and the challenges of managing them in an optimal way to enhance the knowledge transfer and learning process.

2.5 ERP Implementations as a Dialectic of Learning, whereby the forces opposing and supporting change need to be balanced and the dynamics of the learning and change environment understood for implementation projects to be successful.

2.6 Action Research, which forms the basis of this research, and arises out of an action learning approach as adopted by the ERP implementation projects being investigated.

2.7 Summary of Literature Review, whereby chapter 2 is summarised to highlight the key aspects of the literature review.

***Chapter** 3* investigates the context for implementing an ERP system at PackltCo. It discusses:

3.1 Company Overview, in terms of the positioning of the company in the competitive environment and highlighting key aspects of its value chain.

3.2 The ERP Implementation Programme at PackltCo in terms of strategic goals, tactical approaches, timing and tools available.

3.3 The Target Population of the study, including both the business role-players and the project team.

***Chapter** 4* details the research method and fieldwork conducted, including a rationale and justification for using an action research methodology, and gives measures to ensure validity and reliability of the data collected from various sources.

Chapter 5 provides the research results and analysis, in terms of:

5.1 Project Team Learning Sessions;

5.2 Quality and Time ratings;

5.3 Comparative Project Costs;

5.4 Project Duration and

5.5 User Satisfaction ratings.

***Chapter** 6* discusses the findings and offers conclusions reached in terms of the research objectives established.

***Chapter* 7** offers implications and recommendations of this research for the advancement of management practice in the field of ERP implementation projects.

Chapter 8 recognises the limitations of the research conducted, while ***Chapter 9*** makes recommendations for further research in this field.

2 LITERATURE REVIEW - ERP IMPLEMENTATION PROJECT OPTIMISATION THROUGH ACTION LEARNING

2.1 The Project Environment

2.1.1 Projects Defined

A project may be defined as any series of activities (or tasks) that, according to Stein (2000, pg 15):

- Has a specific objective - to be completed within the constraints of time, cost and quality (or performance)
- Has defined start and end dates (or times)
- Utilises resources (capital, equipment, manpower, materials), and
- Is not repetitive

The Project Management Institute succinctly defines a project as:

> *a temporary endeavour to create a unique product or service. Temporary means that every project has a definite beginning and a definite end. Unique means that the product or service is different in some distinguishing way from all similar products or services* (quoted by Pearlson, 2001, pg 218).

According to Frigenti and Comninos (2002, pg 10):

> *Projects deliver results that assist the organisation to achieve its business outcomes. Integrating the project results as soon as possible into the business and transferring ownership will contribute to the achievement of an organisation's business outcomes ... they are vehicles through which the organisation achieves its changes.*

2.1.2 Project Management defined

The role of project management may be defined as:

> *the planning, scheduling, directing and monitoring of an organisation's resources for a project which has been established for the completion of specific strategic and operational goals and objectives. Moreover, project management uses the systems approach to management through the utilisation of functionally controlled personnel*

(vertical hierarchy) assigned to a specific project (horizontal hierarchy) over its life cycle (Stein, 2000, pg 16).

A trade off exists between time, cost and quality (Frigenti and Comninos, 2002, pg 40) and it is the project manager's role to balance these effectively while achieving the goals of the project (Pearlson, 2001, pg 219). The relationship between these competing forces is illustrated by Kerzner (2001, pg 5):

Figure 1: Overview of Project Management

QOodCustomerfl

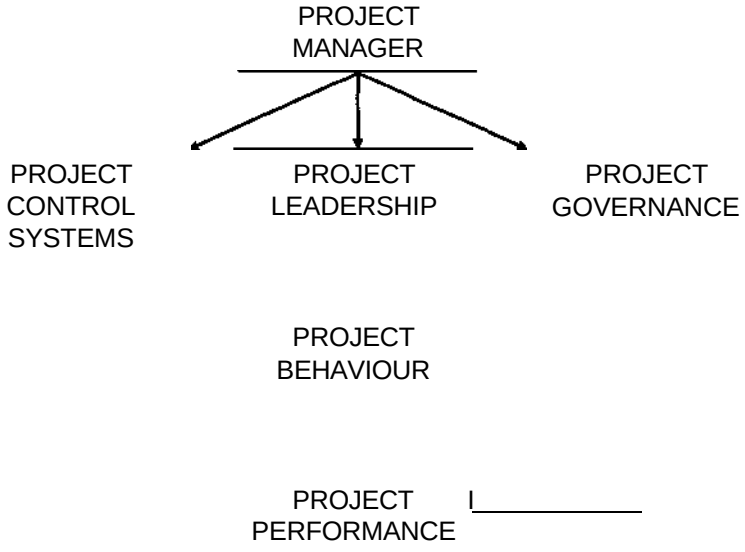
(Kerzner, 2001, pg 5)

Time, cost, quality and customer satisfaction are thus the constraints faced by a project, while delivery is achieved through the effective and efficient deployment of resources to the task at hand. Pearlson (2001, pg 220) lists typical activities undertaking to manage the trade-offs as:

- Ensuring progress of the project according to defined metrics
- Identifying risks and assessing their probability of occurrence
- Ensuring progress toward deliverables within constraints of time and resources
- Running coordination meetings of the project team
- Negotiating of resources on behalf of the project

Storm (2005, pg 13) illustrates how project management is predominantly a relational science that seeks to "manage the chaos of a project". Storm shows how of all the influences exerted by the project manager, those dealing with people and relationships are dominant. This model of project management which will be used in this investigation assumes that a project manager can influence the behavior of his project through three different general means.

Figure 2 : A model of Project Management



(Storm, 2005, pg 13)

1. Project control systems (technical project management issues), including planning, monitoring and control. In more detail control systems involve:

- Planning
    - Identifying the work to be done
    - Quantifying this work
    - Identifying available resources
- Monitoring and Control
    - Tracking progress against plans
    - Making necessary adjustments - while minimising the disruptive effect of variation orders (changes to scope)
    - Analysing the impact

2. Project leadership, such as problem solving leadership, team leadership, coaching and development. Project leadership deals with those leadership traits and qualities deemed important for a successful project manager.

3. Project governance, such as business cases, steering committees and contract strategies. Project governance deals with the structure and formalised power and reporting relationships within a project. The project manager, together with the project champion and sponsor, has significant influence on behaviour and ultimately performance.

The resultant project behaviour is represented by three general categories:

- Behavior that fosters alliance, which can be described as the degree to which all of those who are expected to contribute directly to the project
    - share a common goal,
    - acknowledge the necessity of the contributions by the others and
    - accept the risks of the project. Behavior that fosters alliance is essential to a project, as any project is a temporal alliance of parties with different interests.
- Behavior that fosters focus. Focus means having a clear vision on the results, the scope and the strategy of the project. Behavior that fosters focus is equally important to a project as the parties involved in a project must adapt their vision to new knowledge that is gained during the project and to changing circumstances in the environment of the project.
- Behavior that fosters momentum. Momentum means a positive increase in the speed with which a project is progressing. Progress refers to all the essential processes within the project. These are for instance, mobilisation of resources, defining core problems, searching for potential solutions and deciding on preferred solutions. Behavior that fosters momentum is important because all projects follow, to some degree, a curvilinear path (the S-curve) in their progress from start to finish.

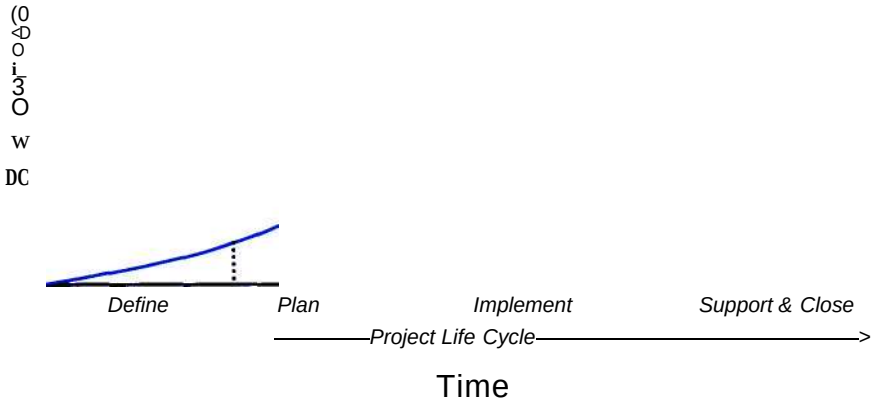
The goal of this behaviour is improvement in project performance which may be represented by two categories:

- Project management performance, as expressed by such well established variables as schedule performance and budget performance.
- Project performance, as expressed by such variables as owner satisfaction, user satisfaction and contractor satisfaction with the results of the project.

2.1.3 Project Complexity, Risk and Success

Because projects are once-off interventions, they have a life cycle that is distinct, yet part of broader product life cycles. The figure below (Gido, 1999, pg 9) illustrates this:

Figure 3 : Project Life Cycle



(Gido, 1999, pg 9)

The majority of resources are committed during the implementation phase and this is where costs are also highest, while during project closure the project team is rolled off. The nature of this life cycle also lends itself to the use of standardised tools and methodologies, based on consistent and repetitive processes that can be applied across a wide range of projects in different business sectors.

Frigenti and Comninos (2002, pg 60) describe the complexity inherent in projects in terms of a series of paradoxes which must be recognised and managed:

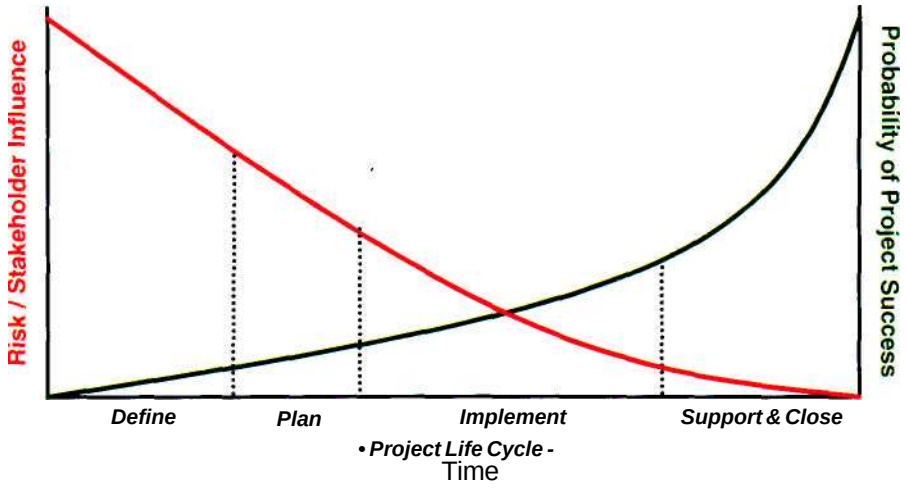
1. Project change requires stability
2. Clarity is achieved by embracing "fuzziness"
3. Business results are the measure of project success
4. Build teams by focusing on the individual
5. Integrate horizontally with a vertical focus
6. Focus on the unknown to achieve certainty

They go further to state that "Managing these paradoxes is not easy, yet they are crucial to successful project outcomes." Pearlson (2001, pg 234) explains how high complexity leads to high risk, and that IS projects are more difficult to manage as a result of this, together with increasing dependence by organisations on integrated IS.

Frigenti and Comninos (2002, pg 35) develop this concept further by plotting the project risk and success profile against the project life cycle. The management of risk across the project

life cycle is a key aspect of project management success. This is primarily achieved through the application of standardised methodology, and its associated advantages (ibid, pg 46).

Figure 4 : Project Risk and success profile



(Frigenti and Comninos, 2002, pg 35)

According to Heerkens (2003, pg 26), successful projects are those that:

- Meet project targets:

  They should be completed on time, within budget and accomplish the objectives
- Are efficient in terms of:
  - making effective use of available resources
  - minimising disruption to the client's operation
  - ensuring the growth and development of the project team members
  - handling conflict
- Satisfy the customer requirements with respect to:
  - Solving the original problem
  - Providing verifiable benefits in terms of increased revenue or lower costs
  - Adoption and use of the product or process as intended
- Improve the organisation through the application of learning

2.1.4 Positioning of Projects in Organisations

Projects exist in the context of organisations, most of which are structured in a functional, vertical hierarchy. By their nature, large projects extend horizontally across the functions of the organisation, hence choosing an appropriate project structure is important for success.

Inappropriate positioning of the project within the organisation will lead to sub-optimal performance (Pearlson, 2001, pg 224).

Organisational structures can be classified in a wide range from functional at the one end to pure project on the other. Meredith and Mantel (2003, pg 200) concede that "the choice of structure is determined by the situation, but even so is partly intuitive." The most common structure chosen for large projects is a matrix structure whereby staffing is provided by functional managers to a project, resulting in a dual reporting line. Kerzner (2001, pg 115) emphasises that there should be no disruption due to dual accountability and a difference in judgment should not delay work in progress. He further states that "When operating under a matrix management approach, it is obviously extremely important that the authority and responsibility of each manager be clearly defined, understood and accepted by both functional and project staff." (pg 121) Frigenti and Comninos (2002, pg 30) advocates a balanced matrix structure that harmonises the power of the project and functional manager. If choice of project structure exists, Meredith and Mantel (2003, pg 201) suggests:

- Determining the kind of work to be accomplished
    - Listing the primary deliverables
    - Listing the major tasks associated with each deliverable and which functional unit will be responsible for these
- Bringing the individuals together in a way that will integrate their efforts
- Taking into consideration the interpersonal issues and political relationships
- Matching skills to technology being employed
- Taking into consideration the needs of the client and the culture of the parent organisation

Once the above has been considered, a structure may be chosen (ibid, pg 202).

2.2 Enterprise Resource Planning (ERP) System Implementations

2.2.1 Defining ERP Systems

Kale's (2000, pg 13) definition of ERP systems is a useful introduction to this section:

> *An Enterprise Resource Planning (ERP) software application package is a suite of pre-engineered, ready-to-implement, integrated application modules, catering to all the business functions of an enterprise and possessing the flexibility for configuring and customising dynamically the delivered functionality of the package to suite the specific requirements of the enterprise. ERP enables an enterprise to operate as an integrated, enterprise wide, process-oriented, information-driven, and real-time enterprise.*

Many other definitions exist in the literature of ERP systems. Adam and Sammon (2004, pg 5) tabulate a number of these effectively as:

Figure 5 : ERP Definitions

ERP Description	Reference
An ERP system can be thought of as a company-wide Information System that tightly integrates all aspects of a business. It promises one database, one application, and a unified interface across the entire enterprise.	Bingi et al., 1999, p. 8
ERP systems are highly integrated enterprise-wide standard Information Systems (software packages) that automate core corporate activities (business processes) such as finance, human resources, manufacturing, and supply and distribution.	Holland et al., 1999a, p. 289 ; Holland et al., 1999b, p. 273
ERP is an integrated package of software applications designed to automate and integrate a company's business processes throughout its entire supply chain and to provide immediate access to business information. ERP systems can be thought of as wide-ranging, general-purpose management information systems (MIS) for business.	Maher, 1999, p. 36
ERP systems, a form of Enterprise-Wide Information System (EWIS), represent sets of business applications that allow for an organization-wide management of operations. ERP systems are seen as optimization and integration tools of business processes across the supply chain (within and beyond organizational boundaries) implemented through modern information management systems.	Al-Mashari, 2000, p. 3
ERP is known as a large-scale, cross-functionally integrated, packaged system.	Brown et al., 2000, p. 1029
ERP systems are software packages that integrate information across the entire organization. This integration removes inconsistencies and enables the organization to attain consolidated reports.	Shakir, 2000, p. 1033
ERP is an integrated comprehensive Enterprise-Wide Information System.	Milford & Stewart, 2000, p. 951
ERP is a comprehensive Information Technology package built on the promise that all critical information should be totally integrated in a single information database.	Wood & Caldas, 2001, p. 387
ERP links all areas of a company with external suppliers and customers into a tightly integrated system with shared data and visibility. ERP systems are designed to solve the problem of the fragmentation of information over many legacy systems in large business organizations.	Chen, 2001, p. 374; Chen, 2001, p. 379
ERP systems are comprehensive, fully integrated software packages that provide automated support for most of the standard business processes within organizations.	Shanks et al., 2000, p. 537
An ERP system is a packaged business software system that enables a company to manage the efficient and effective use of resources (materials, human resources, finance, etc.) by providing a total, integrated solution for the organization's information-processing needs. It supports a process-oriented view of the business as well as business processes standardized across the enterprise.	Nah et al., 2001, p. 285
ERP systems allow a company to share common data and practices across the enterprise and produce and access information in a real-time environment. These systems are designed to solve the fragmentation of information in large business organizations and to integrate information flow within a company.	Themistocleous et al., 2001, p. 195
ERP plays a critical role in improving or reengineering outdated infrastructures, gaining tighter control over internal operations, and driving down costs.	Turban et al., 2001, p. 303
ERP consists of massive computer applications that allow a business to manage all of its operations (finance, requirements planning, human resources, and order fulfillment) on the basis of a single, integrated set of corporate data.	James & Wolf, 2000
ERP systems are large and complex integrated software packages that support standard business activities.	Oliver& Romm, 2000, p. 1039

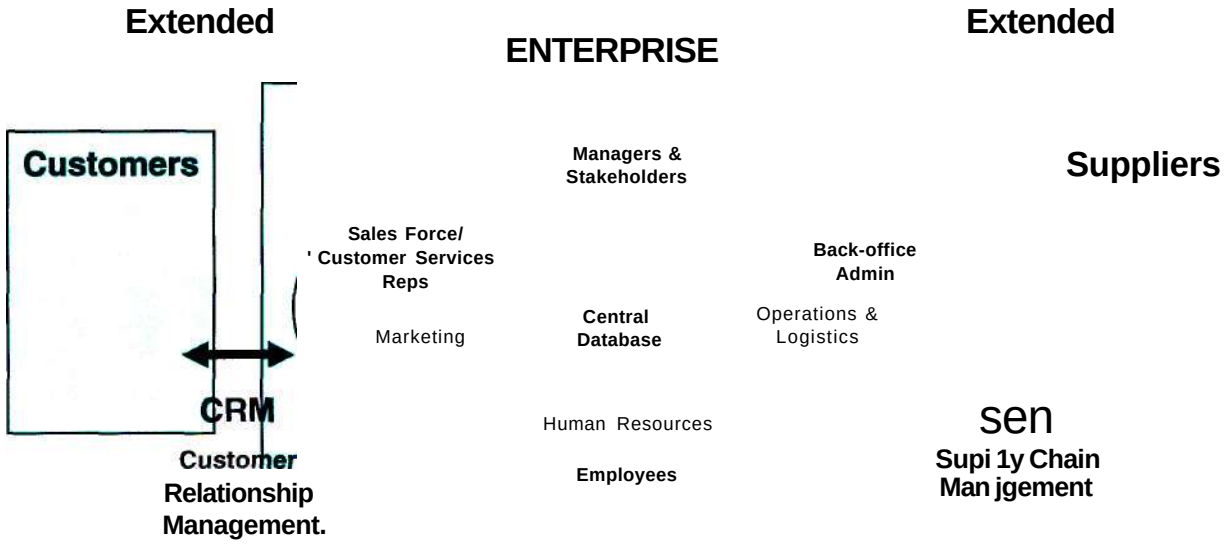
(Adam and Sammon, 2004, pg 5)

Three major benefits are recurrent in giving momentum to a move away from non-integrated (disparate) legacy systems to fully fledged ERP offerings, as discussed by Markus and Tanis (2000, pg 179):

1) a unified enterprise view of the business that encompasses all functions and departments;
2) a central enterprise database where all business transactions are entered, recorded, processed, monitored and reported; and
3) real-time access to information

The scope of ERP systems continues to develop, extending across the full breadth of the supply chain, through new functionality that facilitates effective supplier relationship management (SRM) and customer relationship management (CRM). Current trends also include the web-enablement ERP suites as an enabler of E-commerce transactions (Adam and Sammon, 2004, pg 6). The diagram below attempts to capture the scope of ERP systems, showing how the systems permeate the value chain of an organisation and facilitates the upstream and downstream linkages to suppliers as well as customers.

Figure 6 : Scope of ERP Systems



(Adapted from Davenport, 1998, pg 124 and Chen, 2001, pg 384)

As can be seen in the above figure, ERP systems use a modular structure to support a broad spectrum of key operational areas of the organisation. For example, a manufacturing application normally includes modules that permit sales and inventory tracking, forecasting raw-material requirements, and planning plant maintenance. Typically, an ERP system is integrated across the enterprise (Davenport, 1998, pg 124) with an "underlying integrated

database that stores master and transactional data in a consistent way and with controlled redundancy" (Soh et al, 2003, pg 84).

2.2.2 Implementation Approaches

Ragowsky and Somers (2002, pg 12) contend that:

> *a key implication of ERP is that it involves sweeping changes to a company's organisation, business practices, and core competencies. Few companies begin implementations with the required organisational dynamics and business practices in place. The method of introducing the systems into companies might well make the crucial difference between successful organisational transformation and an abandoned project. Many of the issues involved in implementation are not so much technical as they are people-related and culture-related.*

Because ERP packages provide a tool for business integration, their main benefits may actually come from changes in the business processes, organisational structure, the roles and skills of organisational members, and knowledge management activities (Davenport, 1998, pg 3; Themistocleous et al, 2001, pg 1).

Somers and Nelson (2001, pg 3) emphasise that proper management of scope is critical to avoid schedule and cost overruns and necessitates having a plan and sticking to it. A project scope that is too broad or ambitious can cause severe problems. Modification of the software increases the scope of an ERP project and adds time, cost and risk to an implementation[2]. Strong scope management ensures that there is little if any user suggested changes and customisations.

Parr and Shanks (2000a, pg 301) outline three generic implementation methodologies available to a project manager:

1. Comprehensive: This category represents the most ambitious implementation approach. Typically it involves a multi-national company, which decides to implement an ERP in multiple sites, often across national boundaries. Apart from the physical scope of the

Most ERP systems are highly customisable without having to fundamentally change the software through programmatic intervention. Experience suggests that any software modifications result in greater complexity, and ultimately greater cost due to compatibility problems when upgrades are undertaken.

project, there is implementation of the full functionality of the ERP, and occasionally this may involve the commissioning of industry specific modules. Additionally, because there are multiple sites, usually with independently evolved business processes, the scope and level of business process reengineering (BPR) required is high.

2. Middle-road: This category is mid-way between a Comprehensive and a Vanilla implementation. Characteristically, there are multiple sites (although there may be only one extensive site), and a major decision is to implement a selection only of core ERP modules. The level of BPR is significant, but not as extensive as that required for a Comprehensive implementation.
3. Vanilla: This is the least ambitious and least risky implementation approach. Typically, the implementation is on one site only, and the number of prospective system users is small (less than 100). A decision is made to have core ERP functionality only, and to do minimal BPR in order to exploit fully the process model built in to the ERP. This decision essentially is a decision to align company processes to the ERP rather than modify the ERP to reflect unique business processes. These systems are the least complex.

Although ERP system vendors promote their packages as universally applicable, the "best practices" incorporated in each package may often determine the extent to which an organisation will need to adapt its own processes to the package requirements (Soh et al, 2003, pg 84). It is well documented that such requirements may be a source of severe problems in organisations that do not fit their own processes to those of the package or lack the resources to completely address such issues before the system go-live date (e.g., Nicolaou, 2004, pg 83; Soh et al. 2000, pg 82).

According to Kraemmerand et al (2003, pg 347) if the ERP system is customised to fit the organisation and the basic processes of the organisation are left unchanged, explorative learning will take place but only lead to incremental changes. If the organisation is adapted to fit to the standard within the system, the existing organisational processes will be inclined to change. Depending on the gap between the ERP imposed "best practice" and existing business processes, the outcome may vary from incremental to more radical change (Boudreau and Robey, 1999, pg 294). They go on to warn that although the processes embedded in an ERP may be customised through configuration tables, modification of a package's software code to satisfy organisational idiosyncrasies is highly impractical (Ibid, pg 292). It is usually necessary for an organization to redefine its business processes to fit the

best practices inherent in the software. Thus, ERP is often considered to be a unique kind of technological change, one that is capable of significantly transforming organisations.

The high cost and long implementation process of customisation results in most organisations aligning their business processes with the functionality provided by the ERP program rather than customising the ERP package to match their current processes. According to Forrester Research, only 5% of organisations among Fortune 1000 companies that had purchased an ERP application customised it to match their business processes (Davis, 1998, pg 3). Therefore, implementation of ERP entails using the business models included in the package (Soh et al, 2003, pg 84; Slater, 1998, pg 1). In other words, the business knowledge incorporated in the basic architecture of the software is transferred into the adopting organisation (Lee and Lee, 2000, pg 281).

Other researchers argue that process standardisation, as per the requirements of the ERP system, suppresses local adaptation and learning (Pisano and Rossi, 2001, pg 16). Lacking the opportunity to adapt to local conditions, firms may be overtaken by competitors. Standardisation has also been viewed as an enabler of process duplication by competitors. The structuring of a business process in such a way that it is repeatable within the firm may also make it repeatable outside the firm. Packaged information technology implementation has been singled out for particular criticism in this regard. The broad availability of these technologies and their associated implementation services makes them readily available to competitors. Because of this, investment in these kinds of technologies and services has been viewed as non-strategic (Porter, 1996, pg 77). Davenport (2000, pg 1) goes even further to suggest that investments in these technologies may evolve into a parity move within an industry, rather than a step toward competitive differentiation.

Given this caveat, however, overwhelming opinion is that there are many strategic competitive advantages to be realised from appropriately positioning the ERP in the organisation.

Lee and Lee (pg 287) concludes that:

> *The ERP implementation process should be understood by distinguishing the implementation process from the integration process. In the first implementation process, organisations adopt the 'bestprocesses' by configuring to their environment*

and their explicit processes are then easily transferred to the organisation. However, when it comes to internalising the process, the adopted processes conflict with existing business values and rules and it is the organisational capability to adjust to the conflicts which then provides a process-based competitive advantage. In addition, each organisation has a variety of ranges of 'capability' and options in integrating systems, which will determine their process-based competitiveness.

