# AN ANALYSIS OF TELKOM'S SAP R/3 ADAPTATION STRATEGY

Joe Botha
e-mail: bothaj5@telkom.co.za or joebotha@telkomsa.net

Supervisor: Mike Poulter

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Unless specified to the contrary, this project is the result of my own work.

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## ACRONYMS

| | |
|---|---|
| **ACSI** | American Customer Satisfaction Index |
| **APO** | Advanced Planner and Optimizer |
| **ARIS** | Architecture for Integrated Information Systems |
| **BEE** | Black Economic Empowerment |
| **BPM** | Business Process Management |
| **BPR** | Business Process Re-engineering |
| **B2B** | Business-to-business |
| **CAPEX** | Capital expenditure |
| **CEO** | Chief Executive Officer |
| **CIG** | Continuous Improvement Group |
| **CRM** | Customer Relationship Management |
| **CSF** | Critical Success Factor |
| **DOP** | Drop-off-point |
| **DTI** | Department of Trade and Industry |
| **EAS** | Enterprise Application Suite |
| **EBP** | Enterprise Buyer Professional |
| **ECR** | Electronic Customer Request |
| **ECSI** | European Customer Satisfaction Index |
| **EDI** | Electronic Data Interchange |
| **ERP** | Enterprise Resource Planning |
| **ESIA** | Eliminate, simplify, integrate and automate |
| **FTE** | Full Time Employee |
| **IFS** | Industrial & Financial Systems |
| **ISP** | Internet Service Provider |
| **IT** | Information Technology |
| **JIT** | Just-in-time |
| **KPI** | Key Performance Indicator |
| **Mbs** | Million bits per second |
| **MC** | Material Centre |
| **MIS** | Management Information Systems |
| **MRP** | Materials Requirements Planning |
| **MRP II** | Manufacturing Resource Planning |
| **MTTI** | Mean time to install |
| **MTTR** | Mean time to repair |
| **NDC** | National Distribution Centre |
| **OMS** | Order Management System |
| **OPEX** | Operational Expenditure |
| **RFM** | Request for Material |
| **RFQ** | Request for Qoute |
| **ROI** | Return on Investment |
| **SAP R/3** | Systems, Applications and Products, Real time, 3 tier architecture |
| **SASI** | South African Satisfaction Index |
| **SCM** | Supply Chain Management |
| **SCT** | Systems & Computer Technology |
| **SLA** | Service Level Agreement |
| **SNO** | Second Network Operator |
| **VMI** | Vendor Managed Inventory |
| **VTP** | Vital to Production |
| **1:1** | One-to-one |
| **1:M** | One-to-many |

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## EXECUTIVE SUMMARY

This study set out to ascertain whether or not Telkom's SAP R/3[1] process modification adaptation strategy resulted in improved supply chain performance. For Telkom who have struggled, at great expense and with great frustration, with incompatible information systems and inconsistent operating practices, the promise of an off-the-shelf solution, in the form of SAP R3, to solve its problem of supply chain integration was too great to resist.

There are two alternative approaches to implementation of packaged software: Package adaptation to organisational needs and organisational adaptation to the package. This research revealed that typically, Enterprise Resource Planning (ERP) vendors recommend process adaptation and discourage ERP adaptations for the fear of potential performance and integrity degradation as well as maintenance and future upgrade difficulties - however, enterprises often find reasons to stray from that directive. Telkom decided to use the process modification and enhancement ERP adaptation strategy for its SAP R/3 implementation, because management believes that by enhancing the speed and effectiveness of business processes before implementing SAP R/3, the full benefits SAP R/3 will be realised. Telkom redesigned 489 processes to take full advantage of the new system's capabilities, in particular its ability to simplify the flow of information.

Taking a broad look at the results and comments made regarding Telkom's SAP R/3 implementation, it was found that Telkom's SAP R/3 implementation strategy resulted in quick achievements of a positive return on investment (ROI) when comparing pre- and post-implementation performance. Inventory levels, receivables, operating costs, order cycle times, stock turns, labour and distribution expenditures have all improved. On the other hand, fifty percent of the peer group benchmark baselines were not matched or exceeded by Telkom's measured post-implementation performance. It was found that Telkom's supply chain performance is tightly related to three areas of concern identified in this research: Problems with SAP and c-commerce integration, SAP's forecasting ability remains at a disadvantage, and the issue of Telkom not benchmarking their supply chain performance. It was also found that process improvement emerged as the principal element that enabled Telkom to realise the measured benefits of its ERP implementation.