2.2.3 ERP Implementation Rewards and Challenges

ERP systems have the potential to radically change existing businesses by bringing improvements in efficiency, effectiveness, and the implementation of optimised business processes (Watson and Schneider, 1999, pg 6). One of the key reasons why managers have sought to proceed with difficult ERP projects is to end the fragmentation of existing systems, to allow a process of standardisation, to give more visibility on data across the entire corporation, and, in some cases, to obtain competitive advantage (Umble and Umble, 2002, pg 26). A seamless integration is essential to provide visibility and consistency across the enterprise.

Realising the high promise of ERP systems comes at a potentially high cost (Umble et al, 2003, pg 244), as the transition to ERP is neither easy nor quick. The out-of-pocket costs of software, consultants and staff training are considerably higher for ERP than for most system implementation projects (Esteves et al, 2002, pg 4). Such investments are also risky and many organisations adjust slowly to the inherent complexity of ERP software. ERP projects often experience out-of-control budgets (Aiken, 2002, pg 5), and some critics believe that about half of ERP projects fail to achieve anticipated benefits because managers significantly underestimate the efforts involved in managing change (Umble and Umble, 2002, pg 28; Hoetzel, 2005, pg 6). Many well-known organisations have failed to implement their ERP packages as they intended, either departing significantly from their original design specifications or missing project deadlines. The consequences of ERP project failures are considerable due to their high levels of effort and cost.

Masini (2003, pg 17) offers a bleak warning:

> *Companies that operate in complex and turbulent markets, characterised by rapid technological changes, unpredictable demand patterns, and by the continuous*

emergence of new business models should consider whether an ERP implementation is appropriate at all, even before discussing the type of implementation to adopt (not to mention the choice of a particular vendor). They should also consider whether they possess enough resources/expertise to conduct a radical reengineering of their processes and to accompany the process codification efforts with appropriate upfront investments is process analysis. Conversely, firms that operate in very stable environments and have limited needs for integrating their processes across different locations should consider whether the results of a full-scale implementation would be worth the efforts and the investments they require.

The acquisition of an ERP package thus not only constitutes a large and complex technical endeavor for an organisation but also carries the prospect of major changes in business processes and organisational structure, and the decision to customise or standardise is one that must be taken after extensive due consideration, as there is clearly no simple answer to this paradox.

2.3 Critical Success Factors and the Measurement of Success

Critical success factors (CSFs) were initially devised as a tool for identifying what organisations must do well in order to succeed and determining the information needs of top executives (Rockhart, 1979, pg 82).

ERP implementation critical success factors have been identified and the benefits of their use have been researched by a number of authors (Stjernstrom, 2003, pg 4; Parr et al, 1999; pg 216; Holland and Light, 1999b, pg 31). In addition, determining what distinguishes a critical factor from a non-critical factor and the type or level of criticality led Williams and Ramaprasad (1996, pg 251) to develop a taxonomy of critical success factors. In relation to systems implementations, CSFs exist within a complex social organisation, with interactions between various stakeholders, and are naturally subjective (Parr et al, 1999, pg 119; Williams and Ramaprasad, 1996, pg 257).

Many authors use CSFs so generally that they could be viewed as possible influences on success rather than causal factors. Parr and Shanks (2000b, pg 6) argue that CSFs in ERP implementations are defined factors which, while not sufficient to ensure a successful

outcome, are necessary to achieve success. They suggest that "...both the concepts of causality, and necessary and sufficient conditions, are concepts so rigorous that they were regarded by the authors as unachievable in the analysis of complex social, organisational and technical interactions such as ERP implementation".

Expectations are also a key element in the discussion of success factors (Aiken, 2002, pg 2). Most ERP implementations today result in cost and schedule overruns. The following research by the Standish group (1999), quoted by Aiken (2002, pg 5) illustrates this point:

Figure 7 : Misalignment of Expectations

(Aiken, 2002, pg 5)

- 10% of ERP implementations succeed with full functionality, within forecast cost and time frames
- Cost overruns average 178%
- Schedule overruns average 230%
- Implemented functionality averages 41% of what was desired

These outcomes indicate a lack understanding of ERP implementation complexities by those engaging in them (Themistocleous et al, 2001, pg 2). Routinely, the cost of implementing and the time required to implement are underestimated while the scope of what organisations are able to implement are overestimated (Huang et al, 2004, pg 105; Ragowsky and Somers, 2004, pg 12; Adam and Sammon, 2004, pg 2; Chang, 2004, pg 1).

The literature also recognises that, despite the significant technical challenges posed by an ERP system, it is in fact the organisational factors that are most critical to successful ERP implementation (Constantinos, 1999, pg 802).

The work of several researchers (Bingi et al, 1999, pg 12; Ross, 1999, pg 10; Constantinos, 1999, pg 802; Parr et al, 1999, pg 104; Willcocks and Sykes, 2000, pg 32) investigating factors critical to ERP implementation success identifies the following factors as most common:

- top management support of the ERP project team and the implementation process
- effective full-time project team staffed with top business and information technology (IT) people, and
- commitment to change throughout the organisation.

Somers and Nelson's (2001, pg 7) comprehensive and influential research ranked CSFs as follows:

Figure 8 : Rankings of CSFs by degree of importance in ERP implementation

Critical success factor	Mean
(1) *Top management support*	4.29
(2) *Project team competence*	4.2
(3) *Interdepartmental co-operation*	4.19
(4) *Clear goals and objectives*	4.15
(5) *Project management*	4.13
(6) *Interdepartmental communication*	4.09
(7) *Management of expectations*	4.06
(8) *Project champion*	4.03
(9) *Vendor support*	4.03
(10) *Careful package selection*	3.89
(11) Data analysis and conversion	3.83
(12) Dedicated resources	3.81
(13) Steering committee	3.97
(14) User training	3.97
(15) Education on new business processes	3.76
(16)BPR	3.68
(17) Minimal customisation	3.68
(18) Architecture choices	3.44
(19) Change management	3.43
(20) Vendor partnership	3.39
(21) Vendor's tools	3.15
(22) Use of consultants	2.9

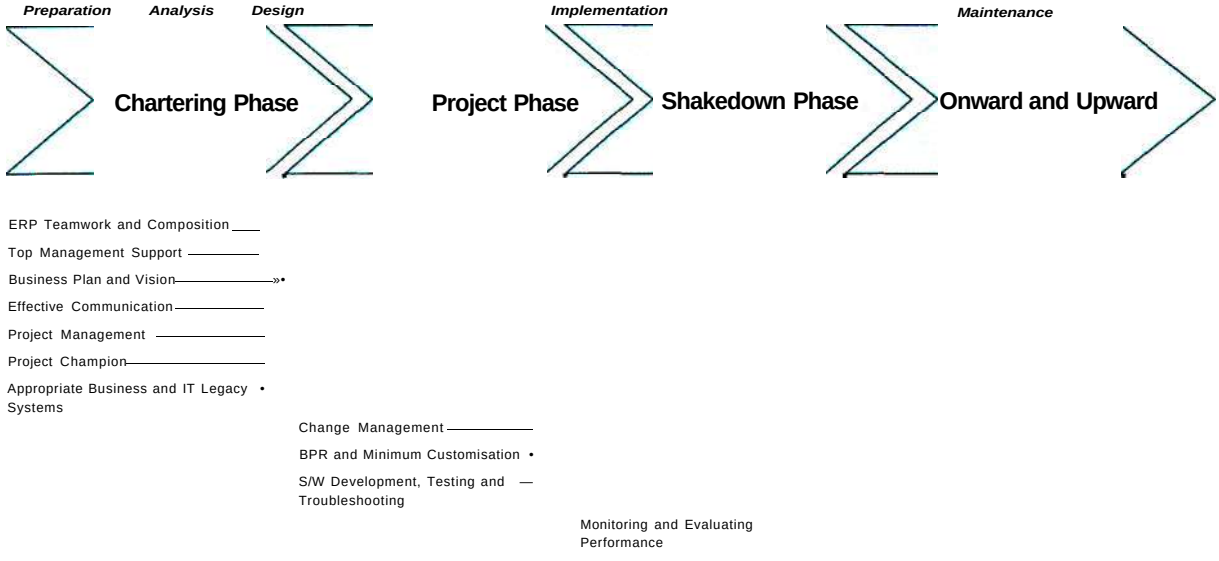
(Somers and Nelson, 2001, pg 7)

More significantly, they not only identified which CSFs are most critical in ERP implementations, but also determined which factors are significant in the implementation process for a particular period in time. "This information can now be used to identify, anticipate, and allocate time and resources across those factors that need attending to for effective project monitoring" (ibid, 2001, pg 8).

The above classification was extended by Akkermans and van Helden (2002, pg 45) who, through the application of a longitudinal case study, showed that interdependencies both indirect and direct exist within the success factors and importantly that "they all influenced each other in the same direction, either all positive or negative, leading to a self perpetuating cycle of good or poor performance".

Somers and Nelson's (2001, pg 7) study is corroborated by Nah et al (2001, pg 290) who show which factors are most influential at a particular phase of an implementation by considering their relationship to Markus and Tanis' process-orientated ERP life cycle model (Markus and Tanis, 2000a, pg 189).

Figure 9 : Classification of CSFs of ERP Implementation



(Nah etal, 2001, pg 290)

Perhaps even more challenging than identifying the factors contributing to success, is the measurement of success itself (Sternstrom, 2003, pg 4). The bulk of emerging academic ERP research has adopted a variance approach, with the main goal of predicting outcomes of ERP implementation from an understanding of antecedent conditions (Markus and Robey, 1998, pg 585).

Lian (2001, pg 8) discusses how the success of an ERP implementation can be defined in two ways:

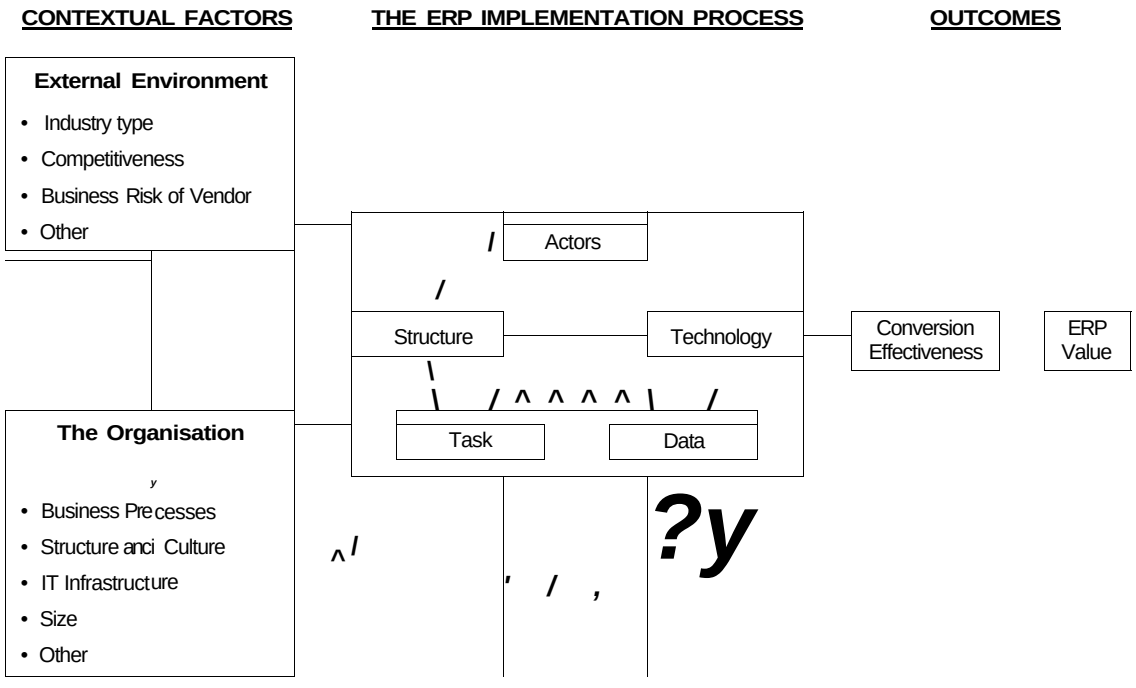
1) An implementation is considered successful if it meets the initial project requirements for going live, such as meeting deadlines, staying within budget and achieving system performance as expected.
2) The cost effective integration of complete business processes using information technologies. Companies satisfied with their ERP software often list dozens of productivity enhancements, including process automation, improved efficiency, tighter integration, as well as elimination of bottlenecks and wasteful procedures.

Thus, success can be defined in terms of project characteristics: meeting project deadlines, working within budget, and sustaining a harmonious relationship among the various participants involved in ERP implementations. Although these are intermediate indicators of success rather than final outcomes, they are important because ERP systems have to be implemented before final outcomes can be realised.

Integration is understood as the value that companies generate from their ERP systems in the medium to longer term. A successful implementation does not necessarily ensure that firms will reap any long term benefits (Umble et al, 2003, pg 244; O'Grady, 2002, pg 10; Somers and Nelson, 2000, pg 1000), but certain factors have been found to be associated with business value. The factors that researchers have identified as key to generating benefits from an ERP include: a set of metrics that clarifies managerial objectives for the ERP, development of process expertise and structures for managing cross-functionally, and clearly assigned accountability for generating benefits (Ross, 1999, pg 3).

Somers and Nelson (2000, pg 999) have developed a model for the integration of contextual factors (both external and within the organisation) that affect the implementation process, resulting in outcomes measured in terms of effectiveness which leads to true value for the business from the ERP. Their objective was to develop a more systematic account of ERP implementations that would be useful for guiding implementation management and advancing ERP research. Specifically, they proposed a unique approach that involved the application of the socio-technical model of systems development to ERP implementations. It provides a basis for identifying and classifying Critical Success Factors (CSFs) according to the model's components and their interdependencies, developing causal relationships, and explaining ERP's impact and value-added on a number of organisational dimensions.

Figure 10 : An Integrative ERP Framework

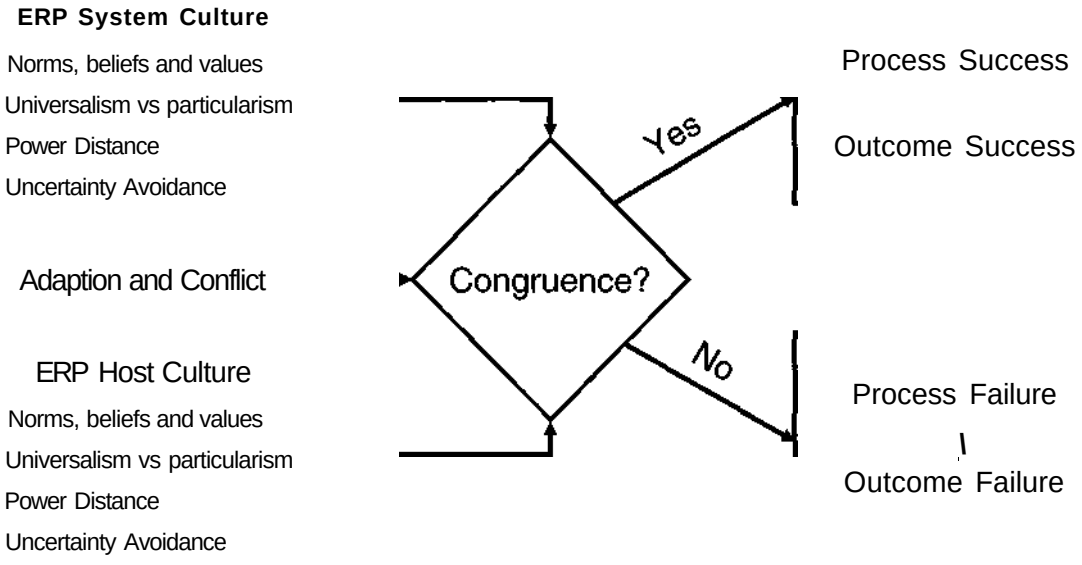


(Somers and Nelson, 2000, pg 999)

Molla and Loukis (2005, pg 6) look at project success or failure in terms of analysing congruence of system and host cultures. They define the system culture as that embedded in the ERP software reflecting the views of the ERP developers, vendors and consultants. Host culture is a culture reflecting the views of the implementing organisation's project team, managers and users. They argue that good congruence between ERP system and host cultures can contribute to ERP success both in process and outcome terms. "The extent of [in] compatibility between these two can affect the process and outcome of implementing ERP" (ibid, pg 13), and thus a lack of congruence can contribute to ERP process and outcome failure.

For the purposes of this research, only project orientated (implementation) success factors were relevant as the scope was confined to the successful project management of ERP implementations.

Figure 11 : Success or Failure framework



(Molla and Loukis, 2005, pg 6)

2.4 Use **of Consultants**

Consultants operate as external intermediaries who facilitate organisational learning by bringing in external knowledge (Westrup and Knight, 2000, pg 638; Robey *et al.*, 2000, pg 145).

The available literature shows that little research has been done into the extent to which effective learning occurs when organisations use consultants. One such study, conducted by Werr (2002, pg 1) does, however, propose that: "projects in which consultants and employees of the hiring organisation interact extensively provide large opportunities for individual learning."

It is realistic to suppose that user organisations do not fully understand an ERP system during implementation, because it may be the first experience of this system for the client. This is why the implementation services from a consulting firm are introduced for a project in the first place, and the user organisation anticipates knowledge transfer to them during the project. Although organisations use consultants as an implementation partner to help during the implementation process, it is also important that knowledge is transferred from the

consultant to internal employees, and in the case of multiple implementations to the in-house project teams, who will be the long term users of the new system (Chang, 2004, pg 6).

Prior to an ERP implementation, a firm has to configure its packaged software in order to specify the business rules that would constrain organisational decision making. Configuration involves populating many tables with business rules. To succeed in configuration, a firm has to understand the capabilities and limitations of the software and be able to describe the business processes that would be supported by the ERP (Lee and Lee, 2000, pg 285). The complexity of the ERP software packages creates significant knowledge barriers (Robey et al, 2002, pg 29.

Typically firms would hire consultants to overcome configuration knowledge barriers inherent in this complexity. Consultants bring external software expertise gained through formal training and prior experience (Chang, 2004, pg 6). Thus consultants apply their knowledge either by configuring the software themselves or by working with the firms' core teams. More successful companies effectively manage the relationship with their consultants (Ibid, pg 7). This entails bringing in consultants to help address specific problems and then letting them go. Sometimes consultants may even be "phased out" before implementations are even completed, although they would be expected to help with future software upgrades. Even where consultants are regarded as being in "the driver's seat," it is important to avoid over-dependence and ensure knowledge transfer (Robey et al, 2002, pg 32). In successful cases, consultants play a key role in transferring external knowledge to the organisation but that role must be carefully managed by the client firms.

According to agency theory (Haines and Goodhue, 2003, pg 27), organisations implementing ERP systems and engaging consultants to fill in the knowledge gaps have to consider that organisational life is sometimes driven by self-interest. For the principal-agent relationship of an implementer and a consultant, this means that the implementer has to be able to control the consultants' behavior to curb opportunistic behavior.

Westrup and Knight's (2000, pg 637) research warns that organisations will continue to be offered the seductive vision of strategic positioning and control through IS. This is the business of both consultants and vendors. But, at the same time, IS in use will continue to fall considerably short of these expectations. They question the much quoted view that ERP

systems incorporate 'best business practice' and show that this is an effect that has to be constructed.

> *One of the key players in this activity is argued to be management consultants. Using empirical evidence the paper elaborates the pivotal role of consultants and proposes that much of the ERP phenomenon is based on the efforts of management consultants to create new markets for their expertise* (ibid).

Haines and Goodhue (2003, pg 33) suggest that the key to ensuring desirable behavior is the knowledge possessed by the implementer. This knowledge enables the implementer to evaluate the consultant's behavior and also determines the level of involvement of consultants in the first place. It is obvious that the more knowledge and skills are available internally, the less dependent an organisation becomes on consultants. But in the case of an ERP implementation, hardly any organisation has all the necessary knowledge in-house. Methodology and technical knowledge and skills needed during the implementation may well be provided by consultants. Some of this knowledge is only needed temporarily and does not have to be retained. The implementer has to be aware, though, that some of the technical skills, such as system administration, system customisation, and a good conceptual understanding of the system, are needed beyond the day of going "live." If not already present these skills need to be transferred into the organisation during the implementation.

Among the more strategic roles in an implementation project are project leadership and management (Lian, 2001, pg 46). Although it is clear that an organisation is better off if it has this knowledge in-house, this is sometimes not the case. The first option is to increase, before beginning the project, the implementer's internal knowledge and thereby limit the need for consultants, especially in strategic aspects of the project. This could be done by hiring appropriately experienced and skilled people into the organisation, which is a challenging task (Robey et al, 2002, pg 18).

Haines and Goodhue (2003, pg 34) also recommend the implementing organisation purchase the services of a second consulting firm, hired solely to give feedback on the first consulting firm's performance. This, however, creates a more complex set of relationships between the vendor and the consultants, having its own set of problems. This is a costly alternative, however, it may be necessary when in house experience is limited, especially if it is made clear to all parties from the time of the initial discussions.

Where companies support the core implementation team and manage their relationships with consultants well, they succeed in overcoming knowledge barriers related to the configuration of ERP software. Where they invest wisely in training and adopt an incremental approach to organisational change, they deal more successfully with the assimilation of the ERP system (Esteves et al, 2002, pg 4; Boudreau and Robey, 1999, pg 294).

The transfer of knowledge is thus seen as a key aspect in the relationship between implementer and consultant (Lee and Lee, 2000, pg 206; Chang, 2004, pg 6). This has implications on how organisations select an "appropriate" consultant. Expertise, experience, and costs are criteria commonly included in the evaluation of a consultant. The organisation also needs to take into account the willingness and ability of consultants to transfer critical knowledge to the implementer, so that effective learning does take place within the organisation. The key is how this transfer takes place, which is dealt with in the next section.

2.5 ERP Implementations as a Dialectic of Learning

The interaction between people with different skills and organisational backgrounds, within the constraints of tight deadlines, budgets and strongly driven objectives, all of which are inherent in large ERP projects, sets the foundation for the learning process. This is best achieved through what Gunson et al (2004, pg 16) term a "community of practice", which is seen as an extension of the concept of project team. The team is required to go beyond merely achieving a set of tasks, by also becoming part of the environment and need to be responsive to the dynamics within it. It is the assertion of this dissertation therefore, that project team learning most effectively takes place in terms of action learning which will be discussed in Section 2.7.

The change brought about by the ERP may be viewed as a dialectic change process that focuses on the balance between forces promoting and forces opposing change (Hoetzel, 2005, pg 7). According to Robey et al (2002, pg 36), the most fundamental dialectic occurs between:

- the old knowledge embedded in business processes and practices associated with legacy systems and
- the new business processes and practices that ERP is designed to support.

Where older processes are deeply ingrained into organisational memory, they represent formidable barriers to the implementation of new knowledge associated with ERP. People trust the familiar and stick with strategies and behaviours, which have been successful for them in the past. When the situation changes, they will keep applying inappropriate and ineffective behaviours and wonder why they no longer work.

Soh et al (2003, pg 97) show how misalignments between the structures embedded in the ERP may directly conflict with the organisations own institutional structures. In many cases, organisational memory is supported by organisational structures in which managers traditionally enjoyed great autonomy and were held accountable only for bottom-line performance. As previously discussed, the ERP is associated with integrated, process-centered models of organisation. Thus, ERP systems typically require organisations to forget large portions of what they already know about technical infrastructures and business processes. In many cases though, despite the need being clear, the alternatives evaluated and the path to success clearly communicated, change fails (Stein et al, 2003, pg 1). As Marsh (2001, pg 30) concludes, "Just being right isn't enough: you have to win the hearts and minds of the people who will make the change happen."

In successful implementations, core teams operate as forces promoting new knowledge against the forces of existing organisational memory, which act as further knowledge barriers.

The challenge is how to turn resistance into acceptance (Umble and Umble, 2002, pg 32). At the core of this process are trust and direct, personalised communication early and often. "It is not that people cannot cope with changes to their working environment - it is the way in which these changes are communicated that causes resistance" (Marsh, 2001, pg 31). As Frady (1997, pg 32) concludes, "employees need to know what is expected of them, they need to believe that what they want and do are important, they need to know how to contribute and become involved, and they need to hear this at a time they are ready to hear it and in a format that makes sense to them."

Research conducted by Robey et al (2002, pg 28) showed how ERP implementations challenge established knowledge in two ways:

1) The software is prepackaged, allowing for customisation only through tables that a firm can configure in order to reflect its business rules. Whereas prior systems implementations started with an understanding of how management wanted to change existing

processes, the starting point in the ERP implementation is an understanding of the software and how to configure it. Because the software is very complex and highly integrated, this was a formidable learning task.

2) As firms replace existing legacy systems with an ERP, they disrupt the processes that are built on those systems and replace them with more standardised, cross-functional processes. This means that firms are not merely introducing new systems capabilities; in most cases they are also attempting to assimilate a new management structure and new management processes into the organisation.

The assimilation of new work processes is a challenge not only for users but also for core team members and other stakeholders such as customers. As Marsh (2001, pg 29) observes: "only people who instigate change enjoy it; other have to suffer it."

Before users can effectively use an ERP system, they must learn to appreciate its implications for their work and learn how to perform any new business processes resulting from system implementation. According to Boudreau and Robey (1999, pg 294), this can be achieved in two ways:

- by providing formal training for users on at least the new systems and in some cases on the new processes, and
- by taking an incremental approach to systems implementation.