[1] SAP R/3 stands for Systems, Applications and Products, Real time, 3-tier architecture.

# 1. INTRODUCTION

This dissertation investigates whether or not the implementation of Enterprise Resource Planning (ERP) in the form of SAP R/3 to Telkom SA's geographically scattered supply chain in the Kwa Zulu Natal region, has resulted in a quick return on investment. Customisation of Telkom's new ERP software solution was minimal and business processes were adapted to fit those of the SAP R/3 solution. Telkom argues that SAP R/3 was not a plug-in project that individual divisions or sections could customise to suit their own specific needs - instead, the approach followed was that of a vanilla[1] implementation where company processes were changed to accommodate software requirements, to reflect ERP best practices. There are two alternative approaches to implementation of packaged software: package adaptation to organisational needs and organisational adaptation to the package. Talbert (2002, p. 11) identified four ERP adaptation strategies[2] for achieving a fit that reflects an organisation's preparedness to change business processes on the one hand, and to customise the ERP software, on the other: (1) process replication, (2) process modification, (3) software modification and (4) system exploration.

## 1.1 This research report has the following objectives in mind:

1. Develop and document a theoretical framework on ERP adaptation strategies.
2. Develop criteria to evaluate ERP adaptation strategies.
3. Evaluate Telkom's ERP adaptation strategy against the identified criteria.
4. Report the findings for discussion and debate.

## 1.2 The aim of this research:

Telkom's decision to modify its business processes (i.e. adaptation strategy 2) to fit the SAP R/3 system is important because this research aims to test the following research question:

- Has Telkom's ERP process modification adaptation strategy resulted in its supply chain becoming more responsive and cost-efficient?

[1] Vanilla - also referred to as "as-is" (i.e. process modification strategy).
[2] A detailed description of the 4 strategies can be found on pages 26-27 of this study.

### 1.3 The logic of the SAP R/3 system versus the logic of Telkom's supply chain

Since the implementation of ERP, SAP R/3 has become the only transaction system in Telkom that manages and controls fulfillment, it is Telkom's link to the supply chain. Imposing stricter and more uniform processes on freewheeling, and more discipline to Telkom's supply chain could be counter productive. For example, in their efforts to swiftly obtain material necessary to restore a corporate customer's interrupted service, operational managers were in the past able to circumvent the old request for material process, by using material reserved for other jobs, enabling technicians to quickly restore service. Before SAP, the vast majority of divisions in Telkom used to hoard some form of safety stock, this to eliminate the delay associated with ordering the material from Telkom's material centers - this enabled technicians to repair and/or install services swiftly. Once a portion of this safety stock was used, it was replenished. Since the implementation of SAP R/3 the above mentioned maintenance stock items cannot be used or replenished and have subsequently been returned to the material centers.

Problems arise because ERP developers make assumptions about management and business practices during the development effort (Laughlin, 1999, p. 33). An ERP system is after all, a generic solution. Its design reflects a series of assumptions about the way companies operate in general. ERP vendors try to structure the systems to reflect best practices, but it is the vendor, not the customer, that is defining what "best" means (Davenport, 1999, p. 167). The ERP software developers make assumptions about how organisational processes may match some of the company's needs, but such packaged software is rarely a perfect organisational fit, even with careful configuration (Talbert, 2002, p. 11).

#### 1.3.1 Configuring SAP R/3

The starting point is deciding which modules to install. Then, for each module, the system is adjusted using configuration tables to achieve the best possible fit for the company's processes. The two configuration mechanisms are now examined more closely:

- **Modules:** Telkom installed the following SAP R/3 modules: Financial, Human Resources, Asset Management, Materials Management, and Sales and Distribution. Davenport (1999, p. 184) states that in general, the greater the number of modules

selected, the greater the integration benefits, but also the greater the costs, risks, and changes involved.

- **Configuration tables:**[3] Although Telkom tried to optimally balance its supply chain needs with the best practices supported by the SAP R3 software, by selecting the best options allowed by the SAP R/3 system for their important business process - by and large, business processes were changed to exploit the attractive software features. Adaptation of the application software was not considered as an option.