User training is a key requirement for ERP implementation (Esteves et al, 2002, pg 3). Implementations may, however, differ in the kind and amount of training they provide (Robey et al, 2002, pg 32). It is possible to distinguish between the training that was designed to teach users the procedures for using the new system, and the education that was also needed to teach the users new business processes. Research shows that a combination of both forms of training lead to greater success (Esteves et al, 2002, pg 6). The role of change management is also important by way of workshops designed to ensure that people meet their performance objectives. Sufficient attention should be given to supporting the cultural change that accompanies an ERP implementation. Robey et al (2002, pg 34) suggest that user knowledge barriers are overcome more effectively when change is introduced incrementally. Firms look for ways to "break up" the huge implementation effort by choosing one site at a time or by limiting the number of modules initially implemented. Other research suggests that forcing in a solution first and supporting the consequences later is more effective.

Werr (2002, pg 22) indicates how the implementation of an ERP system provides opportunities for individual as well as organisational learning in a number of different knowledge areas. These include the way in which operations are carried out (structures and processes), the technical configuration and maintenance of the ERP system and the way in which projects are organised and structured.

As discussed in section 2.3, it is essential that there is sufficient technical expertise in-house to overcome the configuration knowledge barriers, and to achieve this may require substantial effort and cost in providing relevant training opportunities ahead of the implementations.

The learning curve is a tool to map improvement as a result of learning. According to Kerzner (2001, pg 954), current theory and practice shows that:

- The time required to perform a task decreases with repetition
- The amount of improvement decreases as more units are produced
- The rate of improvement has sufficient consistency to allow its use as a prediction tool.

Repetition of operational activities occurs in any project. Invalid estimation of operational learning may lead to more or less serious deviations from expected performance of the project (Arditi et al, 2001, pg 265). Validity of estimation is strongly influenced by such factors as experience and availability of historic data for the particular type of project at hand, disruptions caused by changes, (Eden et al, 1998, pg 138), activity complexity and job conditions (Arditi et al, 2001, pg 276).

Meredith and Mantel (2003, pg 351) illustrates how ignoring the learning curve can have cost overrun implications on a project. Most template-based ERP implementation methodologies in contrast have learning time built in, and may in fact overstate the required resources in terms of time and cost. It is thus important that an action learning approach is followed to ensure that plans are updated to reflect learning in terms of time, resource allocation, content of tasks and definition of deliverables.

2.6 Action Research

2.6.1 Overview

ERP projects are more than a technical endeavour - because there are people involved, any project takes on social and cultural dimensions (Umble and Umble, 2002, pg 31). It is this purposeful working together of people in problem situations that demands research methods that are best suited to this situation. This dissertation uses an action research (AR) methodology, as extensively documented in the literature, to investigate the issue of ERP project management optimisation.

The use of action research in information systems research can be traced to the work of Kurt Lewin in the 1940s (Baskerville and Wood-Harper, 1998, pg 105) in the social sciences. In the information systems discipline, the application of action research to information systems gained momentum in the 1980s particularly due to the development of Soft Systems Methodology by Checkland, which also draws on systems science for its foundations. Since this time, the use of action research in publications has been steadily increasing (Lau, 1998, pg 1), as has the debate on its use as a research method (Baskerville and Wood-Harper, 1998, pg 92). Despite lingering reservations by some researchers, action research is now accepted as a legitimate research method for information systems (Rose, 2000, pg 192; Avison et al, 1999, pg 94).

Action research "aims to contribute both to the practical concerns of people in an immediate problematic situation and to the goals of social science by joint collaboration within a mutually acceptable ethical framework" (Rapoport, 1970, pg 500). It involves simultaneously bringing about change in the project situation (the action) while learning from the process of deriving the change (the research). More precisely, Hult and Lenning (1980, pg 240) define it in the following way:

> *Action research simultaneously assists in practical problem solving and expands scientific knowledge, as well as enhances the competencies of the respective actors, being performed collaboratively in an immediate situation using data feedback in a cyclical process aiming at an increased understanding of a given social situation, primarily applicable for the understanding of change processes in social systems and undertaken within a mutually acceptable ethical framework.*

Baskerville and Wood-Harper (1998, pg 90) suggest it is characterised by:

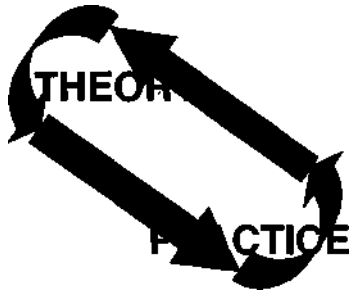
1. multivariate social settings
2. interpretive assumptions about observation
3. intervention by the researcher
4. participatory observation
5. the study of change in the social setting

Clearly research into projects contains elements of each of the above, especially where the researcher is an active participant in the process.

Rose (2000, pg 42) distinguishes between iterative process models (typically where action and problem diagnosis activities alternate until sufficient improvement is obtained) and linear process models (where a set of steps such as analysis, fact-finding, conceptualisation, planning, implementation and evaluation are followed).

Checkland (1991, pg 398) sets out the iterative action research cycle of theory and practice.

Figure 12 : Checkland's Action Research Cycle



Checkland (1991, pg 398)

Theory and practice inform each other in a never-ending spiral. Neither is 'grounded,' that is independent of the other. Checkland, as discussed by Rose (2000, pg 43), also stresses the importance of defining the methodology in advance of the research. This allows conceptual separation between theory, which is embodied in the methodology, and practice; enabling the reflection and comparison which leads to learning about both. In this type of research, Checkland distinguishes between the intellectual framework of ideas (the methodology that embodies them) and the research situation (or area of application).

> *Initially the researcher will select a real world situation as being potentially relevant to research themes significant to him or her. Next, from a research point of view ... it is essential to declare the framework of ideas and the methodology in which they are*

> *embodied. Substantive work can now begin, consisting of the involvement of the researcher in the unfolding situation with a view to helping bring about changes deemed 'improvements'. While doing this the researcher tries to make sense of the accumulating experience, doing so by means of the declared framework and methodology. This may cause a rethinking of the earlier stages (and again it is the explicit declaration of the intellectual framework which makes this possible). Finally the researcher exits from the situation (which is essentially an arbitrary act....) and reviews the experience in order to extract the various kinds of lessons* (Checkland, 1991, pg 401).

As a qualitative research method, action research is thus unique in the way it associates research and practice, so research informs practice and practice informs research synergistically. Action research combines theory and practice (and researchers and practitioners) through change and reflection in an immediate problematic situation within a mutually acceptable ethical framework. Action research is an iterative process involving researchers and practitioners acting together on a particular cycle of activities, including problem diagnosis, action intervention, and reflective learning.

Holwell (1997, pg 12) neatly summarises action research:

> *Firstly, it aims to link theory and practice, achieving both practical and research objectives; secondly it is a process of critical inquiry with a focus on social practice and an ongoing deliberate process of reflective learning and finally, it emphasises analysis of subjective accounts generated by the researcher immersing themselves in situations in everyday settings using qualitative data.*

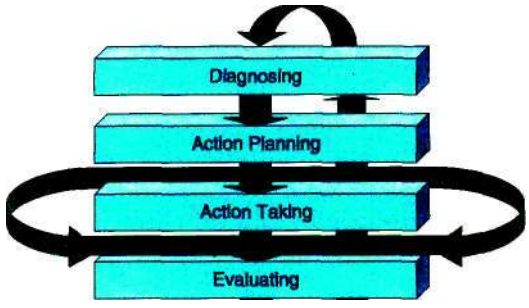
The following section looks in more detail at how Action Research is applied.

2.6.2 The Action Research Approach

As discussed above, action research can be described as a family of research methodologies which pursue action (or change) and research (or understanding) at the same time. According to Dick (1997, online) it does this by using a cyclic or spiral process which alternates between action and critical reflection and in the later cycles, continuously refining methods, data and interpretation in the light of the understanding developed in the earlier cycles. This cycle

takes the form of: diagnose -> plan -> act -> reflect -^ learn (and then -> plan etc.) as illustrated below.

Figure 13 : The Action Research Cycle



(Dick, 1997, online)

As Tripp (2005, pg 445) comments:

> *Most development processes follow the same cycle .... It is clear, however, that different applications and developments of the basic action inquiry cycle will require different actions in each phase and will start in different places.*

Thus each research endeavour is designed specifically to the needs of the research environment.

2.6.2.1 Client-System Infrastructure

The client-system infrastructure is the research environment. It provides the authority, or sanctions, under which the researchers and host practitioners may specify actions. It also legitimates those actions with the express expectation that eventually these will prove beneficial to the client or host organisation (Baskerville and Woodharper, 1998, pg 134). Considerations found within the agreement may include the boundaries of the research domain, and the entry and exit conditions

A key aspect of the infrastructure is the collaborative nature of the undertaking. The researcher works closely with practitioners who are located within the client-system (Lau, 1998, pg 2). These individuals provide the subject system knowledge and insight necessary to understand the complexities being studied.

2.6.2.2 Diagnosing

Diagnosing is the identification of the primary problems that lie behind the organisation's desire for change. Diagnosing involves self-interpretation of the complex organisational problem, not through reduction and simplification, but rather in a holistic fashion (Baskerville and Woodharper, 1999, pg 135). This diagnosis will develop certain theoretical assumptions (a working hypothesis) about the nature of the organisation and its problem domain (Baskerville, 1999, pg 8).

2.6.2.3 Action Planning

Baskerville and Woodharper (1999, pg 136) describe action planning as a collaborative activity between researchers and practitioners that specifies organisational actions that should relieve or improve the primary problems. The discovery of the planned actions is guided by the theoretical framework, which indicates both some desired future state for the organisation, and the changes that would achieve such a state (McKay and Marshall, 2002, pg 4). The plan establishes the target for change and the approach to change.

2.6.2.4 Action Taking

At this stage planned action is implemented through active intervention into the client organisation, causing certain changes to be made. Several forms of intervention strategy can be adopted. For example, the intervention might be directive, in which the research "directs" the change, or non-directive, in which the change is sought indirectly (Baskerville and Woodharper, 1999, pg 136).

2.6.2.5 Evaluating

After the actions are completed, the collaborative researchers and practitioners evaluate the outcomes. Evaluation includes determining whether the theoretical effects of the action were realised, and whether these effects relieved the problems (McKay and Marshall, 2002, pg 9). Where the change was successful, the evaluation must critically question whether the action undertaken, among the myriad routine and non-routine organisational actions, was the sole cause of success (Baskerville and Woodharper, 1999, pg 136). Where the change was unsuccessful, some framework for the next iteration of the action research cycle (including adjusting the hypotheses) should be established.

2.6.2.6 Specifying Learning

While the activity of specifying learning is formally undertaken last, it is usually an ongoing process.

Action research differs from other forms of research in its focus on improving practice as opposed to developing theoretical understandings.

> *The fundamental aim of action research is to improve practice rather than to produce knowledge. The production and utilization of knowledge is subordinate to, and conditioned by, this fundamental aim.* (Elliott, 1991, pg 49)

According to Dick (1999, online), the knowledge gained in the action research (whether the action was successful or unsuccessful) can contribute to:

- the restructuring of organisational norms to reflect the new knowledge gained by the organisation during the research.
- setting new foundations for diagnosing in preparation for further action research interventions (where the preceding research was unsuccessful).
- the growth in knowledge within the scientific community for dealing with future research settings.

2.6.3 Participatory Action Learning as Action Research

The traditional action research approach described above has been extended into a form known as "participatory action research". An important change is the realignment of the roles of researcher and subject into more collaborative and synergistic forms. Formerly, responsibility for theorising rested primarily on the shoulders of the researcher. In participatory action research, this responsibility is shared with client participants. "Members of the organisation are actively engaged in the quest for information and ideas to guide their future actions" (Whyte et al, 1991, pg 20).

This increased client participation is a major change. The single most distinguishing characteristic that contrasts participatory action research from earlier forms is the "co-

researcher status" that is accorded to the client participants (Elden and Chisholm, 1993, pg 282). Researchers and clients bring their own distinctive sets of theoretical knowledge into the action research process. Action researchers bring their knowledge of action research and general information systems theories. Client participants bring situated, practical theory into the action research process. As a result, control over the social setting is realigned. The setting is free to self-reorganise rather than be artificially determined by the external researchers.

By emphasizing collaboration between researchers and practitioners, action research would seem to represent an ideal research method for information systems (Avison et al, 1999, pg 95).

2.6.4 Limitations of Action Research

Action research is not without its problems for the researcher (Avison et al, 1999, pg 96). Of the possible information system research methods, it is among the more qualitative approaches. It is situated outside of valid positivist techniques. There is a lack of generally agreed criteria for evaluating action research complicates the publication review process.

In summary, acknowledged problems with action research include:

- goal dilemmas between the practical problems at hand and the research endeavour (Avison et al, 1999, pg 96))
- value dilemmas between roles as consultant and researcher, such as clients' belief in quick actions (quick wins) versus researchers' belief in careful abstract reflection before action (Rapoport, 1970, pg 510)
- difficulties establishing rigour and objectivity according to conventional positivist natural science traditions (Susman and Evered, 1978, pg 599)
- preoccupation with organisational problem solving at the expense of transferable theoretical understandings (ibid, pg 601)
- lack of epistemological clarity in theory testing and development (Rose, 2000, pg 44).

The action research collaborative framework diminishes the researcher's ability to control the process and the outcomes of the research. This lack of control makes it difficult to apply

action research as an instrument in an orchestrated research program (Baskerville, 1999, pg 15).

A researcher may lose the focus of their original research question due to the influence of the iterative process which may highlight other noteworthy issues, thereby diverting the original research in an entirely different direction.

Despite these problems, action research addresses the need for relevance in information systems research, and provides a rewarding experience for researchers who want to work closely with the practitioner community (Ibid, pg 16). It can be used in many research modes, both to generate new theory and to reinforce or contradict existing theory. It can be combined with other research methods for diversifying a research program. Participatory action research also enriches the research community by drawing researcher-practitioners into the research process.

2.7 Summary of Literature Review

This review started by looking at the specific and distinctive characteristics of the project environment. The scope of projects was defined and the role of project management clarified. Topical issues on project management such as complexity, risk and success were explored with a section on the positioning of projects within existing organisational structures.
This was followed by a definition of a particular type of Information Systems project, an Enterprise Resource Planning (ERP) System Implementation. The available approaches when implementing an integrated, enterprise wide system were critically analysed and challenges pertinent to ERP implementations were discussed.

ERP Implementation projects are complex, high risk endeavours, hence the rate of failure is high. Much research has been conducted in an attempt to determine causal factors that lead to success of failure. An analysis of critical success factors (CSFs) is thus essential for any research that looks at ERP project optimisation, as these CSFs encode much experience and learning accumulated over many years which could assist a project manager to bring more predictability to project outcomes. This section reviewed the existing literature on this topic and showed the progression of research in this area.

Because of the central role played by consultants, and the resultant impact this has on project costs, some issues relating to the use of consultants were presented. These included the challenge of knowledge transfer and appropriate management of consulting resources.

ERP system implementations involve fundamental changes to ways of doing business and they directly impact on people in organisations in a number of ways, with the result that resistance to change becomes a reality faced by project teams (Aladwani, 2001, pg 268). This section discussed the challenges of overcoming resisting forces in order to achieve project success and ensure that learning and competency is transferred and embedded into the new way of doing business.

Research into a project environment lends itself to the use of qualitative methods that are able to accommodate the multivariate nature of the field of study where the researcher may be intimately involved in the social change process of an implementation project. "Action research can address complex real-life problems and the immediate concerns of practitioners" (Avison et al, 1999, pg 95), hence is well suited as a research approach in complex socio-technical environments undergoing significant levels of change (Hoetzel, 2005, pg 4).

The action research approach was defined and discussed and the processes and tasks required to undertake action research were explored, setting the theoretical framework for the research conducted.

3 IMPLEMENTING AN ERP SYSTEM AT PACKITCO

3.1 Company Overview

The target companies in this research, PackltCo[3], manufacture and sell a diversified range of flexible plastics and paper packaging products as part of a larger multinational packaging conglomerate ("The Group")- All six of PackltCo's manufacturing plants (grouped into 4 companies, namely Packitl, Packit2, Packit3 and Packit4) are in South Africa, distributed across 3 geographic regions in the country. It commands the position of market share leader, with over 25% of a R 3.5 billion market, dominating with up to 80% market share in some of its core focus areas. This position is, however, increasingly coming under threat from smaller, more agile competitors. This market is dominated by multi-national customers and monopolistic suppliers. PackltCo employs around 1 000 people in its six physical manufacturing factories and numerous warehouses.

Manufacturing processes are largely capital intensive resulting in extensive "sweating" of assets so as to compete on an "appropriate quality at low cost" basis. PackltCo is under invested in capital equipment compared to international benchmarks, and its local competitors are investing aggressively to attempt to challenge its market leading position. Investment in new technology across The Group is also rare and usually forced onto it by competitors attacking previously secure markets.

Manufacturing processes include the use of large machinery such as extruders, printers, laminators, slitters, tubers, bottomers and other equipment required for the production of flexible packaging end items. As an intermediate input into the production of retail products, demand for flexible packing is predominantly derived demand, based on what consumers want of the final products. This puts a lot of emphasis on forecasting of demand so as to be able to effectively produce raw material and capacity plans for timeous execution, thus enabling manufacturing to meet this demand. Customer collaboration is an important, although not fully exploited, part of this process. A number of raw material inputs required in production have import substitutes which may be more cost effective, but have longer lead times, and thus have to be bought ahead based on sales forecasts so that PackltCo can compete with the large number of smaller, more agile competitors in this market. Raw material imports are also susceptible to exchange rate

[3] A pseudonym has been used for this research

fluctuations. Advanced planning and scheduling (APS) tools were not in use in all of the manufacturing sites.

3.2 The ERP Implementation Programme at PackltCo

A wide range of disparate business systems existed across the individual manufacturing plants in The Group, some of which were outdated and no longer supported by the vendors. As a result of this, The Group was forced to embark on a program to consolidate its enterprise resource planning platforms into a "single instance"[4] across all businesses.

These legacy systems were well entrenched in these businesses, and existing business processes had been honed over the years to the specific strengths and shortfalls of these systems. Management of systems had traditionally been decentralised, with each operation having a fair amount of autonomy as to the way in which their business system was strategically positioned in the business. Consequently, across The Group, there was no system standardisation of reporting, and a number of intermediate software reporting tools were in place to construct reports as they were required. No centralised data warehousing solution was in place, and only financial reporting was consolidated each month to enable The Group to give a consolidated picture of performance.

The Group's core strategy in implementing the new integrated ERP system was to leverage and create competitive value though this single instance business system and accepted best operating practices inherent in the logic and processes of the new system.

Before the ERP Implementations could commence, a large project was launched to ensure that the necessary supporting network infrastructure was in place, including the design and implementation of a country-wide wide area network (WAN) as the new architectural platform for the future ERP system. All desktop computers were analysed and users profiled in terms of their processing requirements into the future, and wherever feasible, all full specification desktop systems were replaced by a centralised model whereby a Citrix infrastructure was implemented and "thin clients" given to users as replacements for their full

[4] *A "single instance " of the ERP software means that all setup and data (master data and transaction data) would be held in a single, common set of databases facilitating ease and standardisation of reporting across the entire business, something that was not possible with the disparate systems previously. This single instance platform also ensures that standardised performance measures (KPIs) could be instituted directly from the common system, saving extensive time where previously substantial manipulation of data would have been required to achieve this, with the result loss of rigorousness and applicability from this "massaging" of information ahead of reporting to key strategic decision makers.*

desktop systems. This was in order to optimise and right size the WAN links that would be required to support the soon to be installed ERP system, by reducing overall bandwidth requirements.

All access to the new ERP and its reporting tools would be through the standard internet web browser interface built as a front end to the "thin client" technology. All equipment on the country wide network was checked for compliance to the new standards and upgrades of communication routers, hubs, switches and cabling were performed at every site in The Group that was targeted to be implemented onto the new ERP system. The necessary bandwidth was procured from the national communications provider, and all network server hardware moved to a secure centralised location. Extensive upgrades were performed to ensure conformity with the upcoming requirements, including putting in place "server farms" and a storage area network (SAN) that would house:

- application servers responsible for centrally processing all ERP transactions entered across The Group
- data storage servers required for both the transactional system and the data warehouse
- Backup and redundancy equipment to safeguard against data loss or service disruption due to system failure
- Citrix servers to host the applications being access by "thin clients" across the network
- e-mail and internet server infrastructures

A centralised call centre and help desk was set up to cope with the planned increase in support requirements for desktop and ERP application support.

With all these pre-requisites in place, The Group was ready to embark on the biggest ERP Implementation programme to date in South Africa. The JD Edwards ERP suite was procured as the most appropriate software solution. The following JD Edwards modules were in scope for all business:

- Planning (including short term scheduling, medium term requirements planning and long term demand forecasting)
- Sales
- Procurement
- Finance and Costing

- Production
- Distribution

Only the Human Resources modules were omitted from scope due to problems associated with localising the JD Edwards remuneration and tax modules for the specific requirements of the South African business and statutory environment.

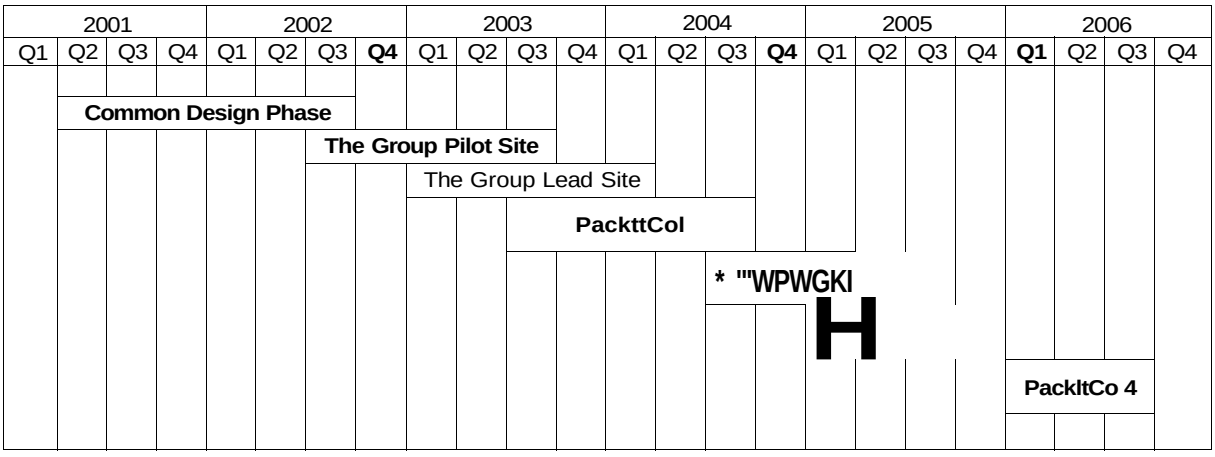
The Group strategy was to design a common solution (known as "Common Design") up front which would then be driven through all businesses in the group with as little modification as possible. The scope of common design ranged from stipulating the philosophy of business to be supported by the system and the types of functionality that would be made available, to the look and feel of the menu interfaces, the security profiles of users and the various system processing options that would be configured.

The development of the common design took place over a period of 18 months with direct input from key business stakeholders to ensure that all foreseen future requirements were incorporated into this design. This would ensure standardisation and maximise the benefits of leveraging the economies of scale in all areas, driven from a base of common reporting on a real time basis. A full "bolt on" business intelligence (BI) suite of software tools was implemented via a dynamically linked data warehouse to provide relevant, standardised and timeous reporting to all levels of the business.

Once the Common Design process was completed, a Group pilot project was set up to test the template implementation methodology provided by the external consultants. This was followed by the Group lead site project, and thereafter the PackitCo companies commenced their implementations.

The PackitCo implementations were a small subset of The Group's full programme which consisted of approximately 50 such projects across a total of production 135 sites.

Figure 14 : PackltCo Cluster ERP Implementation Time Line



(Adapted from The Group Roll Out Plan, 2002)

At The Group level, the full roll-out was managed by a central programme management office (PMO) which was the custodian of the solution, the methodology and the relationship with the external consultants. They maintained an appropriate staffing level of centrally available consultants who were available to assist individual projects as required, and as stipulated by the common methodology. This methodology was encapsulated in:

- The common design (as outlined above)
- A PMO intranet website which contained a full descriptive of the methodology across the various project stages, as well as template documents, together with project management software tools and prescribed standards for deliverables
- 10 template project plans per implementation, covering the phases of the project and against which all projects were tracked. These plans for all implementations were synchronised and consolidated at the PMO level to assist with resource allocation and progress tracking. In total there were approximately 5000 project activities listed across these plans.
- Milestone tracking and quality review checkpoints, including two "Go/No Go"[5] decision points.
- A Change Request review mechanism whereby any requests to deviate from Common Design would go through an extensive feasibility and approval process before being accepted. These change requests would typically require extensive justification, in

The "Go/No Go" reviews occurred at crucial synchronisation points in the plans and involved all stakeholders. This included a consolidation of the risk profde of the project at that point in time, focusing particularly on pre-requisite activities affecting readiness to proceed with further activities.

terms of cost and benefit, in order to be approved as many of the changes would involve the need to write and amend the underlying software code. This could have had severe negative consequences in terms of complexity introduced whenever software upgrades might be needed into the future. The central principal adopted by the PMO was to keep the JD Edwards ERP software as standard as possible.

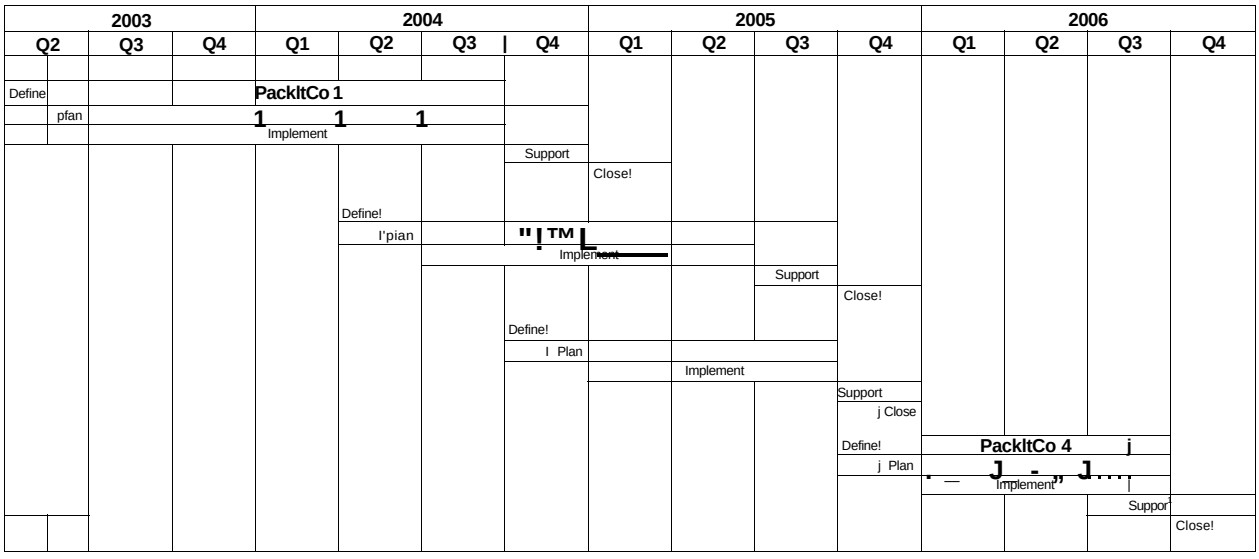
At a high level, each of the PackltCo implementations consisted of a number of distinct phases, namely:

- Define and Plan: This involved:
  - the formulation of a business case to demonstrate how the business would be able to return value back to The Group after the ERP was implemented,
  - the presentation of project and capital expenditure proposals,
  - the formation of the project teams
  - the confirmation of scope with the business and
  - any additional requests that would require the initiation of a Change Request (CR) review process.

  This phase typically had a duration of between one and two months.
- Implementation Phase: This was where the bulk of the project activity took place, during which time the project team would engage with the site and commence the numerous activities needed to implement the ERP. This phase could last from 5 up to 9 months due to intensive work on business analysis, system configuration, user training, testing and process redesign.
- Support Phase: Once the site was technically live with all users transacting on JD Edwards and following new business processes, the project team would go into support mode, whereby they provided assistance, both at a technical and a user level to ensure that the new system steps and processes were "bedded down".
- Close: During this phase, quality reviews were conducted, formal sign-off occurred confirming scope and costs incurred and the project teams disengaged from the sites. The business continued working on the new system supported by the centralised call centre and help desk staff, with the project team and central consultants only being brought in if these first lines of assistance were unable to resolve reported problems.

Figure 15 shows the flow of phases within any one project and between projects.

Figure 15 : PackltCo Implementations showing Project Phases



(Adapted from The Group Roll Out Plan, 2002)

For each implementation project, the nine template sub plans covered the following:

01 Start-up Plan: This included tasks for the initiation and launch of a project and business engagement activities for implementing the ERP at a site. This included establishing the business case, completing a project initiation document (PID), forming the project team and engaging with the site.

02 Change Management Plan: This covered the management of organisational and process changes at a site. The main areas of this plan were:

- ERP and supply chain education
- Organisational structure and process change, which included the identification of new, changed and redundant positions, together with workforce transitional plans, as an outcome to a full process and role mapping exercise
- "As is" and "To Be" process mapping with a full gap analysis and transitional action plans to align the business with new processes
- A project communication plan
- Project quality review requirements

03 Solution Set Up and APS Plan: This plan listed the tasks needed to get the ERP solution up to a state where the site can "go live". The main areas covered were:

- Configuration of the ERP Solution, including:

    - set up of the businesses specific requirements in the ERP solution
    - security set-up
    - technical set-up for the users, printers set-up, batch jobs and any other site specific configuration
- Data Migration - This included data collection, extraction, clean up, population of templates and data loading into the ERP system. A number of progressive data environments were used so as to ensure the population of relevant and complete data, without putting the live system at risk. A project specific training environment and practice area was made available prior to user application training.
- Advanced Planning and Scheduling module configuration

04 BI Implementation Plan: This plan included the selection of relevant Business Intelligence (BI) reports for the SBU from a predefined pool, and the development of any additional reports. It dealt with the necessary activities for the testing of all reports.

05 Training Delivery Plan: This plan covered all ERP user training and education. This included:

- Training needs analysis and training preparation
- Physical set-up of training infra-structure, including training rooms and materials
- Delivery and administration of training, covering:
    - BI training
    - Train the Trainer (key user) training
    - Pre-requisite (introductory) training
    - End user training

06 Acceptance Testing Plan: This plan covered the detailed acceptance testing performed by the key users and ended with the acceptance sign-off by the relevant process owners and project steering committee. This was a final test of how the business would use the JD Edwards application, while indicating levels of user readiness.

07 Cutover Plan: This outlined activities from acceptance testing sign-off to the actual cutover to the new system. It included:

- A 'dry run' of the cut over process, with a formal reconciliation and sign off by the business owners

- "Go / No Go" decision to proceed beyond the point of no return
- Migration of data into the live environment
- Taking on of stock balances and open items
- Capture of opening ledger balances
- Any transactions requiring manual capture

08 Implementation Support Plan: This included:

- Shutting down and archiving of replaced legacy systems
- Procedures for first line (telephonic via centralised help desk), second line (Project team) and third line (consultant and programmatic intervention) support of users
- Daily, weekly and monthly routines for managing the correct working of the system from both a technical and process perspective
- Post implementation Audits of the project, user knowledge, use of help desk support process, control systems and bedding down levels

09 Summary Plan: This plan contained the milestones from all the above project plans and was used by senior management to track the progress of the entire project at a summarised level.

Appendix 1 shows the interrelationship between these plans as plotted on an implementation time line.

3.3 The Target Population

3.3.1 The Business

The target population was determined by The Group's strategy which identified ahead of the implementations, which businesses would be involved. PackltCo had identified that all its business would be affected.

Each project, as part of its initiation, identified and accepted a formalised project structure which was in operation throughout the implementation. This consisted of:

- The Project Sponsor - Managing Director of PackltCo
- The Project Owner - General Manager of the business in which the implementation was being conducted

- The Process Owners - Senior function managers across all process streams, namely Finance, Sales, Planning, Production, Distribution and Procurement.
- Key Users - representatives of each of the major departments in the project
- The Project Manager
- The Project Change Manager
- The Project Team
- Users

The governing body for each project was the Steering Committee, which consisted of the Project Sponsor, Project Owner, Process Owners and Project Manager. Other participants from the project structure were included as required.

Each PackltCo business was divided into system and non-system users. Non-system users had limited involvement in the implementation, relying on project progress reports and communications. System users, numbering between 90 and 125 people in each business, were further classified as "Users" or "Key Users".

The key user sub-set population was selected for their status as more experienced, capable users who would be required to take an actively role in implementation process, as representatives of their respective departments. Key users were required to be involved in:

- Up front validation of the prototype design and solution
- Additional training to ensure they were certified competent ahead of all other users
- Signing off of all data to be migrated from the legacy system to JD Edwards
- User Acceptance Testing (UAT) once the system had been configured by the project team ahead of cut-over
- First line support of users in their departments once the system was live
- Providing training to new users coming into the business post "go live"

The key users worked particularly closely with the project team and were considered pivotal to overall project success, especially in terms of providing a core competence and stability in the business to allow the project team to progress to the next implementation and not be held back due to issues arising post-implementation.

3.3.2 The Project Team

This research focused primarily on the optimisation of project management, hence the project team was central to this process, within the context of the business. The internal project team (excluding centralised consultants) was constituted to reflect the modules to be implemented (Finance, Sales, Planning, Production, Distribution and Procurement). For the first projects each area had both a Business Analyst and a Solution Expert whose respective roles were:

- Business Analyst:
    - Analysis of business in terms of "As Is" and "To Be" processes, as well as the drawing up and execution of transitional action plans to align existing business processes with the requirements of the new ERP system.
    - Proposing organisation structure changes
    - Training of all users
    - User Acceptance Testing
    - 1st and 2nd line support
- Solution Expert:
    - Conducting solution setup workshops to validate the Common Design configuration options selected
    - The configuration of the ERP to reflect the options chosen
    - Surface testing of the initial solution
    - Verification of all data uploads
    - User Acceptance Testing
    - 2nd Line support

In addition the project consisted of the following resources:

- Data migration specialist and Data Analyst
- Business Intelligence (BI) report writing specialist
- Change Manager
- Project and Training Administrator

A full set of consultants, mirroring the specialisations held locally in the project team, managed by the central PMO, was available to the project team on request to assist with any aspect of the project. These consultants were charged out at rates substantially higher than internal project resources and were used only where deemed absolutely necessary.

Part of the mandate to optimise the management of future projects was to reduce, firstly, the number of consultant hours per project, and thereafter to reduce direct project personnel as learning and experience levels increased, as this would have a substantial effect on cost savings.

4 RESEARCH METHOD AND FIELDWORK

4.1 Overview

The researcher was actively involved in all researched projects in the role of project manager, thus was closely involved in all activities and had access to all source records and documentation produced by the ERP implementation.

For the purposes of this dissertation, research was conducted as follows:

- It was conducted over a 3 year period, covering 4 large ERP implementations, across 6 manufacturing sites, with total project variable costs (staffing) of approximately R 60 million.
- Each project was planned to be completed in a period of between 9 and 18 months, with some overlap between each project (see Figure 14).
- A detailed set of learnings from both the business and the project team were collected during and collated after each project. These learnings were obtained from representative samples of project team members and business users directly involved in the implementation. This was achieved through a structured questionnaire and conferencing to arrive at consensus. All learnings were formally documented and published to ensure that particular action points were carried forward to the next project.
- The original template project plans were analysed, and the changes in terms of duration and resource allocation (hence cost) to subsequent plans as the projects progressed were tracked as a measure of methodology improvement. The active project plans were updated regularly (at least every week) to reflect all progress against tasks, and these were used by project management to ensure that all activities were completed, that the required deliverables were met and that critical path items were kept fully on track through forward planning.
- Throughout the project, detailed research, through observation and interview, was conducted. This included formal and informal interactions, including meetings at all levels. The researcher had full access to both the project team and the business at all levels, up to the project controlling body, the Steering Committee, chaired by a senior director from The Group.

- A full quality assessment (QA) of the success of the project, based on a pre-defined set of criteria, was conducted. This used a pre-defined questionnaire and ranking scale to determine a quality rating, as a percentage for the relevant aspects of the implementation project. These criteria were set for all ERP implementations for the Group and covered all factors considered critical for success (CSFs). The Group appointed an impartial officer to ensure that consistent standards were applied to the QA assessment process.
- The results of each QA were analysed to determine areas of measured improvement, and these were compared to the learning that had been captured from previous projects to find links between the capture of learning and subsequent project improvement.
- A change management programme was put in place for each implementation, part of which was to conduct regular interviews (both individual and group) across all levels of the project. The results of these were fed back into the project management loop and relevant actions taken to address issues as they arose. This included pre-engagement readiness assessments, project "health checks" during the implementation, pre "go live" readiness assessments and project close out user satisfaction surveys.
- From the analysis of results obtained above, conducted across all four ERP implementations, it was deduced whether an Action Learning approach to consecutive projects resulted in tangible benefits for future projects through the optimisation of the project management process, as reflected in the template plans in terms of delivery on time, at acceptable cost and to the required quality standards.

In summary, for this research, the objective was to determine whether an Action Learning approach to consecutive projects resulted in tangible benefits in future projects through the optimisation of project management. For this purpose, a case study research design was used. The case study is a well-known research method for exploratory, theory-building research (Eisenhardt, 1989, pg 532; Yin, 2003, pg 14). As a research method, case studies, and certainly single-case ones, score low on generalisability of findings. However, their richness of data lend themselves well for the inductive process of theory building. It is precisely this 'intimate connection with empirical reality that permits the development of a testable, relevant, and valid theory' (Eisenhardt, 1989, pg 532).

The researcher combined the case study approach with a vigorous action research iterative cycle so that the current learnings were used to inform and test future actions in a focused, conscious attempt to add to the body of knowledge relating to the project management of ERP implementations in terms of the benefits of applying learning from a previous project to enhance the methodology applied in subsequent projects.

4.2 Learning as Research

Storm's (2005, pg 9-10) research focuses on the problem of investigating learning in projects. He proposes that the following requirements need to be heeded (These are quoted verbatim in italics below). This was used as a test to ensure that the action research approach taken conformed to the requirements of learning as research:

1. Managerial learning should be distinguished from operational learning and organisational learning. Managers, workers and organisations are distinct entities. It should not be assumed that if learning takes place within one of these entities, similar learning will occur in the others.

In this research the focus was on the performance of a project team which worked distinctly from the organisation, with clearly defined roles and responsibilities. The effect of learning on project success, by optimising project management, can thus not be extended beyond the scope of the project team without further research being conducted.

2. *Learning should be viewed as a process. In order to understand the causes and effects of managerial learning, we must first be able to somehow describe this process.*

The ERP Implementation project process was largely standardised, as described in section 2.3, through the use of best practice template methodologies propagated by the major ERP consulting houses. The tasks on the projects' critical path maintained the logic behind all actions to ensure that there was consistency in delivery.

3. The process of learning should be investigated synchronously with developments in the context of learning. The context of learning changes repeatedly within projects. During project initiation the context is quite different from the context as present during project realisation.

A full change management programme was put in place for each implementation to track, guide and inform the changes that were occurring within the context of the organisation ("the context of learning") and to suggest actions and decisions required at a project management level to reduce risk and assist business users in coping with the extensive changes to their work environment.

4. More than one ideal-type of the process of learning should be used as reference for interpreting observations and other data. Learning is a concept with different meanings. The process of learning is a complex phenomenon which can only be described with the aid of simplified or ideal-type models. It seems unlikely that any one of these models represents the reality of learning to a satisfying degree. Using two or more ideal-type models simultaneously may help us to understand which model has more explanatory value under which circumstances.

This research made use of a number of research instruments to capture the learning taking place through the ERP implementations, ensuring a wide range of data sources were collected and analysed so as to give as wide a view on reality as possible, and to validate this through the triangulation of results. One of the recommendations presented in this research was the proposal to adopt a new model of project learning that resulted from this research. This proposed model would require further validation through corroborative research before it could be accepted as a useful addition to the existing body of knowledge on ERP implementations. As previously discussed, the generalisability of action research is low, although due to the iterative nature of the research conducted, in terms of research in consecutive implementations, clear trends emerged.

5. A multiple of projects should be included in the investigation. Research on the causes of project performance has been dominated, so far, by cross-sectional surveys including large numbers of projects. Research on learning in projects, particularly the Project Based Learning stream of research, has been dominated by non-comparable case studies. What we need now is a stream of longitudinal research in which a multiple of projects is included.

The research conducted was clearly a longitudinal study in that all the ERP implementations were run consecutively using the same basic project team, working under the same overall objectives, in the same broad business environment and strategy, with consistent project management in place, and consistent tools and measures by which to measure delivery against template plans and methodologies.

This research enabled direct comparison to be made between multiple projects in a stream of longitudinal research.

6. The comparability of the projects involved should be assessed or, preferably, controlled. It is quite likely that type of project has an influence on learning within the project. It has been shown, for instance, that learning is less likely in short-term project teams with a strong performance orientation (Druskat and Kayes, 2000).

Due to the action learning approach followed from the outset of the ERP implementations, combined with the factors mentioned in point 5 above, comparability was high for this research. The projects were of sufficiently long duration to allow for in depth reflection and assessment. Indeed this was a standardised requirement imposed on the project from its controlling body, The Group Project Management Office (PMO).

Storm (ibid, pg 11) further points out, as per the italicised points below, a number of challenges that should be addressed:

- *To investigate "knowledge in action" the researcher must be rather involved in, or at least very close to, that action. But, being involved may imply influencing the process of learning itself.*

  The researcher was involved at a project management level in these projects thus was very close to all activities taking place. It was part of the researcher's mandate to ensure that a learning process was in place so as to optimise future implementations thereby meeting the stated objectives of delivering each successive project faster, cheaper and at acceptable quality levels. Indeed, the researcher went beyond merely influencing the process of learning to actively promoting it.

- *Investigating the actions and corresponding learning behavior of project managers over the course of their projects requires heavy investments on the side of the researcher as well as on the side of the project managers. The risk that these investments will not pay off as expected are high. The dilemma is that the greater the length and depth of the study, the higher these risks will be.*

With the researcher working as a project manager in the project, this risk was negated and the researcher was able to ensure the correct depth of study was conducted throughout the length of the projects.

- *Selecting similar projects will increase comparability but reduce the chance of finding strong variances in learning. The quintessence of these dilemma's, it appears, is to design the investigation in such away that it optimises the usefulness to both the researcher and the practitioner. Research suggests that the following measures may help to increase the perceived usefulness:*
    - *Action planning is related to the research effort*
    - *The research enables dialogue within the organisation*
    - *The research uses joint interpretative forums*
    - *The research promotes mutual perspective taking.*

As previously emphasised, by having the researcher working under a clear mandate, requiring a learning process to be part of the implementation, assisted in ensuring that variances in learning were evident. Action learning was a formalised, accepted part of the project, facilitating extensive dialogue at all levels, through the use of interpretative forums which promoted mutual perspective taking.

4.3 Using Action research: a rationale

In this research, the author was actively involved at a project management level in the company. This role was ongoing for a period of 36 months, spanning the 4 ERP implementation projects researched. The author actively participated in all project learning review sessions and the Quality Assessment for each implementation, and had full access to all project documentation and reports. Due to the repetition of the diagnose -> plan -> act -> reflect -> learn cycle, this makes the research conducted clearly action research. This choice of an action research design had several clear benefits.

- First, it provided the ability to observe up close an organisation during a period of strong instability, while it was experiencing periods of most drastic change, when normally no outsiders would be allowed access.

- Secondly, it ensured the direction of the research to be of guaranteed managerial relevance, since company management was closely involved in the research effort as it progressed
- Thirdly, it indirectly generated the close relations and common understanding that enabled the researcher to revisit the company during subsequent periods of change to observe and reflect with members of the organisation and consultants on ultimate levels of success achieved due to the action learning approach applied to the projects.

4.4 Research Quality - Measures to ensure Validity and Reliability

Case study research in general, and action research in particular, is arguably well suited to ensure relevant IS research regarding project implementation, but also poses considerable problems in ensuring sufficient validity, rigor and reliability.

According to Yin (2003, pg 34), there are 3 forms of validity, namely construct, internal and external validity.

Construct validity requires:

- The use of multiple sources of evidence
- The establishment of a chain of evidence
- Review by key informants

Internal validity must ensure the following are in place:

- Pattern matching
- Explanation building
- Addressing of rival explanations
- Use of logic models

External validity requires the researcher use:

- Replication logic in multiple-case studies

Oates et al (2001, pg 4) provide a useful framework for ensuring operationalisation and validation of Action Research. The efforts of this research were measured against these criteria:

- Paradigm: As described and explained, an action research approach was used.
- Purpose: Clear research objectives and questions were established at the outset for this research. The theoretical framework was presented in the literature review.
- Participants: Participation can mean more informants and therefore richer data. Involving participants as interpreters and co-researchers allows the assumptions of the researcher to be challenged. Qualitative data is to be found in dialogue. If the appropriate climate can be fostered, deeper understanding can emerge as a result of dialogue. The goal of having different perspectives was accomplished by:
    - having independent facilitators to administer post-project learning questionnaires
    - involving multiple members of the organisation coming from different backgrounds in consensus sessions where learnings were agreed upon and documented
    - making use of consultant resources to conduct post Implementation Quality Reviews using a ranking questionnaire to determine relative success of the implementation. This questionnaire had been tested prior to this research in previous implementations.
- Process: Action research is emergent. As understanding grows, so action becomes better informed, and so does the methodology which is being used. Multiple sources of data were used. Thus triangulation was achieved by collecting data at different points in time, from different stakeholders and comparing these with project documents, quality review sheets, outcomes from meetings and workshops, and personal research notes.
- Product: Because action research is an action-oriented approach, plans are tested immediately in action. So too can assumptions be tested. Action and research thus informed each other in an iterative cycle.

By reliability is meant the use of case study protocol, thereby ensuring that if the study was repeated, it would have the same results, thereby minimising errors and biases in the study (Yin, 2004, pg 37). This demands careful observation of reality, rather than on accidental circumstances regarding measurement instruments or the researcher's own bias.

Several measures were taken to ensure adequate levels of reliability for this research, thereby limiting personal biases by employing as many independent perspectives and sources of data as possible in an iterative process of data collection, analysis, reflection and synthesis.

4.5 Sources of Data

Data was gathered from:

- all team members of the implementation team responsible for the 4 implementations researched. These team members are all senior business analysts with substantial experience in ERP implementations
- key business process owners and users who were actively involved in the projects
- the project implementation manager

The gathering and consolidation of implementation learning was monitored and controlled by a change management specialist.

The quality review process, which assessed the level of implementation success, was conducted and ratified by the overall Group programme manager, together with the Group Quality Manager.

All User surveys, including readiness assessments, progress reports and satisfaction reviews, were conducted by the Project Change Manager.

For these implementations, a leading firm of ERP implementation consultants was selected at a Group level to partner the process, providing the initial intellectual capital needed in terms of:

- Management consultation in terms of the overall direction of the implementation programme, especially during the Common Design phase
- A template based methodology
- Solution experts to assist with setup and configuration

These consultants were included in all learning sessions.

Yin (2003, pg 85) discusses six common sources of evidence for case study research. They are: Documentation, archival records, interviews direct observations, participant observation

and physical artifacts. In order to obtain a triangulated view of the projects that were researched, and as no single source has a complete advantage over the others, but are in fact highly complementary, a number of data multiple sources of evidence were used.
These included:

- Detailed project plans, listing tasks against which time and resource usage (cost) were tracked. These were tabulated for comparison purposes.
- Detailed notes from participative project team learning sessions conducted after each implementation project. These were tabulated and correlated to facilitate analysis.
- Financial records, especially relating to the costs of consultants
- Project Quality Assurance (key deliverables quality assessment) summary sheets for each project which were tabulated for comparison purposes
- User satisfaction surveys conducted one month after the close of each project which were summarised and analysed.
- Detailed project notes taken from observation and interaction with key resources throughout the period of research. This included presentations, team meetings and personal interactions.

This research showed how the convergence of evidence supported the hypotheses presented by establishing a clear chain of evidence.

4.6 Data Collection

The five core data collection areas for each of the four projects were:

1. Quality and Time Assessments

During each project, the plans used stipulated key Quality Assessment check points at which time the Group Quality Manager would conduct an interim assessment covering work done since the last assessment. These checks would focus on completed tasks pertaining to particular aspects of the project such as Pre-implementation Engagement, Business Preparation, Change Management, Organisational Design, ERP Solution Setup, Business Intelligence, Training, User Acceptance Testing, Cutover, Support, Project Management and Team Management.

This set of interim assessments was collated, circulated to key role players and finalised two months after the "Go Live" of each project and focused primarily on the quality of the projects in terms of completeness of deliverables from an "on time, in full" (OTIF) approach.

The summary rating questionnaire used summarised all the critical milestone tasks in the ten template project plans (see Appendix 5). Each question was ranked according to a 6 point ranking scale (DME = Did not meet expectations, PME = Partially Met Expectations, ME- = Met expectations, but with some gaps, ME = Solidly Met Expectations, ME+ = Met Expectations at a consistently high level, EE = Exceeded Expectations). The percentage figure allocated to each rating was:

EE = 100% ME+ = 85% ME = 75% ME- = 65% PME = 40% DME = 0%

The concentration of weighting in the ME range was a conscious strategy to concentrate effort towards delivering to accepted standards, while severely discounting the rating for those tasks that were delivered below standard. In an ERP implementation, any gap in delivery can have severe consequences for the overall performance of the system, and due to all companies being brought on a single instance of the ERP, any error in configuration or gaps in training could have a highly detrimental effect on the system as a whole, affecting all live companies.

Assessments were first filled in by the PMO Programme Director, The Group Quality Assurance Manager, the Consultant Project Manager and the Project Manager. These ratings were circulated and a meeting held to reach consensus on each rating. As per Appendix 5 objective evidence, in terms of the deliverables of the standard implementation methodology, was presented to justify the ratings and a final rating agreed. The final quality and time scores for each assessment was a key input into the incentive bonus scheme under which all project team members operated.

	PackItl	Packlt2	Packlt3	Packlt4
Quality	67.05%	80.23%	83.41%	82.95%
Time	68.33%	77.38%	76.43%	77.86%

Behind this assessment process was a clearly articulated objective to not only assess performance but, perhaps more importantly, to ensure that areas of weakness could be highlighted and corrective actions taken to ensure improvement and optimisation for the next project. The assessment rating results, as summarised above, are analysed in the next section.

2. Project Costs

A key part of the preparation for each project was the drawing up and acceptance by the project steering committee (Steercom) of a detailed project budget. This budget covered all costs in terms of staffing (internal and consultant costs), subsistence and travel, and training. All ERP and BI software licensing costs, hardware costs and network infrastructure costs were excluded from this budget, and instead incorporated in a monthly charge back mechanism, combined with the monthly centralised support charge, from The Group back to each business once they were live on the new ERP.

Complete and accurate project cost tracking was required throughout the duration of all projects. These costs were reported out of the ERP itself through the Business Intelligence Reporting tool, giving project managers easy access to the cost status of the project at any point in time. The Project Steercom received monthly updates at their meetings on the progress of actual spending against budgeted costs.

The explicit mandate from the Steercom to the Implementation Project Manager was to ensure that, over time, reliance on external consultant was reduced, and that the internal project team members be given increasing responsibility as their skill and experience increased.