Telkom hopes that competitive advantage in their industry (when the Second Network Operator arrives) might just come from doing the best and cheapest job at implementing SAP R/3. On the other hand, Telkom may soon find itself under the control of the system by integrating its data and changing its supply chain processes only to lose its service edge and, in turn, its customers.

[3] A more detailed description on ERP configuration can be found in chapter 2 of this dissertation.

### 1.4 The motivation for this research

Rajagopal (2002, p. 89) highlights the fact that no other information technology (IT) innovated thus far has had such a profound effect across an entire organisation, even at global level, as did ERP systems, as learned during case interviews.

The motivation for this research study stemmed from the following:

1. The fact that these systems offer both tremendous rewards and carry equally great risks makes this a lively and interesting research topic.
2. Telkom's ERP implementation faces special challenges and needs to accommodate local-specific conditions.
3. It is expected that not much research has been done on large South African ERP projects to date.

**1.** According to Laughlin (1999, p. 32), if you want to start a lively conversation the next time you're with executives from other companies, just say, "My company is thinking about implementing an ERP."

- Somebody will be sure to tell you to stock up on aspirin.
- Another person will be happy to relate a horror story, perhaps describing in detail the company that budgeted $80 million for their ERP, only to find the real cost to be $200 million.
- But someone else will know companies that swear by these software packages and claim that they're worth every penny invested.

Hong and Kim (2002, p. 25) report that three quarters of the ERP projects were judged to be unsuccessful by the ERP implementing firms – and argue that the root of such high a failure rate is the difference in interests between customer organisations who desire unique business solutions and ERP vendors who prefer a generic solution applicable to a broad market. On the other hand, the long-term productivity and connectivity gains created by enterprise systems are often so compelling that not adopting one is out of the question. Summarised examples of both successful and unsuccessful ERP projects are shown in table 1.

**Table 1: Examples of successful & unsuccessful ERP implementations**

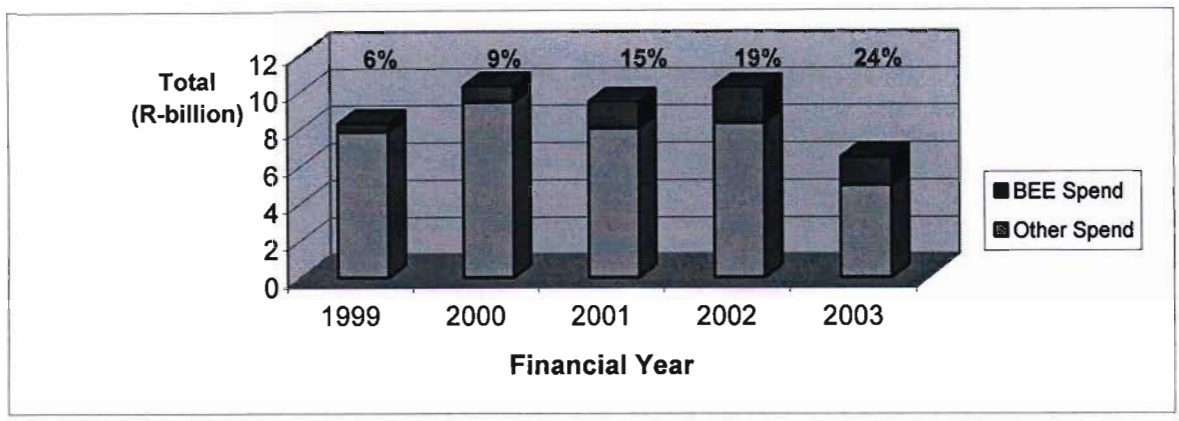
| | |
|---|---|
| | **Successful ERP implementations** (Davenport, 1999, pp. 167 - 181). |
| 1 | **AutoDesk** used to take an average of two weeks to deliver an order to a customer. Now, having installed an ERP system, it ships 98% of its orders within 24 hours. |
| 2 | **IBM's Storage Systems** division reduced the time required to re-price all its products from 5 days to 5 minutes, the time to ship a replacement part from 22 days to 3 days, and the time to complete a credit check from 20 minutes to 3 seconds. |
| 3 | **Fujitsu** reduced the cycle time for filling orders from 18 days to a day and a half and cut the time required to close their financial books from 8 days to 4 days. |
| 4 | **Owens Corning** reduced its spare-parts-inventory by 50% and expected to save $65 million by the end of 1998 as a result of its adoption of an ERP system. |
| | **Unsuccessful ERP implementations** (Davenport, 1999, pp. 167 - 181). |
| 1 | **Applied Materials** gave up on its ERP system when it found itself overwhelmed by the organisational changes involved. |
| 2 | **Dell Computer** found that its ERP system would not fit its new, decentralised management model. |
| 3 | **Dow Chemical** spent seven years and close to half a billion dollars implementing a mainframe based ERP system; now it has decided to start over again on a client-server version. |
| 4 | **FoxMeyer Drug** argues that its ERP system helped drive it into bankruptcy. |