A full analysis of project costs is conducted in the next section.

3. Project Duration

Detailed project plans, detailing all tasks to be performed throughout each project, with durations and resources required to meet target dates, were central to the ERP implementations. They were continually updated to reflect progress against tasks, as well as amended by adding new tasks and removing redundant tasks. The project manager was required to update progress against each plan on a regular basis, and all plans were held centrally so that all stakeholders had access to them. Much of the detail for monthly progress reporting to the central PMO was also taken from the plans.

The duration of each project was directly related to the amount of time spent on each critical path activity. The duration of critical path activities also had a straight line impact on project costs, thus any learning that could be used to improve the efficiency and effectiveness of these tasks had a direct financial benefit. Perhaps more significantly, finishing a project sooner

would allow the business to begin the bedding down and value fetching process earlier, which would have substantial benefits in reducing pay back periods.

4. User Satisfaction

A key aspect of the change management activities during the project implementation, was to monitor, measure and report on how users were coping with the extensive change process they were undergoing. This process included one-on-one interviews with users, facilitated group feedback session, readiness surveys and culminating in a post "go live" user satisfaction survey.

As discussed in the literature review, it is essential for a project team to understand the forces at play within the user community, especially those in opposition to the changes being brought about by the new ERP. The results of these change management interventions were used to give direction to further activities aimed at assisting users to cope with the change and to identify the most appropriate and effective means to achieve this.

The user satisfaction survey used for this research was conducted during the second month after "go live" as a means of gathering a consolidated picture of the degree to which the project was perceived to be a success. These perceptions are key, as they ultimately express themselves in actions that will either promote or resist what is needed to bed down the system and fetch the required value. The survey consisted of eight open-ended questions discussed as part of focus groups of between 4 and 8 people, followed by each person completing a questionnaire where they ranked the project in terms of their perceptions in key, pre-defined areas. The sample of users involved in this survey were as follows:

Project	**PackItl**	**PackIt2**	**PackIt3**	**PackIt4**
No. of Respondents	**20**	**27**	**35**	**26**
Total No. of Users	114	**88**	112	**96**
%	17.5%	30.7%	**31.3%**	27.1%

The 8 open-ended questions were:

1. What have, in your opinion, been the benefits of JD Edwards?
2. Was the support given to you, sufficient? How could it have been improved?
3. What in the JD Edwards implementation has been done well?
4. What would you do differently for the next implementation?

5. Are available reports sufficient? How often do you run reports?
6. Which area within JD Edwards needs improvement at your site?
7. What additional training or support do you need to improve your use of JD Edwards?
8. What difficulties have you faced with the JD Edwards implementation?

The questionnaire is included as Appendix 4.

Tracking, analysing and comparing the extent to which user satisfaction improved or declined gave a clear indication of whether applied project learnings were having a felt effect at the user level. This was crucial in determining whether the system would be adopted and actively promoted by the user community as a positive business enabler into the future. It also assisted the project manager to put in place appropriate change management interventions to ensure that any resistance to change was effectively dealt with.

5. Project Team Learning Sessions

At the end of each project, the project team would hold a learning conference where they would look at all aspects of the project to determine areas they felt were done well, which areas required improvement, and what agreed actions and changes should be effective during the implementation that was to follow. This was important in that, although the other instruments used to extract learning gave useful information and input into the project management process, for this to be converted into actions that would actually improve on project deliverables, it was essential that the project team, and particularly project management, internalised these learnings and were able to understand and articulate them into future changes in behaviour. Representatives from the central PMO as well as key business process leaders were also invited to observe and contribute to the process. This insured that a degree of objectivity was maintained during this intense time of reflection, and to steer the project team away from the possibility of being trapped into a "group think" mentality.

These learning conferences were formally conducted, with each project team member being required to do a comprehensive presentation to the team related to the learning within their direct sphere of involvement and influence. Other general learnings were also included at the end of each presentation. The project change manager was responsible for collating the content of these submissions, together with further content added during discussion and debate, into a formal learnings document which was handed over to the project manager for review. This was used by the project manager in the review of template plans in preparation

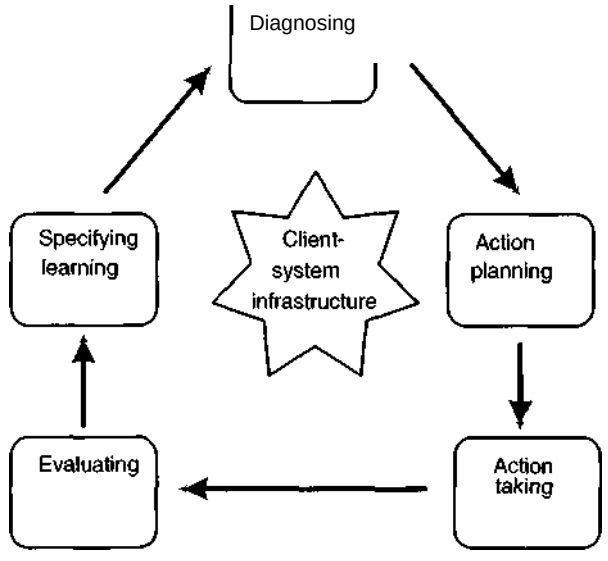
for the next project, and wherever feasible, changes made to activities to reflect these learnings. At all times the key project management goals of delivering to the business the required scope as quickly as possible, in the most cost effective manner, while maintaining an acceptable level of quality, were used to balance all proposed changes to ensure that overall risk was reduced and the project management process was truly optimised for the next implementation.

The above five core sources of information were used to establish the extent to which project learning resulted in optimisation of project management for consecutive ERP Implementations. The next chapter presents, analyses and discusses the resultant findings in detail.

5 RESEARCH RESULTS AND ANALYSIS

This chapter analyses the multiple sources of data collected throughout the duration of the PackltCo ERP implementation projects. The project team learning sessions were the core forum used to support the iterative action research approach adopted, as outlined in the literature.

Figure 16: The Iterative Action Learning Cycle



(Baskerville and Woodharper, 1998, pg 134)

Through the team learning session mechanism, all sources of data, as described in the previous chapter, were collated, analysed and synthesised as part of the evaluation process, with all learning formally documented, distributed to all stakeholders and officially verified and accepted by the project Steering Committee. Thus the knowledge gained in the action research (whether the action was successful or unsuccessful) was used in three ways:

- Firstly, for the restructuring of the project methodology to reflect the new knowledge gained during the research.
- Secondly, where prior actions and changes were unsuccessful, the additional knowledge provided foundations for diagnosing, in preparation for further interventions in subsequent project iterations.
- Finally, the success or failure of the theoretical framework provided important knowledge to the scientific community faced with future research settings, as presented in the recommendations in Chapter 7.

The role of project management was thus to translate (diagnose) the outcomes of the learning sessions into actionable tasks, and institute the necessary changes to the implementation methodology. This action planning phase resulted in planning changes to timelines, activities, people resources and deliverables. Baskerville and Woodharper articulate this as "The plan establishes the target for change and the approach to change" (ibid, pg 135). These changes were implemented by the project team in the project that followed, where after a new data set was gathered, leading on to a further iteration of the action learning cycle.

Throughout this iterative process, the project team was able to "bridge theory with practice, allowing them to solve real-world problems while contributing to the generation of new knowledge" (Lau, 1998, pg 12).

5.1 Project Team Learning Sessions

The project team learning sessions conducted at the end of each project, as outlined in section 4.6, looked at answering three questions:

1. What was done successfully?
2. What were the areas requiring improvement?
3. What were the learnings from this and what should be done differently?

A number of common threads emerged and these were carefully analysed by project management after each project to ensure that improvements to methodology, through changes to plans and deliverables, on the next project were implemented.

5.1.1 Packltl Learning

The learning areas of the Packltl project were documented after extensive debate and verification with all key stakeholders. This section analyses these.

1. **Data**

This was an area of significant learning on the Packltl implementation, and resulted in a variety of poor quality issues, as support by the post implementation quality assessment review for Packltl, where data score a rating of ME, but with a number of qualifying statements added by the PMO. There was general consensus among the project team that data must be accurate and correct before being migrated. This meant that the business needed to

clean their data in the legacy system before the migration to JD Edwards, and a more substantial checking process should be in place. This was recorded in the report on Packltl project learning as:

> *The business and the team should take this matter seriously and take action earlier rather than later. Consequences of migrating wrong or inaccurate or old data must be explained until accepted and understood. The business must buy-in with regard to the importance of data and do the cleanups of master files, open items and balances.*

More formalised checking, sign-off and hand-over procedures were initiated between the project team and the business and central data consultants. Full tracking of the progress of any particular upload was also put in place to reduce errors during the upload process.

Another suggestion documented was:

> *Careful consideration should be given to manually capturing some data to the new system rather than bringing data across electronically. A specific example is open sales orders and open foreign purchase orders.*

This suggestion arose due to errors in the technical mapping software that was used to populated the correct JD Edwards data fields. As a result of this, the software was corrected, and both open sales orders and foreign purchases were captured manually into the system during cutover. This improved data quality substantially.

> *Involve the Master Data Administrators (MDAs) from day one as correctness and relevance of data is the core of the JDE or for that matter any ERP system. We need to ensure that the master data administrators (MDA) are totally aware as to their roles and responsibilities within the JDE system. They need to understand the standards and will have to enforce adherence to the standard data principals.*

For all implementations after Packltl, the MDA position was filled from the launch of the project as a dedicated resource that joined the business after "go live". This approach greatly reduced the problems experience in the Packltl project.

2. Role Mapping and Process Flows

The following learning was recorded for this:

> *These should be accurate and complete and communicated to each user. At cut over, as users started using JDE, there were some activities and tasks that could not be accessed. The new business rules and processes were not communicated /understood /followed. More effort and attention to detail in this area is needed. More focus should be placed on the "to be" process and this process needs to be workshopped by the team and communicated to all the relevant stake holders in the business.*

The template methodology for this set of activities proved to be totally unworkable, and was substantially rewritten after the Packltl implementation. The project plans were simplified from a list of 146 tasks, down to a streamlined 56 tasks.

3. Training and Competence

This learning arose due to a number of users being ill prepared to operate JD Edwards efficiently, despite having been assessed competent via the training methodology.

> *Check windows skills with all users. Do not make assumptions that using a non windows system provides sufficient skills to use JD Edwards. Users did not practice in the environments provided and thus did not hone their skills as they should have. Some team members felt that training should have been closer to cut-over as many had forgotten what they had been trained on.*

A basic computer literacy assessment was devised to target users who may struggle with the new "look and feel" of JD Edwards. Any users who failed this were sent on additional training before attending any JD Edwards training. In addition to this, the orientation and overview course, which set the base for all training that followed, was rewritten ahead of the Packlt2 project. Refresher courses were added to the methodology to overcome the problem of the time between training and going live on the new system.

> *Revise the training material to be in line with requirements of the end user as the current training manuals are more conducive to training of consultants and project team members, and should rather be task/role based training manuals.*

Training materials were continually improved, and trainers on each project were required to customise each course to more closely reflect the actual configuration of the business involved, rather than giving very broad, generic training that was difficult for users to translate into actual activities to be performed after their site was live on JD Edwards.

4. Key Users

These were the people who would support and carry the system after the team had left. In some areas the business did not commit, or did not have people with the right level of skills as key users.

> *The team should have daily access to the key users and they should be very skilled in the system by the time the team leaves.*

A more fomalised approach to key users was set up with regular contact and closer involvement in project activities. The concept of a training bootcamp customised specifically for key users was put in place for the Packlt2 project, offering intensive exposure to the system within a small group to afford key users the opportunity to quickly upgrade their skills.

5. End Users

> *More time should be spent on User Acceptance Testing of the system and reports with end users.*

This proved very difficult to address, as the business was put under extreme pressure during the implementation, which meant that taking out users more frequently to be involved in implementation activities was simply not practical. This problem was carried forward into the Packlt2 implementation.

Perhaps a more significant learning related to the change management process that was in place for end users:

> *End users need to take ownership of the JDE system well in advance - try and curb the negativity that is so inherent!*

This was the first warning of the impending change curve slump that occurred during the Packlt2 project.

6. Reporting Tools

The Business Intelligence (BI) reporting tool was not fully developed or bedded down for the Packltl implementation, resulting in the business experiencing a severe shortage of information directly after "go live".

> *Great expectations were created with regard to BI reports. BI reports should have been available in the test environment.*

This problem continued right up to commencement of the Packit4 implementation and was a cause of great frustration despite the clear expression of this learning below:

> *We need to ensure that we deliver all the basic reports that the business needs to operate successfully on a daily basis. First prize should be for us to deliver most of these reports out of the ERP system. It was totally unacceptable that we could not deliver basic reports that the business required.*

7. Basic Business Principles and Disciplines

The basic business principles have to be in place as JDE relies on strict adherence to rules and discipline.

> *Encourage the users to see the relationship between what they are doing and the rest of the business. All system requirements must be met for the benefits to flow from JDE.*

No workable changes were proposed for Packlt2, and this problem also persisted.

> *The business must ensure that their staff has the basic business practices and principles in place because without this chaos will reign as JDE relies on huge discipline. Integrity errors and huge month-end variances will be the order of the day if we do not apply the basic manufacturing and logistic principles.*

Packltl and Packlt2 experienced extensive system integrities as a result of the above learning not being implemented.

8. Relationship with Consultants

There is a certain degree of mistrust between central consultants and the project. This is evidenced by requests for access being withheld. This includes:

- *request for 'enquiry only' access as well.*
- *By the language which is used in communication.*
- *By unnecessarily pedantic requests for printed copies of all documentation despite the information being available in summary form and in the system.*

At times it felt like we were not working on the same team with the objective to achieve our go live date.

A decision was made to appoint a central project representative and consultant account manager to work closely with the implementation project manager to improve and refine this relationship on the Packlt2 project.

9. Help Desk Support

Turn around time from the help desk was too slow, especially for granting access (over a week at times and on average up to 2 or 3 days was the norm). Often times we were told access was granted when in fact it wasn't causing unnecessary delays since another call had to be made. Perhaps some training for the project team on how the security works would assist in an understanding of the complexity involved and what we could do to make the task easier for the help desk.

Corrective action was put in place for the next project by ensuring that the consultant responsible for security and access setup was brought onto site during key times in the project, including testing and cutover activities.

The appointment of a local/cluster security officer may also assist in the speedy resolution of these issues. This person would obviously need to be appraised of the audit, business and shared service centre requirements in regard to security. A lack of clear direction from the project for the help desk in this regard may have contributed to delays.

This learning was only implemented after the Packlt2 implementation when a PackltCo Master Data Administrator (MDA) was appointed, which greatly consolidated this process, removing a number of responsibilities away from consultants.

10. Technical Learnings

The balance of the learning for Packit 1 was within the process streams (sales, procurement, finance, production, planning). These areas of learning were primarily technical in nature and reflected the increase in experience and knowledge of the team, and their steady reduced reliance on consultants. A few examples of these learning were:

i) Sales:

a) Solution Set-up

Plenty of preparation was done prior to the solution set-up workshops to determine the business needs and as such the Solution Set-up workshops went down well with management and the key users.

Thorough preparation remained a vital component of all tasks, ensuring that all business requirements were accurately captured and converted into the appropriate system configuration and new business processes.

b) User Acceptance Testing

Users completed extensive tests in a formal environment against relevant business data. All tests and results were properly documented. Printed output, such as Invoices, were physically printed and checked for correctness.

Testing continued to receive much focus, ensuring that all scenarios and transaction combinations were meticulously checked and understood by business users. This mitigated much of the potential risk of faulty technical configuration of the ERP system.

c) Training

Users were trained using data that was relevant to the business. This made their understanding of the courses much easier.

Although requiring substantial preparation of data in the training environments, using data that the business was familiar with greatly assisted them in overcoming the knowledge barrier inherent in the new system and processes.

d) Pre go-live audits

All user logins and access were double checked but more time to be allocated to them in future because we couldn 't always check every user profile as closely as we would have liked. We also found that the one-on-one auditing provided the user with a good opportunity to ask questions about their future role as well as discuss any concerns they may have had. It was found to be very beneficial to all.

This activity proved effective in avoiding potential frustration and problems that would otherwise have surfaced during cutover to the new system. The documents used in these audits were update and improved to ensure that a wide range of potential issues was timeously identified and resolved.

e) Go-Live

On the whole was successful and everything ran smoothly from the onset due to the vast amount of preparation and application of learning's from the Pilot project "go-live".

Preparation and the application of prior learning remained a focus area during this high risk time of each implementation.

ii) Finance:

a) Mapping of legacy system to JD Edwards Chart of Accounts

End users were very confused as to which business unit, account and subsidiary to use when capturing transactions. They should have been given a document pointing out the legacy account and the new account to be used. Accounts on the GL were not linked due to management oversight. The end users brought in requests as and when they could not find the appropriate accounts.

The transition from the legacy system logic to the new ERP requirements proved very challenging for the business, and this forced the project team to spend more time focusing on these changes, and not just on technical software applications training.

b) Invoicing

All credit notes "correcting" an invoice created via Sales Order Processing must be entered via Sales Order Processing. If this rule is not adhered to, the Sales reports will not include the credit notes.

This is an example of project team member inexperience, whereby the real implications of particular system transactions only become evident after the users had begun to use the system. This necessitated changes to training materials to emphasise these important learning areas.

c) Training

The users were totally ignorant as to cleaning out their submitted jobs and work centre messages. Thus they get confused with all the reports sitting in the job queue and work centre. Users had to be taught skills like exporting screens to spreadsheets in order to make the correction process easier.

This was clearly a training gap due to standardised training materials missing certain key areas. Training materials were continuously reviewed and updated based on this type of

learning to ensure that subsequent training was more relevant to what would be required once the users were transacting.

d) Data Migration

Accounts Payable users were very frustrated by the fact that not all the banking details were populated into JD Edwards from the legacy system. This reported errors and delayed payments and payment clerks were under tremendous pressure to get their work completed. Get the business involved in validating the templates e.g. fixed assets, customers, suppliers etc. They are most familiar with their legacy data and their checks would be more thorough.

Omissions of this nature posed significant business risk due to delays and inaccuracies in such a crucial as accounts payable. As recommended, further checks were implemented to avoid this recurring in future projects.

e) User Access and Security

Authority problems were frustrating. Certain users had access on the previous environments and were restricted on the live environment. Banking details approval authority was an issue. The business feels that there is not sufficient security around this.

Again, this is an area of significant risk that had to be comprehensively reviewed to ensure that such gaps in implementation methodology were closed before the next implementation..

f) Report Formatting

Documents that worked perfectly on the test environment did not work once "live", including missing logos on remittance advice and creditors statements.

Technical inconsistencies of this nature were beyond the control of the local project team and had to be escalated to the central consultant team responsible for maintaining the various JD Edwards environments. Formalised procedures for logging and resolving issues of this nature were set up and communicated.

g) Electronic Banking

EFT payments that worked perfectly on the test environment did not work on the live ? The bank interface was tested after "go live". Bank statement download could only be tested "completely" in the live environment.

This was another example of technical inconsistencies and limitations that posed severe risk for the project. Additional checks by the local project team were required to mitigate this.

h) Workflow Approval

All the Approval routes did not come across from the test environment and had to be captured whenever we had complaints that "the system did not work!" Credit manager approval of Credit Limits did not come across correctly from the test environment. The staff were populated as credit approvers (Managers normally approve) and this had to be altered via scripts after "go live ".

User dissatisfaction and insecurity was directly linked to the degree of disruption and uncertainty experienced during their early use of the system.

i) System Integrities

Integrity errors occurred between the sub-system and general ledger (GL). The business should be involved in the daily integrity checks from inception. Expose the End User to System Integrities in the test environment (UAT). Require access to the live files - need to extract data via direct access to the JD Edwards database. This helps to check integrities on the system. Go through daily and Month-end procedures during UATs. End users were not fully versed with these tasks. Require access to the live files - need to extract data via ODBC. This helps to check integrities on the system.

The issue of system integrities was a significant source of dissatisfaction as it resulted in senior financial staff having to spend excessive amounts of time checking and reconciling why the system did not balance. This problem was only fully resolved during the Packlt3 implementation through the provision of balancing reports that gave visibility to the issues underlying integrity problems.

iii) Costing and Manufacturing Accounting:

a) Bills of Materials (BOMs) and Routings

Implementing the JDE Standard Costing module into PackltCo was a problematic process. It resulted in the business having to rewrite the BOMs and Routings. This task was poorly carried out as many of the BOMs and Routings had to be rewritten post go-live. The result of having incorrect BOMs and Routings was that JD Edwards inadvertently calculated incorrect costs for finished good items. This extended into incorrect stock valuations and incorrect cost of sales figures.

Where BOMs and Routings have to be rewritten a process has to be developed to ensure the most correct BOMs and Routings are written. Ideally this should involve a high level of participation from the MDAs.

b) Accounting Cost Quantity (ACQ)

This is crucial in determining variances and must be well maintained throughout the life cycle of the finished product.

The concept of the ACQ must be thoroughly explained to the business. These values must be signed-off by the process leader

Additional advanced training courses were written for both project team and business user training to give them the skills to better understand and manage the standard costing approach that was part of the JD Edwards common design configuration.

c) Item Costs

The decision to load the item costs 1 week before go-live proved expensive. These costs, although correct in the legacy system, could not be verified in JD Edwards. Many of the differences were caused by incorrect BOMs and Routings, resulting in it being an exhausting exercise to correct costs.

For future projects it was decided that item costs must be finalised as part of a "dry run" process before go-live, thus giving the project team enough time to verify any differences in cost and stock valuation between JDE and the legacy system.

iv) Procurement

a) Electronic approvals

A lack of understanding by the business meant that the finalisation of approval routes took much longer than necessary.

This was an early example of where communication and coordination of effort were essential to ensure that the correct requirements were set up in the system. The project team gained experience enabling them to act more persuasively when information was needed.

b) Orders awaiting approval

Encourage the discipline of checking orders awaiting approval regularly - for those members of the business that do not work on JD Edwards regularly throughout the day they need to be encouraged, phoned, emailed to inform them of orders awaiting approval.

This reflects the importance of aligning supporting business processes to the requirements of the ERP, which was a recurring learning captured for each project.

c) Foreign Suppliers

Identify foreign suppliers early. The list of foreign suppliers "changed" over time including during the cut over period which added unnecessary complexity. The setup of these suppliers is also slightly different so identifying them separately and early will assist in ensuring that their setup is accurate.

d) Poor Item Descriptions

The uploaded data needs to be checked and verified by the buyers who will be procuring these items. Included with this is inaccurate setup of re-order points for items. Once the data exists the buyers responsible should be involved in its checking since these are the people familiar with the purchase of these items.

This was particularly true of engineering items making it particularly difficult for off site buyers to procure efficiently.

e) Proactive management of open orders

If this discipline is effected a month or so before go live there is less chance of taking over garbage data. This process needs to be pushed by management and not left to the last minute to be done when short cuts are taken such as changing all order dates to one future date.

The need for the project team to work with the cooperation and support of business management was highlighted in a number of areas. This emphasised the dialectic of learning that was taking place, requiring the project team to exercise qualities of persuasiveness and diplomacy to ensure alignment of business and project goals and objectives.

v) PlanninR

a) Solution Set-up workshops

Not all key personnel involved from business in workshops, resulting in the business misunderstanding the solution. The business need to be more involved with the solution requirements as it has been found that this leads to misunderstanding when we went live. The cylinder workflow is a classic case in point where the flow was agreed yet it has not been driven into the business. Workshops need to follow directly on from ERP Solution Set-ups. APS to be more involved in ERP workshops.

Appropriate levels of business buy-in and commitment were crucial for project success, especially at the senior level (as indicated by the ranking of CSFs in the literature).

Due to the time lag from the ERP workshops to the APS workshops a month was "lost" and this put APS under huge pressure to deliver. APS needs to be more aware of the ERP set-up decisions and have input into some of the key processes.

The project team quickly learnt the importance of working together across traditional functional boundaries so as to ensure an aligned and synchronised work effort. The plans were updated to reflect refinements to timing of interrelated activities.

b) Project Staffing Gaps

There was no analyst or integration expert for planning and this resulted in gaps in training and workflows not being driven into business.

There was a definite gap in not having a planning analyst and integration expert. We managed for this project due to the availability of consultant resources but the future looks bleak.

c) Business Staffing Gaps

The business took too long to appoint the Demand Planner and Master Planner incumbents. There was a need to get access to these people sooner, as it takes 6 months to train a Master Planner

The Demand Planner and Master Planner need to get close to the solution as early as possible to ensure that business process gets driven into the business. In addition to this they will then take ownership of the solution and be more informed when the full data is available when the ERP goes live. They also learn to identify errors and resolve them within the new structure. I would suggest that the MDA is also made available early so that the task of correcting information goes to that resource.

5.1.2 Packlt2 Learning

The application of learning from the Packltl implementation project proved, in the majority of cases, to have a direct effect on improving the quality of the Packlt2 project (as evidenced by the improved quality rating), as well as giving momentum to the process of knowledge transfer from consultants to the internal project team. Issues occurred in similar areas of learning as with Packltl, with continued focus on the challenges of data migration. This resulted in an even more intense focus on the data migration process, and further changes were made to the methodology in preparation for the Packlt3 implementation.

Further areas for technical improvement were noted and project plans and deliverables were again reviewed to incorporate the lessons learned from experience.

The need for a formalised pre "go live" readiness assessment for every user was tabled, and put into place for the Packlt3 project. This was needed to reduce the number of minor technical problems experienced by users during the first days after cutover when there was already a lot of pressure on them.

As can be seen from the timing of the Packlt3 project, a number of activities had already commenced ahead of the close-out of Packlt2, thus the fresh learnings were only available at the end of the pre-implementation phase.