**2.** A company is as strong as its weakest supply chain partner (Speckman, et al. 2003, p. 20). With this in mind, Southern Africa faces special challenges since many suppliers are not equipped to engage in c-commerce.[4] In this context, in South Africa a key factor is the ability to accommodate the smaller, lower-technology supply chain member. As a major role player in the South African economy, Telkom has a moral responsibility to support the involvement of disadvantaged communities in the main stream of economic activities and to utilise small and medium sized businesses whenever possible. In this pursuit, Telkom will relax procurement conditions and procedures where necessary to allow for businesses from previously disadvantaged communities to do business with Telkom. A recent media release issued on the 9th May 2003 regarding Telkom's empowerment ratings in line with Department of Trade and

[4] C-commerce refers to collaborative, electronically enabled business interactions among Telkom's internal personnel, business partners and customers throughout a trading community. The trading community could be the telecommunications industry or Telkom's supply chain.

Industry (DTI) Black Economic Empowerment (BEE) strategy framework shows that Telkom has substantially met government's proposed BEE scorecard - having spent close to R19 billion to meet its BEE objectives since 1 April 1997 (Vapi, 2003, p. 1). Figure 1 shows that Telkom is steadily spending more on BEE - i.e. 24% was spent on BEE relative to the total spent on procurement during 2003. Garon Kenchenten (Telkom, Manager Procurement) provided the statistics shown in figure 1.

**Figure 1: Total BEE Spend Relative to Procurement Spend**




Gaining position within a digitally enabled environment, integrating seamlessly with suppliers, and providing accurate data to suppliers will be attainable within this new system. However, without this integration, Telkom's SAP R3 implementation could possibly become the next great ERP disaster.

**3.** Verville et al. (2003, p. 205) claim that the limitations of ERP research specifically relate to the newness of the research topic, and the minimal amount of research that has been conducted to date in this area. According to Rajagopal (2002, p. 90), there were only a few research works about ERP implementation reported in the literature when his research was initiated, and he also mentions that the need to conduct an empirical study in this area became rather obvious. Adding to why this may prove to be an interesting research topic is the issue of South Africa's geographic isolation. Miklovic (2002a, p. 14) claims that South Africa lags the US/Western Europe ERP cycle by twelve or more months. With this in mind, it is expected that not much research has been done on large South African ERP projects. Potential users in South Africa have the distinct advantage of being able to leverage the learning curve of ERP. With an ERP

implementation backlog, Southern African companies can make more informed and intelligent decisions, because they can see the future, now.

### 1.5 Telkom's Supply Chain Strategy

Like many other organisations, Telkom was seeking a better way to manage its supply and distribution efforts. Many companies like Telkom are discovering the magnitude of savings that can be achieved by planning and managing their supply chain more effectively.

The exemplars, companies such as Wal-Mart, Dell Computer, and Toyota – have systems in place that meticulously analyse everything from customer forecasts to product pricing to warehouse inventory turns - and already, the top performers are twice as efficient as the average (Cook, et al., 2003, p. 35). Independent research shows that that supply chain leaders spend only about 4 percent of their revenue on supply chain costs, while the average company spends about 10 percent (Cook, et al., 2003, p. 35). Telkom now recognises the importance of information and new technologies that make timely and accurate information available. With the potential for competitive advantage, globalisation, integrated systems, best practice/business processes and cost effectiveness or reductions - for companies like Telkom, the ERP solution appears to be a dream come true.