More so than in any other project, there were comments from a number of team member around the change management issues, which corroborates the finding of the user satisfaction survey discussed earlier which identified the slump in general user satisfaction with the ERP programme after the Packlt2 implementation. Examples of this, quoted from the Packlt2 project team learning session, include:

> *In terms of team building between users and project team members, an effort should be made to create an environment that promotes a greater team spirit to combat hostilities that arose.*
>
> *Ensure that business decisions are made by the business to avoid surprises at go-live. Many decisions were made on behalf of the business especially during solution setup. Responsibility and ownership should lie with the business.*
>
> *The project team is there to facilitate the process of implementing the new system but ultimately the business must take ownership. The sooner this is made clear to the users the easier they accept the new system.*
>
> *Continue to pay attention to small signals of discomfort and deal with them quickly. Work at keeping the emotional state steady and deal with anxiety on a one to one basis where ever it occurs.*
>
> *Be vigilant that the business is not keeping relevant information away from the project team, which later is used against the team.*

5.1.3 Packlt3 Learning

The consolidation of learning areas at the close out of the Packlt3 project clearly showed that substantial optimisation had already occurred, and that this final set of learnings would have yet more positive benefit for the final Packlt4 project.

The change management issues saw a substantial improvement. Examples included:

> *There was excellent rapport between the team and the business users.*
>
> *Having change agents in place assisted in getting the system accepted and working. A new method was used to manage the User Acceptance Testing which enabled them to*

be better managed administratively as well as this allowed us to get through more testing

Another key area of learning in the Packlt3 project related to a substantial improvement in data migration activities.

Packlt3 was live with Master Data three weeks before go-live. The extra time enabled the MDA to correct some of the errors that were not picked up during template reviews and UAT's. The process of uploading the templates was quick and well executed.

Change management, in compiling their learning, summarised overall improvement as follows:

a) Applied learning from previous projects.

- *There is evidence that special attention was paid to things that did not work so well in previous projects. Like:*
- *Making sure that access and printing works before go live.*
- *More attention paid to the correctness of data*
- *Providing upfront training on windows*

b) Project plan is very efficient and effective.

- *It is very effective in managing meeting the project activities*
- *Milestones were met and go-live was as planned*

c) Training

- *Users felt that the training was well done*
- *The adaptations and extras provided by the trainers was appreciated. These included summary manuals, lists of actions and quick reference process documents.*
- *The one-on-one assistance is so necessary and works really well with users where the anxiety level is high and the experience on systems is low.*

d) Support

Some of the users were very complementary on the post go-live support by some consultants. Project members were mentioned by name. Generally when asked what users thought of the project team, the descriptions included, knowledgeable, helpful, available, great.

e) Using business as change agents

Business management did a good job of communicating the project up front and motivating a positive attitude in the business.

/) *Space and forums for feedback*

- *Users responded well to the various forums where they could provide feedback to the team.*
- *They seemed to enjoy the photos and public acknowledgement of their parts in the project.*

Another area of successfully optimisation was the pre-"go live" readiness assessments which were carried out as planned.

> *All user logins and access were double checked. We found that the one-on-one auditing provided the user with a good opportunity to ask questions about their future role as well as discuss any concerns they may have had. It was found to be very beneficial to all.*

An area of continued concern was the ability of the Business Intelligence methodology to deliver a comprehensive, accurate and flexible set of reports to a well trained business. The need for improvement was a recurring them in the Packlt3 learning documents, for example:

> *The perception was that BI was available late - 6 weeks after go live.*
>
> *Some reports are lengthy and do not provide usable data.*
>
> *BI continued to deliver too little, too late, leaving the business with serious information gaps making decision making after "go live " difficult.*

The involvement of consultants continued to steadily decline, setting a base for minimal involved in the final project. The efforts of consultants were focused on specialist, high value adding areas that would have diverted the attention of project team members away from more important activities. In Packlt4, the bulk of consulting time was focused on optimising the Business Intelligence delivery process, including the standardisation of reports across all businesses, development of customised reports where required, and intensive focus on BI training to improve overall capacity in this area for the PackltCo businesses.

A final area of learning that was highlighted in the learning document for Packlt3, was that of user preparedness in terms of properly understanding the new business processes and the need to do simulation exercises that would help users to fully understand how their work environment would change, especially in terms of the flow and timing of activities. Project

management developed a Day In the Life Of (DILO) methodology which would be applied during the PackM implementation.

5.1.4 Packlt4 Learning

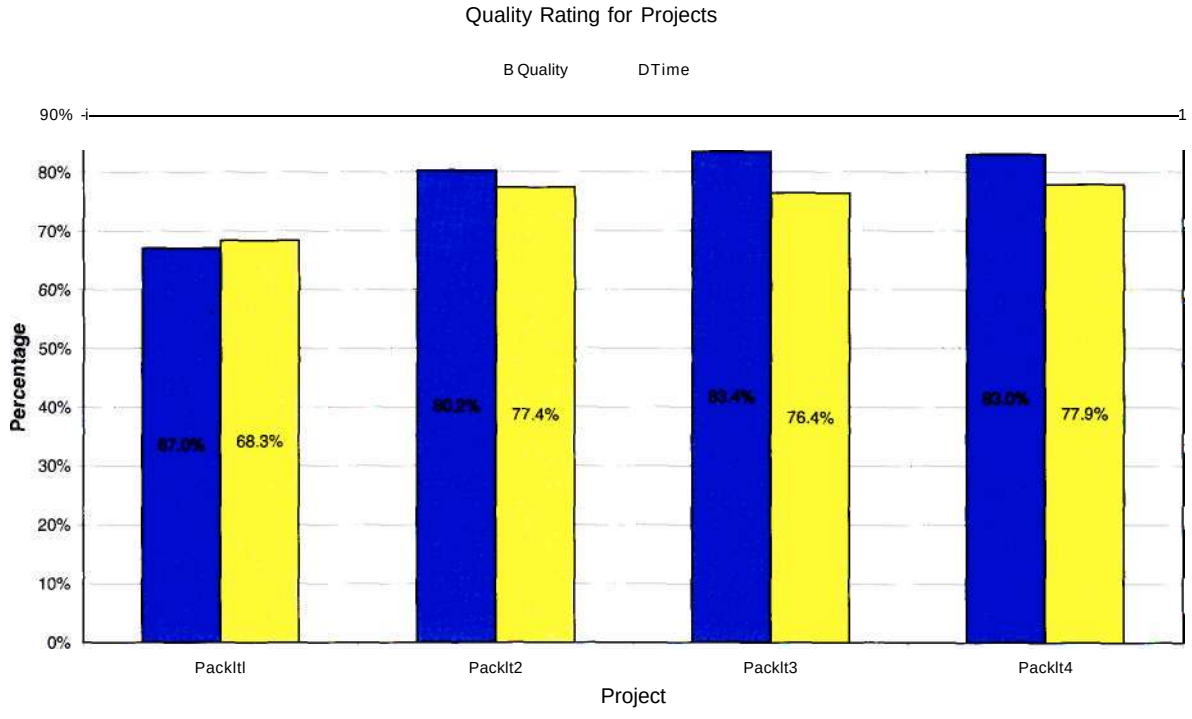
As there were no further projects after PackM, the learning session took on a different format, by looking back across all four implementations and validating the optimisation that had taken place. PackM was the most successful project in terms of time, quality and cost, and the review showed that most of the areas of prior learning had, in fact, been successfully applied to subsequent implementations, resulting in continuous improvement of the project management methodology and the precision of each subsequent project.

Each implementation, including PackM, had its own specific and unique challenges, however it soon became clear that the use of the project learning processes enabled the project team time to reflect on their experience, collate areas of success and concern, document changes needed in methodology and proceed to apply these learning areas to changing the approach and content of tasks in future projects. By formally capturing the learning areas, these documents were used as checklists in subsequent projects to ensure that areas of strength were maintained and that required changes were indeed implemented.

5.2 Quality and Time ratings

The central PMO quality review, performed on each project by an independent quality review committee, was collated and summarised:

Figure 17: Quality Rating for Projects



In terms of quality, Packltl project averaged 67% (equivalent to an ME-), meeting expectations with some gaps. This improved substantially for Packlt2 project, with a quality rating of 80.2% (equivalent to an ME+), meeting expectations at a consistently high level. A minor improvement was measured for Packlt3 project averaging 83.4% with little change in quality rating for the last project, Packlt4, which maintained an ME+ overall rating.

These ratings illustrate a number of interesting issues. Packltl, being the first implementation Project in the PackltCo cluster and being only the second[6] of The Group's implementation programme, faced a number of challenges in terms of:

- Methodology: The methodology was not tried and tested at this stage, hence there was a lack of clarity in terms of standards of delivery, definitions of milestones, documentation required, level and frequency of reporting and applicability of activities on template project plans. Very little optimisation had occurred during The Group pilot project, as an action learning approach had not been consistently applied at that

[6] The position of lead site was foisted onto the PackltCol project as a result of the originally identified lead site falling behind in the implementation and, as a result of a full risk assessment, having its target "go live' date demoted to after that of Packltl.

time. The initial proposed methodology proved to be impractical and unwieldy, significantly over-engineered in a number of areas and having gaping holes in others. The project team expressed frustration at quality requirements that were divorced from, or misaligned with, the actual tasks required to implement the ERP system successfully.

- Relationship with consultants: Lack of clarity as to the extent and scope of involvement by consultants in project tasks resulted in inconsistencies during the implementation. At times, consultants were scheduled to be involved in tasks which ultimately required little input, resulting in sub-optimal utilisation of their input, or conversely they were omitted from certain tasks where their specialist input was required, resulting in errors which at times required rework to correct. The project team members, who had been recruited specifically for their prior ERP implementation experience, often found themselves in conflict with these consultants and frustrated due to their lack of access into the core system, and the continued insistence by The Group PMO that consultants "check up" on work being done. The net effect of this tension and confusion was sub-optimal deployment of consultants combined with an ever climbing set of costs to pay for the ever growing pool of billable hours.

- Internal Project Team issues: The project team was newly constituted, many of its members having been recruited from outside The Group. The plethora of prior experience and inconsistent levels of expertise took some time to consolidate into a performing unit that clearly understood the mandate it was to execute. Those team members who had been recruited as ERP implementation specialists, took time to understand the unique complexities and challenges of the PackltCo business, both in terms of business processes, as well as the corporate culture under which they were required to deliver the new ERP system. Conversely, the business analysts who had been recruited out of senior positions in the business spent some time understanding the technical requirements of the ERP system, as well as the extreme change in working environment from a time regulated, repetitive and predictable business work day to the managed chaos of the project environment where the intensity of the work effort required changed continuously to meet the demands of project plans and required flexibility of response to the dynamic environment of changing and conflicting pressures.

- Business Issues: Packltl was the first of the PackltCo cluster companies to experience the reality of an ERP implementation, and resistance was relatively high and widespread. A lot of internal marketing had been done by The Group leading up to the launch of ERP projects and the message of conformance to the Common Design had been enforced through a number of communication channels, including Group newsletters, roadshows, briefings and personalised attention given to key business stakeholders. The business had never experienced a project of this magnitude before, with its overarching scope, all embracing methodology and invasive impact, and this resulted in displays of resistance from users and management.

- Data Issues: Data analysis and conversion ranks high on the risk of Critical Success Factors (CSFs) for an ERP implementation, and Packltl experienced this first-hand. The business had recently moved from their original business system onto an alternative, only to be faced with the challenge, less than a year later, of implementing JD Edwards. Master data files are core to the effective, accurate delivery of an ERP system, and Packltl proved to be especially challenging in this regard. The business had to commit extensive resources to the gathering, checking and capture of data in the old legacy system ahead of extractions being done in preparation for the migration to JD Edwards. To complicate matters, the centrally-held, consultant-controlled software tools for uploading the data into the ERP contained a number of bugs, causing delays in the data migration plans.

The net effect of the above issues was the delivery, in terms of quality as assessed by the quality assessment, of a project that, although successful going live as planned, exhibited a number of shortcomings in terms of the expected quality of deliverables. As a result of intense interaction and feedback between the Group PMO and the project team, refinements were immediately made to the template methodology. Packltl was assessed as successful, although it was evident that there was much room for improvement.

Packlt2 benefited significantly from the learning from Packltl, with marked improvement in quality across most areas (see Appendix 5), and a successful "go live" as per the project plans submitted at the launch of this implementation. The level of consultant involvement remained high (as per the cost reflected in Appendix 2), however their efforts were more productively directed and the resultant improvement in quality of deliverables clearly demonstrated. The

reviewed quality standards better reflected the actual work to be done, leading to improved levels of motivation and alignment of activity between the central PMO and the local project team.

Knowledge barriers remained firmly in place with the project team relying on the superior experience and expertise of the consultants working with them. Data migration issues also continued to rank highly in terms of problems encountered.

The Packlt3 and Packlt4 Projects maintained the required levels of quality against the stipulated methodology, albeit with a continuously reduced involvement by consultants, made possible by the continuous learning process undertaken by the project team. The number of compulsory quality checks performed by consultants was reduced substantially, with no negative effect on the overall quality rating. During the Packlt3 implementation, the PMO put in place a people resource (consultant) scheduling tool which was accessible by all project managers. This gave full visibility of the time commitments of consultants across all of The Group's projects and brought greater certainty of availability of consultants when they were scheduled to assist a project. This reduced delays that had previous occurred due to multiple projects requesting consultant assistance simultaneously, as now all project managers could book their requirements ahead of time and be assured of the priority against which any consultant would be allocated.

A key area of improvement in the Packlt3 and Packlt4 projects related to data migration activities. A key learning from the previous two implementations was that the position of Master Data Administrator, which was a new position necessitated by the implementation of the new ERP system, should be filled early in the project so that there was unbroken continuity when the project went live and that the incumbent had grown in experience due to exposure to data migration activities in the project and took greater ownership from the outset for data quality in terms of completeness and accuracy. This greatly enhanced the quality of the data migration activities in the project and resulted in less rework being incurred. This improved the stability of the system post-implementation, where the number of basic master data errors, due to gaps in the data migration process, was significantly reduced.

An important principle relating to quality was that it was not always beneficial for a project to exceed the required quality standard of any particular milestone, especially if this could result

in an over engineered solution. The EE (exceeds expectations) rating was only scored (as per the PMO requirements) where:

- the value added to the process would benefit future implementations
- scope was out of the ordinary or more complex than standard
- additional scope was added to the project and the project still completed on time and within budget
- existing methodologies / standards were improved

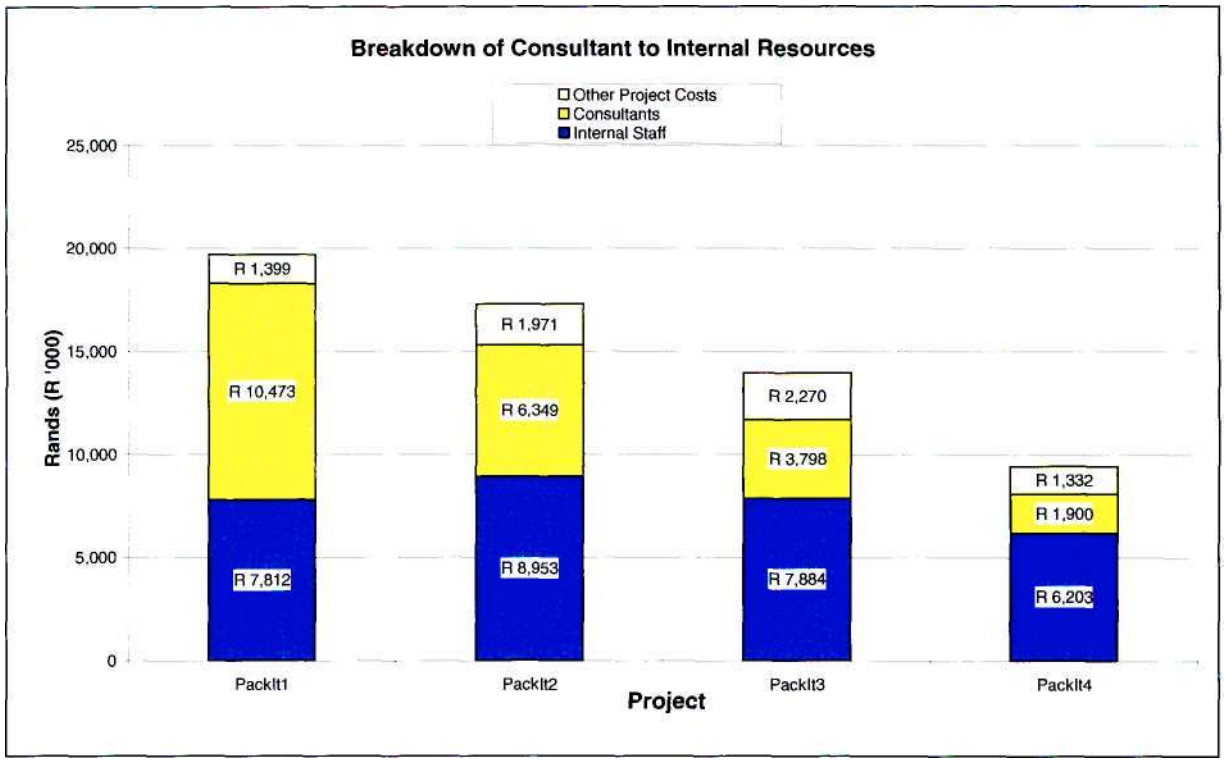
Due to these stipulations, it was more desirable to convert learning into an overall reduction in time (and consequently cost savings) than to spend the additional time on improving on quality standards required in areas that would not meet the criteria above.

The time rating captured for each project was in terms of whether target dates on the project plan were met. It is important to note here that the duration of any particular task had already been optimised (as evidenced by the overall decrease in project duration in successive projects), hence it was unlikely that significant improvements in time spent was possible once a project had commenced. Indeed, it could be interpreted as poor project management practice to have substantially overestimated the project duration when plans were finalised, as this would cause continual alignment and timing problems throughout the duration of the implementation. Due to the need to synchronise the effort and timing between the project team and the central consultants, accelerating any particular task would, in most circumstances, bring no benefit to the project in terms of cost or quality. All target "go live" dates were planned to coincide with a month end, thus unless it was possible to get ahead of plan by a full month, any saving in time could not be converted to an overall time saving. This was particularly true for tasks that did not lie on the critical path, as they had some flexibility in terms of deadlines, as long as they did not put any critical path target at risk.

5.3 Project Costs

All projects were completed under budget (See Appendix 2). The analysis of actual costs incurred on each project was collated as follows:

Figure 18: Project Costs



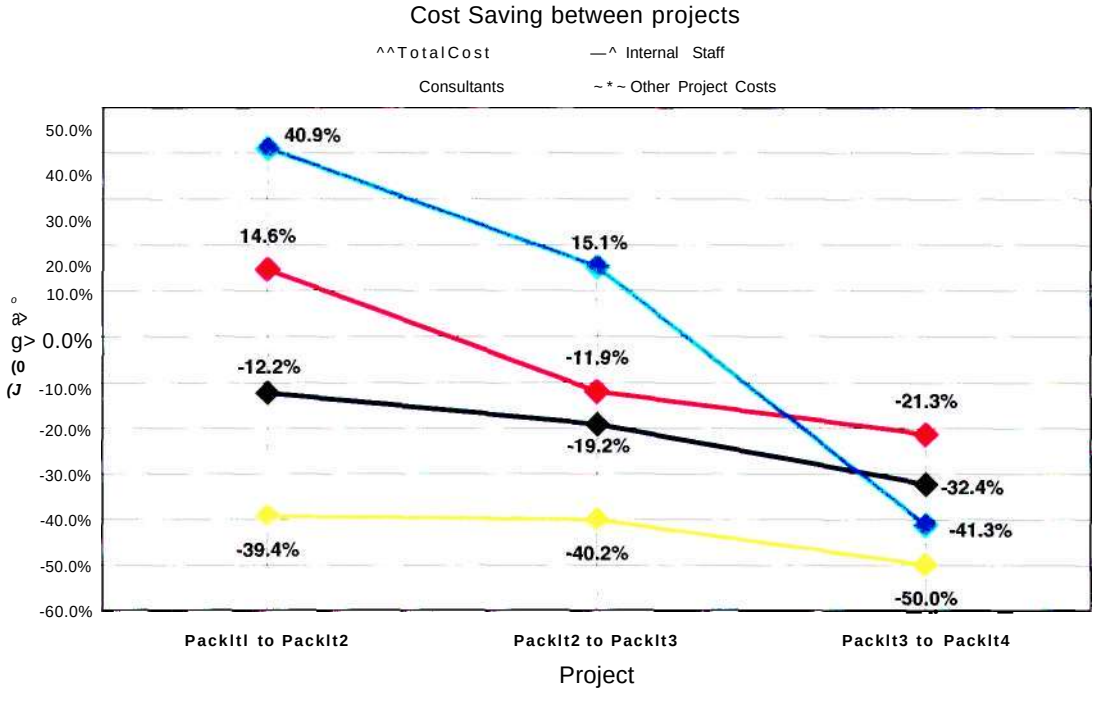
Significantly, the total cost of each successive project continued to decline throughout. This cost saving between projects was maintained throughout, despite the fact that there was no trade-off in quality of delivery (as per the analysis in Section 5.2). Thus the saving incurred was not at the expense of acceptable quality, but rather delivered through a better utilisation and mix of resources applied to each task.

A more detailed analysis of the components that make up the costs indicates that:

- The total cost of projects steadily declined as the project team gained more experience and these learnings were applied to optimise the project management process.
- The cost of internal project staff initially rose between the Packltl and Packlt2 projects. This can better be interpreted in the context that the Packlt2 business was distributed across 3 manufacturing plants, each in a different geographic location. As a result of this, a larger number of project team members was deployed to give coverage to all sites, and to enable them to conduct decentralised training and testing. Internal staff costs declined most significantly between the Packlt3 and Packlt4 projects as a result of a reduction in the number of people employed in the project

team. This was as a result of extensive multi-skilling which had occurred, whereby the Solution Experts had gained enough business knowledge and experience to all undertake the business analyst tasks, thereby enabling PackltCo to redeploy a number of the Business Analysts back into the business into strategic positions. Due to their extensive system knowledge gained during their time in the project team, these analysts were placed in key positions that could be further leveraged to ensure the system would be exploited wherever possible to deliver real value into the future. The positions included Supply Chain Managers, Cost and Management Accountants, Master Planners, Demand Planners and Master Data Administrators, all of which play pivotal roles in the ERP system.

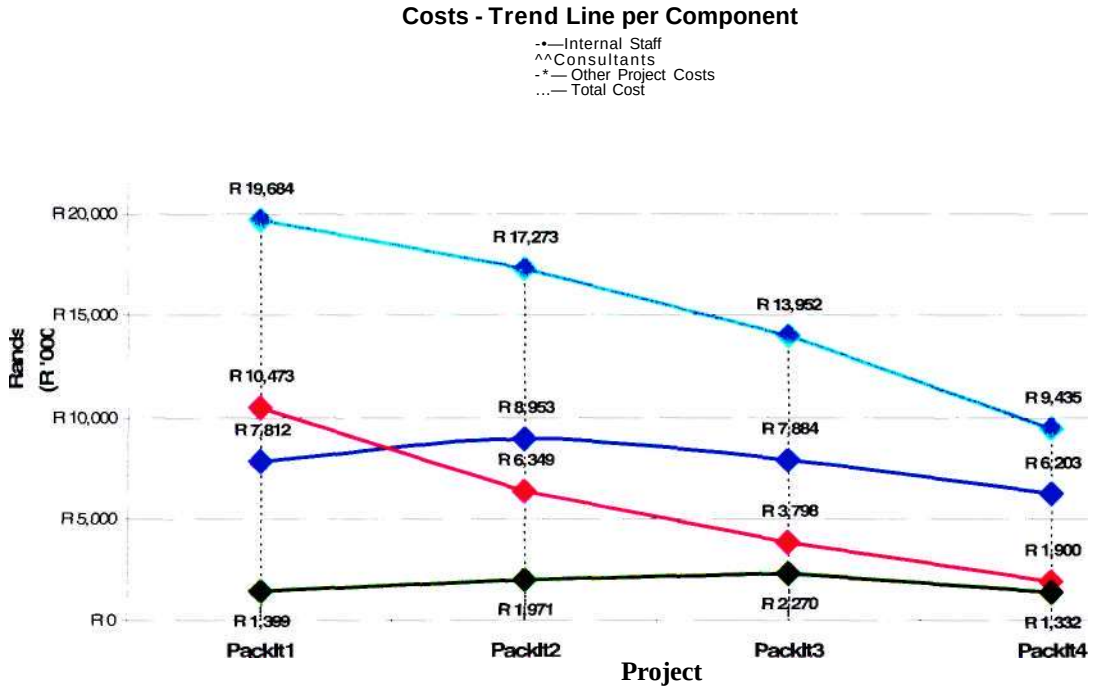
Figure 19: Cost Saving between projects



- Perhaps most significantly, the cost of consultants steadily fell between each successive project. This was directly related to a reduction in the number of billable hours incurred. This was due to a number of factors:
    - As the internal project team members' experience increased, so they were less reliant on advice and support from consultants. The team was able to breach the knowledge barrier and perform their tasks without constant guidance from consultants.

- The Group PMO's confidence and trust in the ability of the internal project team also grew, with a resultant reduction in the compulsory quality assessments conducted by consultants.
- Due to the variability of recovery of consultant costs on a billable hours basis, a fixed cost model was introduced for the Packlt4 project. Project Managers were required to submit their consultant allocation requirements during the planning phase resulting in a further reduction in consultant cost.