In the above context - on the 1st April 2002 Telkom SA implemented the SAP R/3 software solution – this project was called Project Salamis. Salamis refers to a group of islands where the world's oldest counting tablet was discovered in 1899[5]. This counting tablet had a revolutionary impact on the world at that time. Similarly, Telkom argues that Project Salamis will provide a state-of-the-art solution to Telkom that will enhance the Company's customer support environment to the benefit of all stakeholders. Project Salamis entails the development and implementation of an end-to-end support system solution. This will replace the myriad of current systems in Telkom's support environment, in total 39 systems – thereby aligning the underlying business processes. To put it bluntly: if a company's systems are fragmented, its business is fragmented (Davenport, 1998, p. 165).

[5] More information on this counting tablet can be obtained by visiting: http://whatis.techtarget.com/definition/

Project Salamis forms part of Telkom's supply chain strategy (see table 2, row 2) to strategically increase efficiency, thus enabling Telkom to work smarter. The emphasis on real time, accurate management information intensifies as Telkom readies itself to compete with more, stronger players in the communications arena. The licensing of the Second Network Operator (SNO) has finally taken place, which means that Telkom will soon find out what it is like to compete in a competitive and liberalised communications market (this issue is discussed in more detail on page 77 of this study).

**Table 2: Telkom's Vision & Supply Chain Strategy**

| **Committed to becoming a world-class communications group & delivering sustainable shareholder value by focusing on our key strategic objectives.** | | |
|---|---|---|
| | **Telkom Key Strategic Objectives** | **Supply Chain Strategic Objectives** |
| 1 | Growth & defending core markets | Streamlining business process in support of reducing time to market |
| 2 | Exploiting convergence opportunities | Enhance SAP R3 functionalities and processes |
| 3 | Driving operational & capital efficiencies | Employing waste management techniques to reduce both OPEX [6] & CAPEX [7] |
| 4 | Improving the customer experience | Improve interface management with service divisions & suppliers |
| 5 | Investing in our people | Training & development of staff to meet challenges of competitive environment |

The strategic importance of supply chain management is emphasised by the recent observation of John Gossman, vice president of materials management at AlliedSignal: "Competition is no longer company to company, but supply chain to supply chain" (Elmuti, 2002, p. 49). Cook, et al. (2003, p. 42) emphasise that a supply chain is a source of competitive advantage, as the industry leaders have proven. They continue to prove it: they are accelerating so fast that they may never be caught. While the business strategy is the primary resource for understanding the future direction of Telkom, a procurement strategy that parallels that direction is very important i.e. SAP R/3. Telkom's strategic decision to implement SAP R/3 and improve its supply chain performance could ensure that when competition finally arrives, the SNO will have to prioritise catching up.

[6] Operational expenditure
[7] Capital expenditure

## 1.6 ERP vendor selection[8]

It is postulated that Telkom has selected the ERP vendor with the strongest product for their industry – this statement will be examined next. At a cost of several hundreds of thousands or even millions of dollars, the acquisition of ERP software is a high-expenditure activity that consumes a significant portion of capital budgets. It is also an activity that is fraught with a high level of risk and uncertainty - which underscores the need for careful deliberation prior to implementation.

Laughlin (1999, pp. 33-34) reports that the potential for a "train wreck" usually arises in the early stages of a project - one sure-fire contributor to a wreck is picking the wrong system: You must choose the ERP with the management philosophy and business practice assumptions that most closely fit your company. The more foreign the system is to current practices, the more complex and time-consuming it is to configure and the more entrenched organisational resistance becomes.

According to Beth et al. (2003, p. 72), the masters – the leading companies – are extraordinary good at selectively choosing what technologies to implement. Others – the average-performing companies and laggards – are broader and less selective in deciding what technology solutions to implement.