Figure 20: Trend line for Cost Components



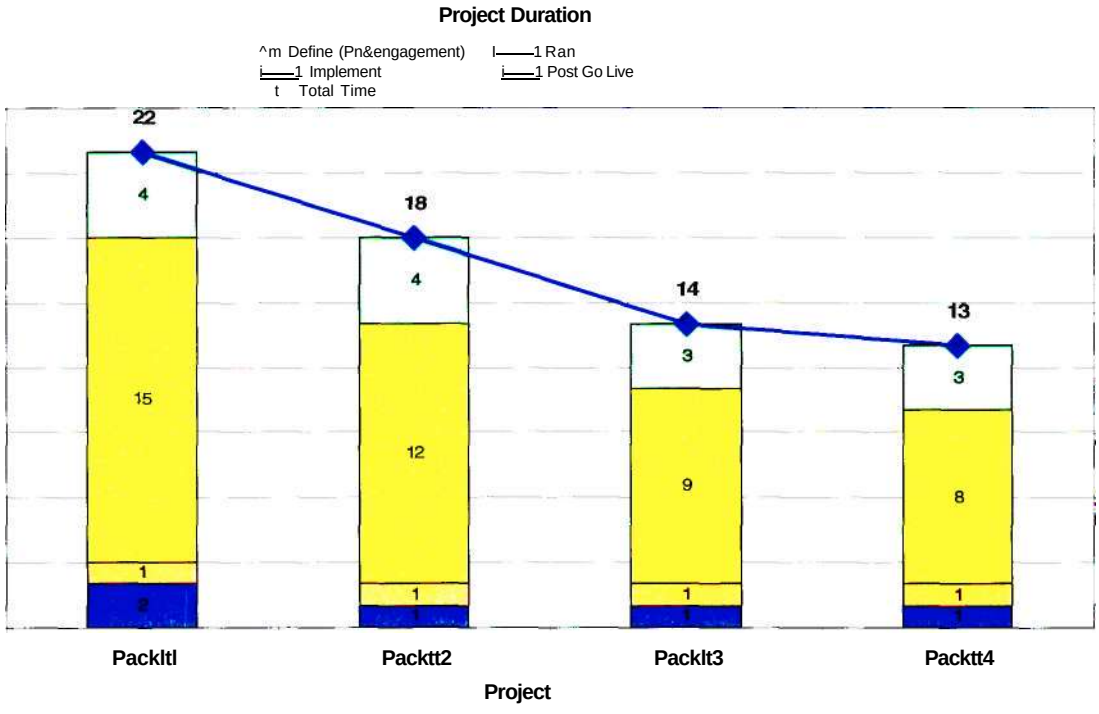
- Other Costs were made up predominantly of Subsistence and Travel costs for the project team. Packlt2 and Packit3 incurred the higher costs as they were geographically located in a different province from the project team which was based nearby the Packltl and Packlt2 plants. The wide dispersion of Packlt3 manufacturing plants resulted in the highest subsistence and travel cost being occurred there.

From the above analysis it is clear that substantial savings were made in terms of costs incurred, and these are attributable directly to the learning process that took place to ensure that the project team continued to apply their improved learning and experience to subsequent tasks, thereby ensuring that progressively, tasks could be done without the assistance of consultants.

5.4 Project Duration

The analysis and comparison of project duration was collated as follows:

Figure 21: Project Duration



Time is the third component of the project management trade off triangle (see Figure 1). With a predominantly stable quality level across all projects, and a steady reduction in cost, if there was no learning taking place, it would be expected that the duration of project would increase, that is to produce the same quality where the scope had not changed, with fewer resources, should take a longer time. Clearly from the analysis done above, this is not the case. The total project duration declined consistently from project to project.

This shortening of project duration can only be due to an increase in efficiency in project management planning, together with an associated application of learning by members of the project team that had enabled them to deliver more within the constraints of the implementations. To achieve an overall time saving, the duration of tasks on the critical path must be shortened, either through applying more people resources to the tasks, or by the existing people delivering at a higher output level. Clearly in the case of the PackItCo implementations, the project team optimised their performance and was able to implement the ERP at acceptable quality by working smarter.

Time savings were achieved by incorporating the following areas of learning:

- Shortening of task durations by working more efficiently due to an increase in skill levels by the project team
- A reduction in rework from errors caused by lack of experience by the project team
- Removal of superfluous tasks
- Replacing tasks with more efficient ones
- Better ordering of tasks
- Better synchronisation of parallel tasks performed in sub-plans, thereby optimising the critical path activities
- Redefining deliverables and the required standards so as to align them better with the overall objectives and mandate of the project

In each project, the new, improved critical path was mapped out ahead of the project team engagement with the site, based on the learning that had been analysed before and applied to the corresponding activities, thereby optimising the plan. In all projects, these revised milestones and revised critical path task deadlines were met without exception.

Even with a reduction in the internal numbers of project staff at the beginning of the Packlt4 implementation, project duration continued to be shortened due to the remaining team working smarter in terms of optimising the implementation process with each successive project.

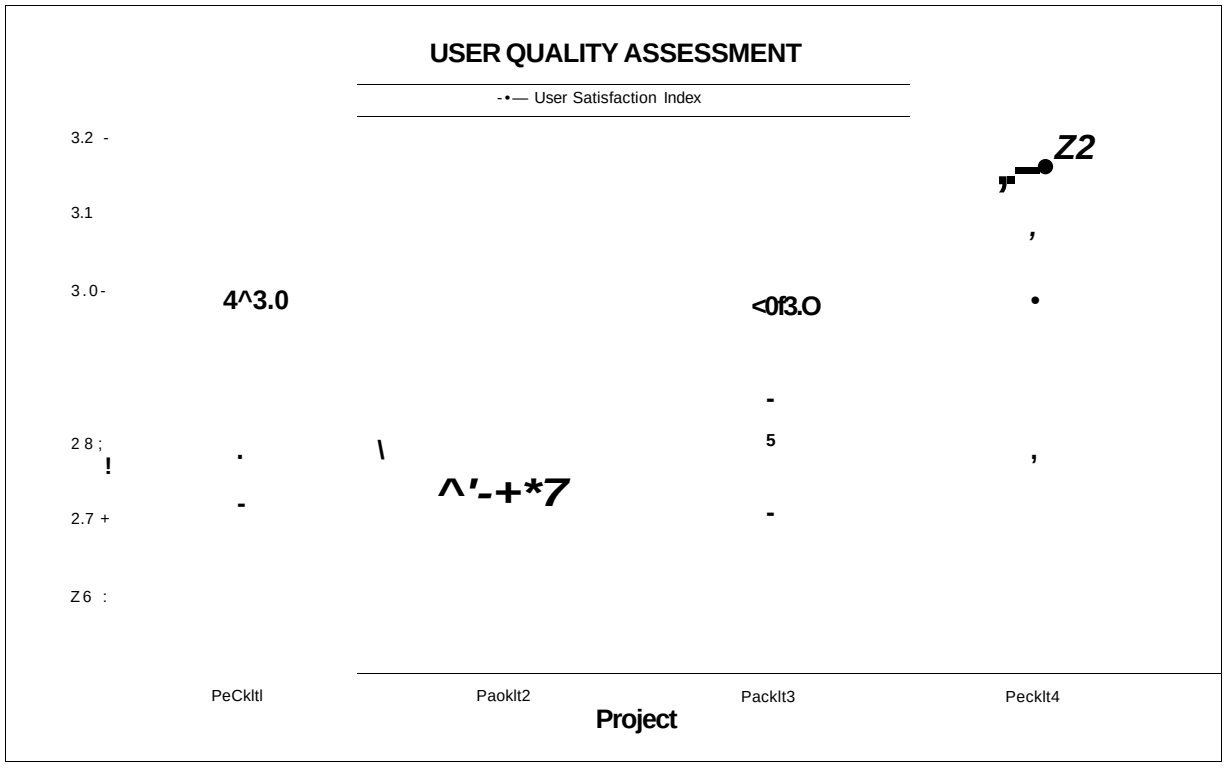
5.5 User Satisfaction

All of the ratings and measures above (sections 5.1 to 5.3) were based on the objective evaluation of various aspects of the project, based on pre-defined standards and data obtained directly from the financial records and project plans. Another vital aspect of any project is to ensure that the customer, in this context the end user, is given a voice. Unless there is positive buy-in to the process, and sufficient ownership demonstrated to take the new ERP system forward after the implementation project has disengaged from the site, the potential benefits of the new system may never be realised.

Before disengaging from the site, a user satisfaction survey was conducted and data collected as described in Section 4.6.

The analysis and comparison of the user satisfaction survey three months after "Go Live" was collated as follows:

Figure 22: User Quality Assessment



Of interest is the decline in satisfaction between the Packltl and Packlt2 implementation projects. This is in apparent contradiction to the findings that the quality of the implementation rose substantially between these projects (from 67% (ME-) to 80% (ME+)). Further analysis revealed that the user quality assessment did not require objective evidence to be presented, but was merely a scoring by users based on their opinions, as gathered via a rating questionnaire. The literature review clearly shows that change management and resistance to change is a fundamental part of the challenge of implementing an ERP system.

The following may explain the above curve:

- Before the Packltl project commenced, there was substantial marketing, to the point of hype, ahead of work commencing, raising the expectations of the businesses about the benefits of the new ERP system. This was combined with a hard sell approach to senior managers who were under pressure to present a positive image of the changes being planned. Within the PackltCo cluster, this was reinforced from the most senior level and the business committed to the process. As previously described, Packltl

faced many challenges, a number of which had a direct negative impact on business performance, especially in terms of a lack of visibility of key information due to the immaturity of the BI reporting tool.

- In addition to the poor performance of the ERP, Packltl management expressed a sense of abandonment as a result of the project team moving on to the next site without having properly bedded down the system. Although support systems were in place, there was a reluctance to fully utilise them and a growing perception that the project team had disengaged too early and were not prepared to return to resolve burning issues that were harming the business by remaining unresolved. Promised benefits were far from being realised.

- These problems came to a head nine months after the project disengaged from the Packltl site and was in the process of going live at Packlt2. The PackltCo cluster, although made up of a number of different manufacturing plants producing different products, is managed centrally. The news of the negative progress from the Packltl implementation spread quickly to the other Packlt companies, resulting in an increased wariness about the justification of such large capital outlays and the fading promises of good returns and quick pay back periods. A general skepticism arose at the Packlt2 plants as management sought to shield themselves from the dangers being broadcast from Packltl. Mistrust quickly arose, and much effort had to be put into managing this through a concerted change management effort. This was managed through the "go live" phase and at the time of the User Survey at Packlt2, users expressed their concerns that they would end up in the same predicament as Packltl.

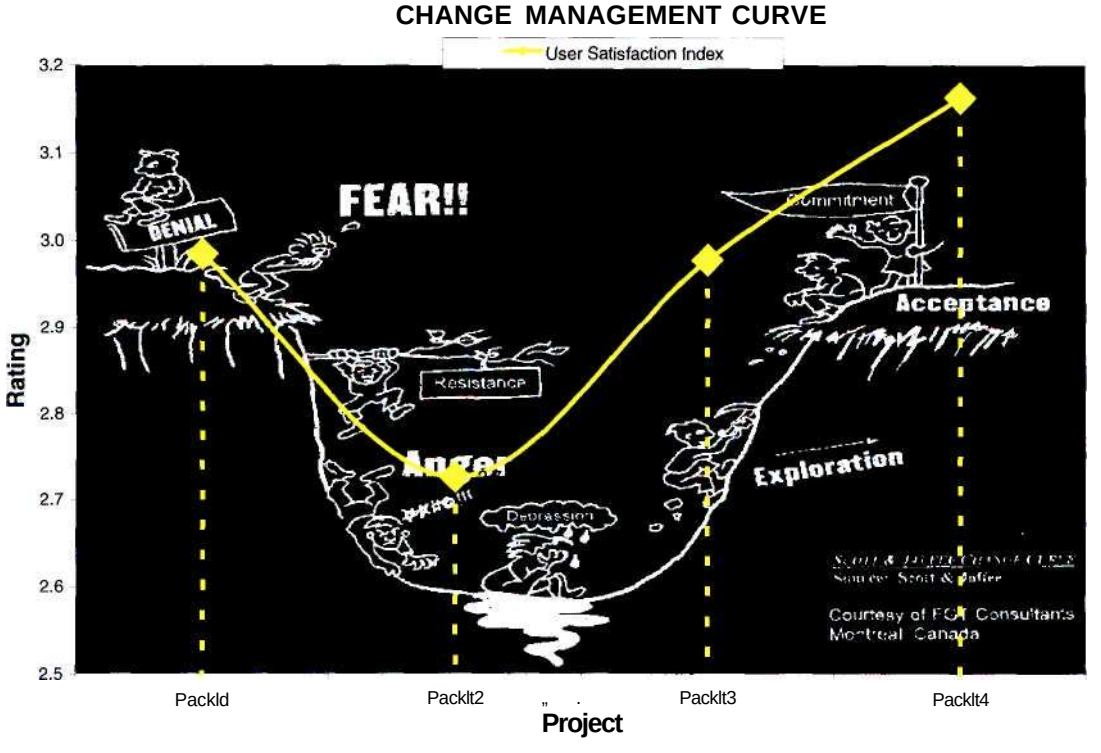
- At the end of the Packlt2 implementation, a "bedding down" programme was devised and implemented in the businesses to ensure that the new ERP was used correctly and that the required disciplines were in place and maintained to ensure ongoing success. This had no direct impact on the implementation projects, as the bedding down process was driven by business users who were identified as key to maintaining the required momentum in the businesses (including some project staff who had been redeployed back into the business during the project). The bedding down initiative assisted in raising morale so that by the time Packlt3 went live, the user quality assessment had risen to the levels observed for Packltl. The Packlt3 assessment

results were, however, based on a more grounded set of expectations and a less heated environment.

- Packlt4's user assessments clearly showed that a new level of confidence had been reached. Their project reaped the full benefit of all prior learning resulting in a smoother implementation. Two other factors contributed to this:
    - o The key Business Process owner had been part of another Group Implementation project and was closely aligned with the goals, methodologies and requirements for the implementation to be successful. His role as a change agent was significant in ensuring the appropriate levels of buy-in and compliance where necessary,
    - o The total project cost had been reduced to below RIO million Rand, a substantial improvement on the R20 million spent on the first implementation, reducing the direct financial exposure to the business.

An interesting characteristic of the trend for user surveys is that it closely mirrors the change curve developed by Scott and Jaffe (2004, pg 29).

Figure 23: Change Management Curve



(Adapted from Scott and Jaffe, 2004, pg 29)

Their research emphasises the importance of preparing for change, the need to transition people through the change process and how to assist them in coping with their reactions. They conclude that the role of leadership is crucial to this process (ibid, pg 55).

As discussed in section 2.5 ERP implementations can be understood as a dialectic of learning. In line with this, the business clearly felt threatened due to the potential loss of control, the challenge of new competencies, changing norms and shifting bases of power.

This finding supports Aladwani's research findings (2001, pg 272) that:

> *an ERP system should not be introduced until a positive attitude (i.e. an intention to adopt) is built and sustained among potential users. For example, do not introduce an ERP when a critical mass of your employees feels threatened by the system or feels forced (neither convinced nor encouraged) to accept the new system. Solving these problems before introducing the ERP would help set the stage for success.*

Once these issues were addressed, people were able to move forward and began to see the potential within the new system for greater freedom, power, recognition, increased participation and reward.

As was clearly evidenced in the implementation projects, a concerted effort was required to ensure that the users were able to rise above feelings of fear, resistance, anger and depression. Part of the ongoing risk management process was to identify areas of resistance, which was evidenced by increased absenteeism and subtle acts of sabotage. Communication was key during this phase in the implementations, and a key learning from Packltl and Packlt2 was the incorporation into the change management plans of special support interventions initiated for those users who were identified to be exhibiting signs of resistance or indifference. The outcome of the interventions was to assist users to begin a process of exploration, encouraging them to acceptance the change. Each successive implementation, through applying the learning in this area from the prior project, saw an increase in commitment by users to the new system and the potential value it would bring to their businesses.

6 DISCUSSION AND CONCLUSION

This research addressed the question of the application of project learning to consecutive ERP implementation projects in order to achieve project management optimisation. An action research method was used to conduct this research, as this methodology was best suited to the complexity and diversity of the study. This research attempts to face the challenge of successfully engaging with the "ill-structured, fuzzy world of complex organizations" (Avison et al, 1999, pg 95). People are what make organizations so complex and different, and people are far different in nature from data and processes.

> *People have different and conflicting objectives, perceptions, and attitudes. People change over time. And systems analysts have to address the fundamental human aspects of organizations. Failure to include human factors may explain some of the dissatisfaction with conventional information systems development methodologies; they do not address real organization (ibid).*

The literature review clearly showed that despite numerous studies having been performed in the area of ERP implementations, the extent of project failure was still very high. Due to the substantial investments companies put into new ERP systems, it remains a major concern that substantial numbers of these fail during implementation, or fail to deliver on expectations of business in terms of realisable benefits once they are in place.

As clearly outlined in section 2.1 of the literature review, project management is key to ensuring successful delivery of a project. The balancing of the competing forces of the project management triangle (Kerzner, 2001, pg 5) can be facilitated by an action learning approach, whereby experience is converted into action that will improve the possibility of success. In this research, the project manager was able to "manage the chaos of a project" (Storm, 2005, pg 13) by utilisation an action learning approach that facilitated timeous and relevant feedback. This enabled project management to focus on relevant areas of project control, leadership and governance so as to guide project behaviour and ultimately influence project performance (ibid).

The ERP implementations were planned to reflect the dynamics of the project life cycle (Gido, 1999, pg 9), by balancing resource requirements, both internal and consultant, across the duration of the projects. This included the reduction of project staffing as experience levels rose due to the effective learning that took place.

The projects were clearly successful, as confirmed by the quality reviews performed, and in terms of the theoretical definitions of success. The projects met their targets (milestones), made efficient and effective use of resources, as evidenced by the continuous reduction in time and cost in successive projects, and ultimately satisfied the customer requirements as per the user satisfaction surveys and quality reviews (Heerkens, 2003, pg 26).

Much effort went into ensuring that project structures were appropriate (Pearlson, 2001, pg 224). The project teams operated with a matrix environment (Kernzer, 2002, pg 115), balancing the needs of the project with the demands of functional management. As the findings clearly showed, this was an area of continual friction and required substantial effort and management focus to ensure that, within the dialectic of learning where opposing forces were at play (Hoetzel, 2005, pg 7), the ultimate project goals of successful ERP implementations was achieved. The role of the Steering Committees, as the governing forum of the projects, was central to the management of any conflicts that arose, thus falling in line with the literature recommendations of due consideration on structure before a choice is made (Meredith and Mantel, 2003, pg 201).

The literature on ERP systems outlined available approaches to implementations. The Group had made a conscious effort prior to launching the roll out programme to limit the amount of customisation that would be entertained by establishing the "Common Design" system configuration for all companies, and putting in place governance bodies that would ensure conformance with these system parameters. This matches Parr and Shank's (2000a, pg 301) *Comprehensive* approach, whereby the system logic and supporting "best practice" business processes were predominantly maintained, and any changes governed by the Change Review Board process. Further research would be necessary to determine whether the integration process was as successful as the implementation process (Lee and Lee, 2000, pg 287). A follow-up research project would also be necessary to determine whether this approach resulted in the realisation of competitive advantage benefits that standardisation across such a large organisation promises, or whether, indeed, the adoption of standardised system logic reduced the ability of The Group to compete in the market with other more agile competitors (Pisano and Rossi, 2001, pg 16).

The risk of spiraling, out of control costs (Umble et al, 2003, pg 244) did not materialise in this project due to the application of learning, as evidenced by the consistent reduction in

project cost between successive implementations. Both time and scope, common areas of failure to meet expectations in an ERP implementation (Aiken, 2002, pg 5), were effectively managed and optimised as per the research findings for the PackltCo projects.

Critical success factors (CSFs), as a predictive tool, remain useful in identifying the areas which project management needs to ensure are in place to avoid project failure. The ability, however, to convert this knowledge into actions that mitigate the risk, remains a problematic issue (Parr and Shanks, 2000b, pg 6). This research showed how an action learning approach can contribute to solving this problem by putting in place an iterative process to capture learning and translate this into actions that will improve the likelihood of success in future implementations.

The commonly identified three most important CSFs, namely top management support, competent project management and team, and organisational commitment (Somers and Nelson, 2001, pg 7) were at the centre of this research. Clearly, the effective optimisation of project management and execution through the iterative action learning process was highly instrumental in the success of the PackltCo projects. This further substantiates and reinforces the validity of the weight of research into the important role of CSFs in determining success..

ERP project implementation success has been defined as meeting the initial project requirements for going live by meeting deadlines, staying within budget and achieving the expected system performance (Lian, 2001, pg 8). In terms of this, the PackltCo projects were deemed successful, although success in terms of cost effective integration of complete business processes is only possible as part of the "bedding down" review process, which was beyond the scope of this research.

Consultants play a pivotal role in mitigating the knowledge risk inherent in highly complex technical projects (Chang, 2004, pg 6). Using a combination of consultant intermediaries and an action learning approach enabled PackltCo to efficiently transfer learning to internal project resources. Thus the reliance on external consultants was reduced significantly during the projects, indicating that the configuration knowledge barriers (Robey et al, 2002, pg 29) were substantially overcome. Through this knowledge transfer process, the internal team was able to effectively perform roles that the consultants would previously have filled, without any increased risk of failure. The pace at which this was achieved goes beyond the learning

curve effect, where the rate of improvement through repetition alone is constant, (Kerzner, 2001, pg 954), indicating that the action learning approach enhances the learning process. Reduced reliance on consultants had a significant impact on reducing the overall costs of successive projects, and reduced the complexity of having to manage them for extended periods of time.

The management of change remained a complex issue throughout, and the importance of an effective change management programme was reinforced continuously. The effect of change on the people involved was significant as evidenced in the change curve effect observed. An important learning from this was that a technically successful implementation is not sufficient without the acceptance and commitment of the business affected. The ERP implementation is clearly a dialectic of learning (Hoetzel, 2005, pg 7) with project management having to balance the forces of change throughout (Soh et al, 2003, pg 97) and turn resistance in acceptance (Umble and Umble, 2002, pg 32). Effective change management remains core to an implementation, especially if the business is to take the necessary ownership to convert the potential of the ERP in real benefits and value for the company.

The ERP implementations at PackltCo were structured using an action learning approach, with project activities closely reflecting the requirements of the action learning cycle. Four complete iterations of this cycle were conducted, and the results collected, collated and analysed. The findings clearly indicated that substantial reductions in time and cost were evident, without any adverse effect on the quality of the project delivered which also showed moderate improvement.

The collection of information during the project remains key to an effective action learning cycle, as it is this information that forms the basis of reflection and learning. Numerous sources were required to ensure that a comprehensive and realistic view of the project was possible, and that decision to make changes in the tasks, timelines and deliverables of project plans were based on sound reasoning. Collaborative, consensus-based team learning sessions proved very successful in distilling out the areas of learning that formed the basis of optimisation.

An action learning approach to the successive ERP implementations at PackltCo was thus highly effective in optimising the project management process, leading to substantial cost

savings for the business and reducing the risk of failure. The structures and tools put in place were effective in converting learning into action, resulting in continuous improvement of the tasks being performed, and growing the skill and knowledge of the internal project team to the extent that ultimate reliance on consultants was reduced to a minimum by the end of the projects.

The main research objectives, which were to:

- investigate how the capture and application of project learning can lead to improvements in ERP implementations,
- determine the extent to which an Action Learning approach should become a standard part of multi-project methodologies and
- establish how using an Action Learning approach results in Project Management learning being translated into improvements through savings in time, cost and/or quality.

The conclusions reached strongly support that by capturing learning and effecting these through changes in project management activities is a successful way of improving ERP implementation projects. In a multi-project environment, the iterative action learning approach can be very effectively used and the recommendations that follow suggest that existing methodologies may be enhanced by following this approach.

The findings clearly show that the application of areas of learning led to substantial project management optimisation, as evidenced by the reduction in time and cost in successive projects, while maintaining consistently high levels of quality.

7 RECOMMENDATIONS

Action research tends to engage in inductive theorising only when there's not an existing explanation or theory that explains whatever is observed, so action researchers often operate deductively. It is often the case, however, that there are no ready-made theories that fit the data or intentions, in which case it is necessary to work inductively, theorising data through creating new categories. When this occurs, the purpose is entirely pragmatic so as to "better know how to improve practice" (Tripp, 2005, pg 456).

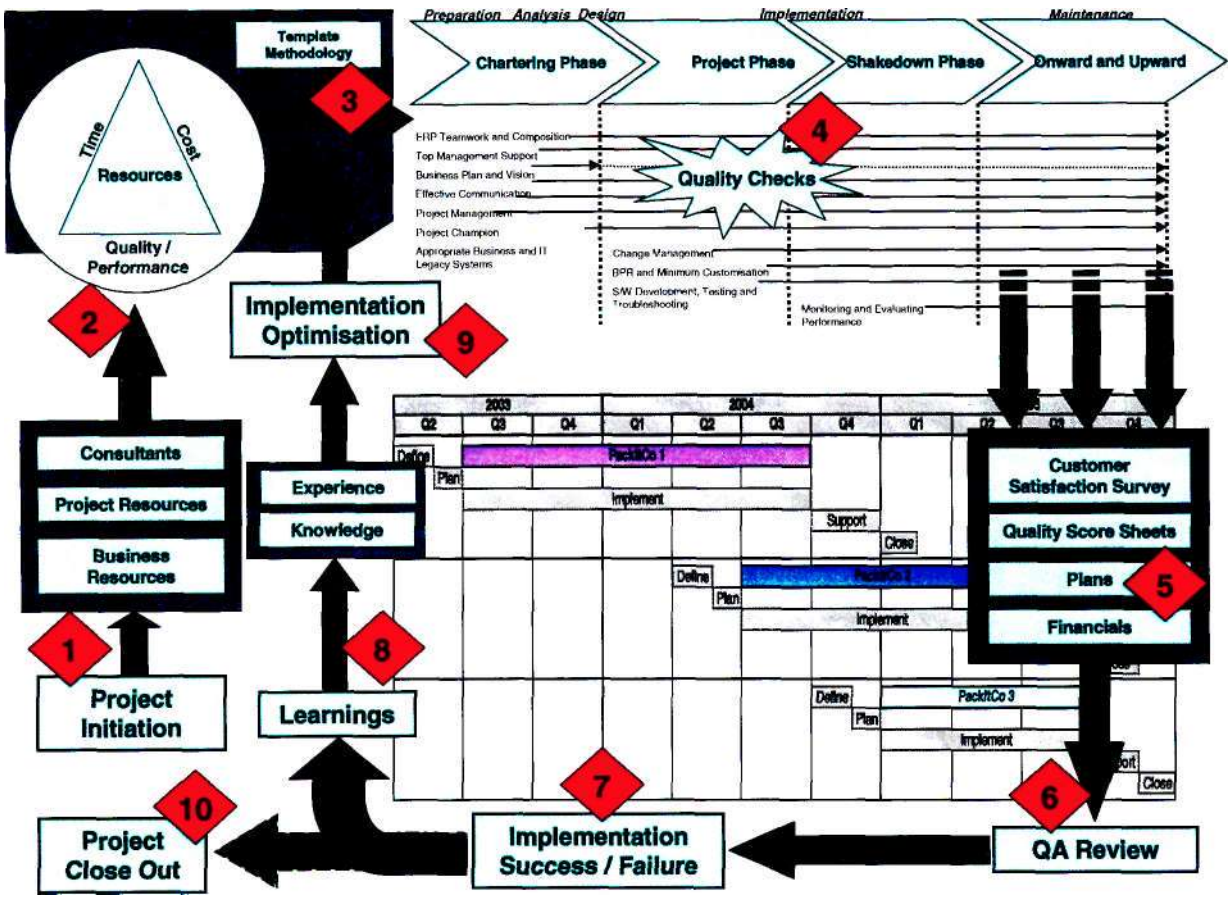
This research clearly showed the benefits to be gained by using an action learning framework to manage successive ERP implementation projects. It is the researcher's recommendation that this approach to ERP implementations thus be formalised into a practical model to promote consistency of results. In this way, project managers would be able to improve the rate of success for implementation projects through the application of a methodology framework to their endeavours.

As a contribution towards the formalisation of the approach adopted, the following model was developed. This seeks to capture the core aspects of the learning approach, and to model these into a flow of key activities that future ERP project managers can use to assist them.

In terms of this model, the following sets of activities form the core of the action learning approach (equivalent action learning steps in parentheses):

1. Project Initiation: This is the upfront formation of the project in terms of establishing the base requirements. This includes confirming of initial scope with the customer (whether internal or external), agreeing project objectives and mandate, formalising structures and putting in place the right people with the right skills in terms of project, business and consultant resources. The positioning of the project in the organisation in terms of chosen organisational and reporting structure (functional or matrix hierarchy) and the setting up of project governance bodies (e.g. project steering committee) is key.

Figure 24: A model for ERP Implementation Project Optimisation



2. Project Scoping (Diagnosing): The first requirement during this phase is the procurement of the best fit ERP software to meet the needs of the customer. In finalising scope, the project manager must ensure that an optimal trade-off is achieved between time, cost and quality while still delivering on the requirements of the customer. The presentation and acceptance of high level plans and budgets is achieved here. The inclusion of a Change Readiness Climate Assessment would be valuable here.

3. Project Planning (Action Planning): In ERP implementations, templates plans, giving suggested "best practice" detailed activities for the project, are readily available through the software vendor whose product has been selected, or through the implementation consulting firms. A choice needs to be made as to the implementation approach to be followed as this will determine the initial template toolset selected. Once obtained, these methodologies must be reworked and customised to "best fit" the objectives of the project.

4. Project, Risk and Change Management (Action taking): Once the project is launched, project managers should be intimately aware of, and manage, the critical success factors at

each phase of the project. This can be formalised in terms of a risk management process, with regular reviews throughout the duration of the project. An effective change management strategy needs to be put in place to continually monitor the progress of the project in terms of CSFs, ensuring that all initiatives are supported by an effective communication plan. External quality check and sign off points, conducted by consultants where appropriate, can add to overall quality, reduce risk and contribute significantly to the action learning process.

5. Project Documentation: A variety of sources of information needs to be created and maintained during the project. Detailed and accurate project documentation and record keeping forms the base of an effective action learning approach.

6. Post Implementation Quality Review (Evaluating): Part of the close out process for a project should be a detailed and rigorous post implementation review process, whereby the project is measured against the pre-defined deliverables of the project plans. This should be a collaborative effort between project and programme management.

7. Implementation Success or Failure (Evaluating): Clear criteria need to be agreed at the outset of the project to determine success, and these should be applied at the closure of the project. Post project activities may be agreed at this point, and the bedding down procedure and measures put in place for the business to manage as a base for the value fetching process to ensure adequate return on investment.

8. Learnings (Specifying Learning): A formalised process for the identification, capture and documentation of learnings is vital in a multi-project environment if optimisation is to take place. This research used a conference approach to provide the context for debate and agreement on proposed learning and changes that would be incorporated into future projects.

9. Implementation Optimisation: As the action learning cycle is perpetuated, the learnings of the project team are converted into experience and knowledge, thereby resulting in implementation optimisation. Clearly, the responsibility for conversion of learning into project optimisation lies with the project manager who must drive the action learning cycle until the programme of implementations is complete.

10. Close out: By close out, the required skill transfer from project team to the business would be complete and the project action learning cycle terminated with the closure of the project.

The role of an effective change management process staffed with people of the highest calibre and experience in change management cannot be overemphasised. Without the ability to "step back" from the frenetic activity that characterised all implementation projects, thereby allowing time to reflect on the dynamics of the interrelationships of multiple and complex factors, an action learning process could not have been maintained. The formalisation of this process proved highly successful.

Thus it is recommended that an action learning approach, as outlined above, is used in multi-project ERP implementations to drive the optimisation of the project management process, due to the potential benefits that may be realised in terms of time, cost and/or quality.

8 LIMITATIONS OF RESEARCH

This research was essentially research-in-practice, that is, the value of the findings was based on the close correspondence of the theory development to actual practice as observed, documented, measured and analysed.

Every implementation project was unique, and it was not possible to anticipate every situation that occurred during the life of a project. The goal was thus to be able to address the issues as they arose. Any theory of project management has to be able to cater for this diversity, and, by having the theory emerge out of practice, provided one way of ensuring that the need to be able to cater for diversity was satisfied. The action research approach applied provided the framework for facilitating effective research within a complex environment.

By focusing on four consecutive implementations that were executed by a single, core project team, this research attempted to show the relationship between using an action learning approach and the resultant optimisation of future implementations. It may be argued that the generalisability of this study, due to the small sample population of projects, is rather limited. Action research is by nature subjective, and it is the reader who should decide on the applicability of this research to the context under which s/he operates.

9 RECOMMENDATIONS FOR FURTHER RESEARCH

A number of potential areas for further research are evident:

- To what extent is the proposed model for action learning in ERP implementation projects valid? Further application, research and refinement is required to develop a generalisable framework that will add to the existing body of research in this field.
- What is the most effective way of "trapping" learning?
- Is it possible and practical to apply an action learning approach to a single implementation?
- How should project managers effectively convert learning into optimal plans?
- How can change management better deal with the change management curve effect in ERP implementations?
- What other sources of information could assist in an action learning process, and how should these be captured?
- In what ways can critical success factors be tracked while a project is in progress? Is there a "dashboarding" approach that could assist this process?
- How, and to what extent, can project management learning and optimisation be effectively transferred to other project teams who had no involvement in the initial iterations?
- What form should an effective ERP implementation quality review process take?
- To what extent is an active learning approach more effective in driving project management optimisation than other methods?
- What are the implications of this research to the existing project management body of knowledge and practice?
- To what extent does an action learning approach during an implementation create a platform for better benefit and value realisation post "go live"?

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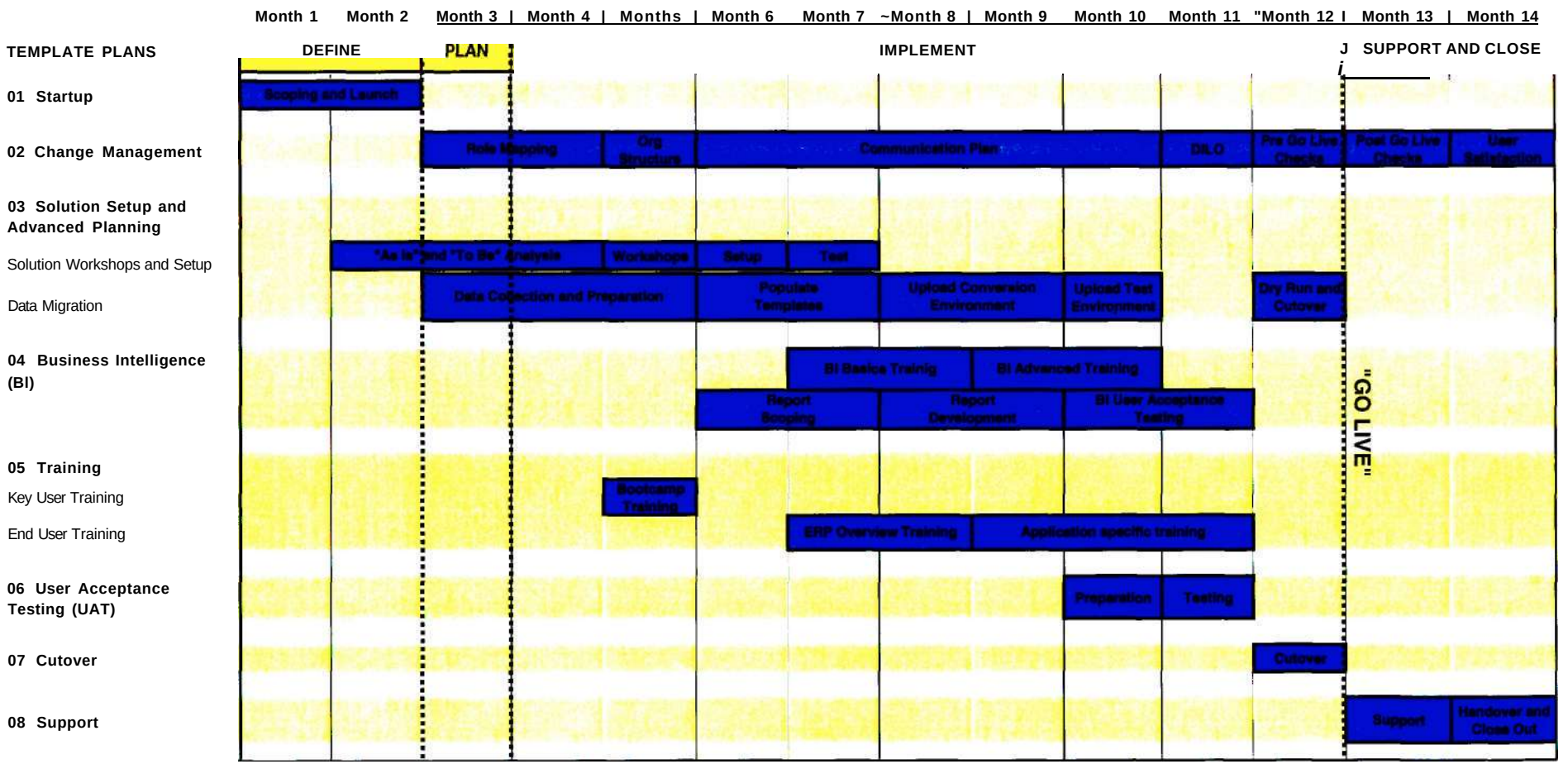
11 APPENDICES

11.1 Appendix 1

Figure 25 : Relationship between Project Plans (single project)



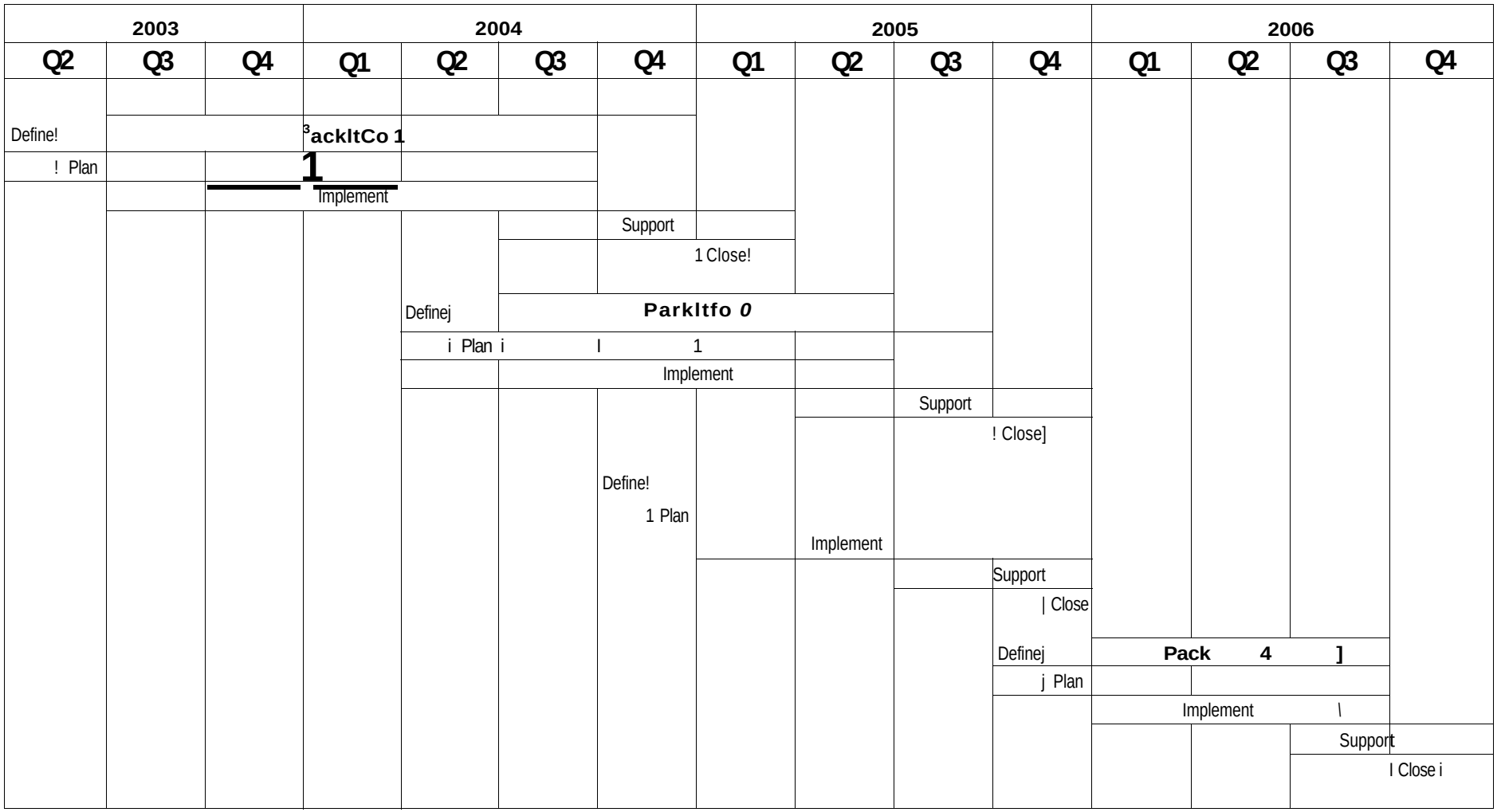
11.2 Appendix 2

Figure 26: Comparative Project Costs

	PackItl				PackIt3		PackIt4	
Project Variable Costs	**Actual**	**Budget**			**Actual**	**Budget**	**Actual**	**Budget**
Internal Project Team Costs	R 7,812	R 10,093	R 8,953	R 6,211	R 7,884	R 5,254	R 6,203	R 6,203
Travel Entertainment	R866	R792	R 1,766	R 2,261	R 1,856	R 4,652	R225	R245
Training	R533	R507	R81	R511	R393	R678	R107	R120
Other	R0	R 1,323	R124	R582	R21	R590	R 1,000	R 1,000
Total Internal Costs	**R** 9,211	R 12,715			**R 10,154**	**R 11,174**	R 7,535	R 7,568
i otai consultant costs	**H 10,473**	**H 8,324**			**IT3788**	***U* b\8b3**	**H 1,900**	**H 2,600**
Total Project Variable Costs	**R 19,684**	**R 21,039**			**R 13,952**	**R 18,027**	**R 9,435**	**R 10,168**
Combined staffing Cost	**R 18,285**				**R 11,682**		**R 8,103**	
Internal	R 7,812	43%			**R 7,884**	67%	R 6,203	77%
Consultant	R 10,473	57%			**R 3,798**	33%	R 1,900	23%
Non Staffing Costs	**R 1,399**				**R 2,270**		**R 1,332**	

11.3 Appendix 3

Figure 27: Comparative Project Duration



11.4 Appendix 4

Figure 28: User Satisfaction Questionnaire

Dimension / Category	PackItl
Overall JD Edwards and the new business processes have and will add value to our division and Nampak	
I believe that my manager sufficiently demonstrates commitment to JD Edwards and the respective changes	
JD Edwards changes have been accepted by my team	
End User Buy-In to the vision	
At Go-Live, my personal computer, printer and network facilities were functioning satisfactorily	
Technical Infrastructure	
I could apply the business process training in the live situation	
The Master Data at Go-Live was accurate	
Functional Aspects	
I was satisfied with the support given by the JD Edwards project team	
I was satisfied with the support during the month-end after Go-Live	
If I experience JD Edwards problems, I know where to request support from	
Project support of end-users	
At Go-Live, the business processes flowed effectively	
I understand how my role at our site has changed	
I have actively used JD Edwards since Go Live	
I understand the impact to our section / division of inaccurate Master Data in the system	
End user understanding of the end-to-end Business Processes	
I received sufficient communication on JD Edwards during the implementation	
The communication briefings provided have been meaningful and understandable to all who received it	
The support material (e.g. quick reference cards, trouble-shooting guides, etc.) were of assistance to me	
The JD Edwards posters were effective	
I have received sufficient information to effectively perform my role in JD Edwards	
Project communication	
I feel that I am not 100% familiar with the JD Edwards system	
I believe that I would not benefit from additional training.	
I believe that my team would not benefit from additional training	
Ongoing end-user learning	
I am satisfied with the JD Edwards training that I received	
At Go-Live we clearly understood the new way of operating in JD Edwards	
The training materials were comprehensive and easy to understand	
Training of end-users	
I am able to use JD Edwards to perform my job effectively	
The JD Edwards system gives me access to more information	
I trust the information I get from the JD Edwards system	
I regularly meet with my supervisor to review the status of work, feedback and reports etc?	
End user Acceptance	
OVERALL USER RATING	

11.5 Appendix 5

Figure 29: Comparative Time and Quality Rating

		PACKIT1				PACKIT 2								PACKIT 4			
Milestones	Quality Criteria	Quality Assessment Rating	Quality Score	Time Assessment Rating	Time Score	Quality Aaiessment Rating	Quality Score	Tfene Assessment Rating	Time Score					Quality Assessment Rating	Quality Score	Time Assessment Rating	Time Score
Pre-implementation Enqaqement																	
Divisional implementation PID approved bv AfriCom	Pre-implementation Enqaqement Methodology	ME	75%	ME	75%	ME	75%	ME	75%	ME	75%	ME	75%	ME	75%	ME	75%
Business Preparation Plan siqned-off	Pre-implementation Enqaqement Methodoloqv	ME	75%	ME	75%	ME	75%	ME	75%	ME	75%	ME	75%	ME	75%	ME	75%
Business Prep activities completed as per plan	Pre-implementation Enqaqement Methodoloqv 1 [||		75%	ME	75%	ME	75%	ME	75% I	ME+	85%	ME	75% I	ME+	85%	ME	75%
Chanqe management Communication Activities	According to Project Plan 1	UE	75%	ME	75%	EE	100%	ME	75% I	EE I	100% I	ME 1	75% j	EE	100%	ME	75%
Role Mapping signed-off	Refer PMO Seshego Quality Assessment V2.2.doc	ME	75% I	ME	75%	EE	100%	ME	75%	ME	75%	ME	75%	ME	75%	ME+	85%
System set-up complete	Refer PMO Seshego Quality AssessmentV2-2.doc	ME	75*	ME	75%	ME	75%	ME	75%	EE	100%	ME+	85%	ME+	85%	ME+	85%
Data Migratton Complete for UAT	Refer PMO Seshego Quality Assessment V2.2.doc	..if	75%	ME	75%	EE	100%	EE	100%	EE	100%	ME+	85%	ME+	85%	ME+	85%
Training completed	Refer PMO Seshego Quality Assessment V2.2.doc	PME	40%	PME	40%	PME	40%	ME	75%	ME	75%	ME	75%	ME	75%	ME	75%
Final project acceptance	Refer PMO Seshego Quality Assessment V2.2.doc	PME	40%	PME	40%	ME	75%	ME	75%	ME	75%	ME	75%	ME+	85%	ME	75%
Sign off Train the Trainers Delivery Phase	Refer PMO Seshego Quality Assessment V2.2.doc	ME	75%	ME	75%	ME	75%	ME	75%	ME	75%	ME	75%	ME	75%	ME	75%
End-user training delivery signed-off	Refer PMO Seshego Quality Assessment V2.2.doc	ME	75%	ME	75%	EE	100%	ME	75%	ME+	88%	ME	75%	ME+	85%	ME	75%
User Acceptance Testing Planninq																	
UAT Planning Complete	Refer PMO Seshego Quality Assessment V2.2.doc	ME I	78%	ME	75%	ME	75%	ME	75%	ME+	85%	ME	78%	ME+	88%	ME	75%
User Acceptance Testing Execution																	
UAT signed-off	Refer PMO Seshego Quality Assessment V2.2.doc	Hi	75%	ME	78%	ME	75%	ME	75%	ME+	88%	ME+	85%	ME+	85%	ME+	85%

Figure 30 (cont): Comparative Time and Quality Rating

							PACKIT2							PACKU4			
Milestones	Quality Criteria	Quality Assessment Rating	Quality Score	Time Assessment Rating	Time Score	Quality Assessment Rating	Quality Score	Time Assessment Rating	Time Score					Quality Assessment Rating	Quality Score	Time Assessment Rating	Time Score
Cut-Over																	
Go Live completed	Refer PMO Seshego Quality Assessment V2.2.doc	" i l l ;	75%	ME	75%	ME	75%	ME	75%	ME+	85%	ME	75%	ME+	85%	ME+	85%
Implementation project signed off	Refer PMO Seshego Quality Assessment V2.2.doc	ME	75%	ME	75%	EE	100%	ME	75%	ME	75%	ME	75%	ME	75%	ME	75%
Project Plan prepared and refined (customised)	Refer PMO Seshego Quality Assessment V2.2.doc	•" PME	40%	ME	75%	ME	75%	ME	75%	ME+	85%	ME	75%	ME+	85%	ME	75%
Project Plan continuously updated	Refer PMO Seshego Quality Assessment V2.2.doc	ME	75%	PME	40%	ME	75%	ME	75%	ME	75%	ME	75%	ME+	85%	ME	75%
Project Plan accuracy over duration of project	Refer PMO Seshego Quality Assessment V2.2.doc	'.; • * £ .'"	40%	PME	40%	ME	75%	ME	75%	ME+	85%	ME	75%	ME+	85%	ME+	85%
Issues and Risks managed over duration of project	Refer PMO Seshego Quality Assessment V2.2 .doc	ME	75%	ME	75%	ME	75%	ME	75%	ME+	85%	ME	75%	ME+	85%	ME	75%
Project structure and roles clearly defined	Refer PMO Seshego Quality Assessment V2.2.doc	ME	75%	ME	75%	EE	100%	EE	100%	ME+	85%	ME	75%	ME+	85%	ME	75%
Team performance assessed over duration of project	Refer PMO Seshego Quality Assessment V2.2.doc	. PME •;	40%	Ml	75%	ME	75%	ME	75%	ME+	85%	ME	75%	ME+	85%	ME	75%
Team performance over duration of project, i.e. unified functioning team	Team Mngt Methodology	! ME	78*	N/A	FALSE	ME	75%	N/A	FALSE	ME+	85%	N/A	FALSE	ME+	85%	N/A	FALSE
					68%										83%		78%

11.6 Appendix 6

Figure 31: Comparison of User Satisfaction survey results

Dimension / Category	PackItl	PackIt2	% Improvement	mi	% Improvement	PackIt4	% Improvement	Average	Total Improvement
End User Buy-In to the vision	**3.4**	**2.9**	-13.9%	^^M		3.4	8.5%	3.3	1.0%
Technical Infrastructure	3.0	**3.3**	10.0%	f^U		3.3	0.0%	3.2	10.0%
Functional Aspects	2.5	**2.5**	2.0%	^^m		2.8	1.8%	2.7	14.3%
Project support of end-users	3.3	**2.8**	-15.0%	^^M		3.5	17.8%	3.3	6.0%
End user understanding of the end-to-end Business Processes	3.1	2.5	-19.2%	^^M		3.3	16.1%	3.1	4.0%
Project communication	3.0	**2.7**	-10.6%	^^1		3.2	1.9%	3.1	4.6%
Ongoing end-user learning	3.0	**2.9**	-5.5%	^^1		3.1	-1.1%	3.1	1.1%
Training of end-users	**2.8**	**2.5**	-10.6%	^^1		2.9	2.4%	2.9	2.4%
End user Acceptance	2.7	**2.4**	-12.0%	^^1		3.1	9.9%	2.8	13.0%
OVERALL USER RATING	3.0 74.6%	**2.7** **68.1%**				3.2 79.1%			

11.7 Appendix 7

Figure 32: Multi Project Implementation Optimisation Model