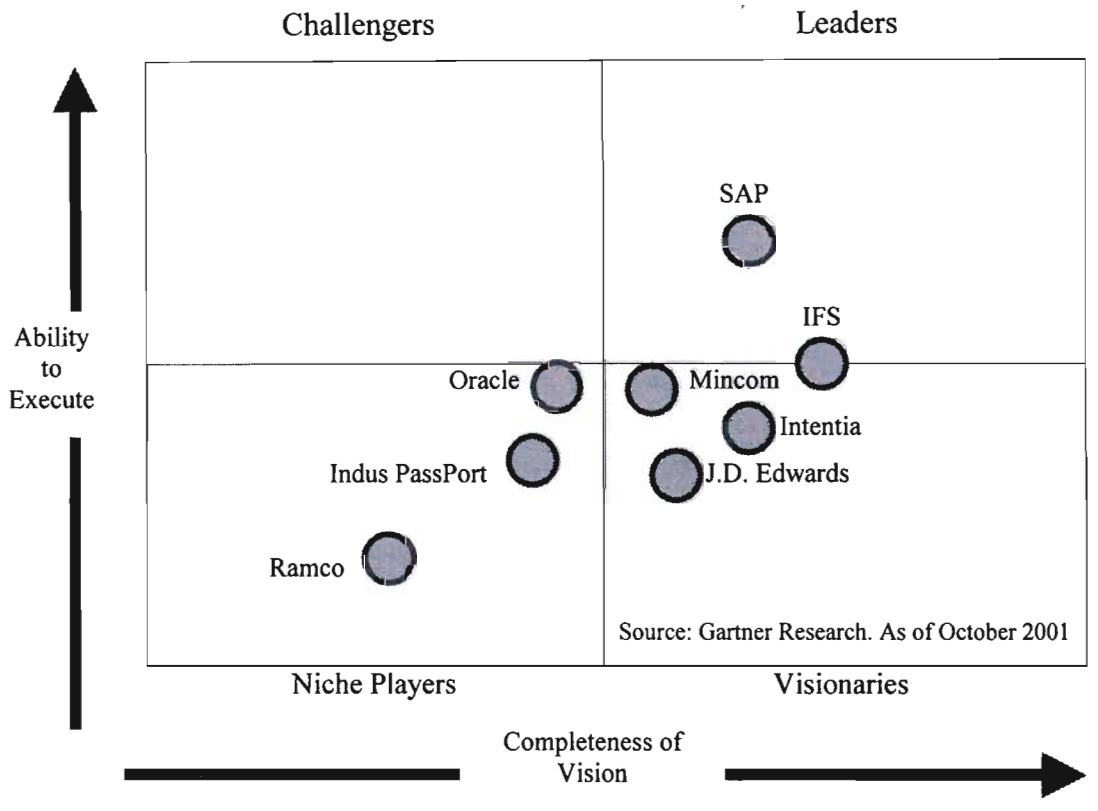
Within Southern Africa, vendor domain expertise and local support issues were the two most important issues considered by Telkom during the vendor selection processes. The top five vendors are: SAP, Oracle, PeopleSoft, J.D. Edwards[9] and Baan (Laughlin, 1999, p. 32). Other vendors with strong products include: Agilisys, Mincom & Lawson Software, Ramco, Systems & Computer Technology (SCT), Industrial & Financial Systems (IFS), Intentia, SSA Global Technologies, Evelon, Coda, Indus PassPort, and Mincom (Zrimsek and Phelan, 2002, p. 3).

Owing to the complexity of ERP software, Telkom's acquisition team sought information because this is one of the best ways to reduce risk and uncertainty. A final part of the major

[8] A detailed description on ERP acquisition information searches can be found in (Verville, et al. 2003).
[9] PeopleSoft bought JD Edwards in July 2003 – more information on this takeover is available on: http://www.supply management.com/EDIT/tech_news_item.

information search process was to obtain details from other (outside) references that were using or had acquired the same or similar software. Telkom's acquisition team was able to more accurately assess the capabilities of the software solution based on this information as well as use it as a measure against the performance, experience, and feedback on vendor(s) from previous installations.

**Figure 2: Gartner's ERP II Magic Quadrant Large-Enterprise, Asset – Intensive** [10]




Only time will tell whether in fact Telkom chose the correct software solution. Based on the position occupied by SAP on Gartner's ERP II Magic Quadrant (Zrimsek and Phelan, 2002, p. 3) shown in figure 2, it does appear as though Telkom chose the ERP vendor with the strongest product for its industry. Natie Venter (Telkom Senior Manager, Business Systems Management, Procurement Services) reports that the SAP R/3 software solution is based on proven architecture in over 200 telecommunication installations worldwide, including British Telecom, Telstra and Deutsche Telekom AG.

[10] Gartner has a different Magic Quadrant for each industry – see appendix 1.

Another form of ERP vendor rating is shown in table 3 (Micklovic, 2002b, p. 11), which can be used as a guide to judge the supply chain management capabilities of a particular vendor. Although SAP does not offer the strongest product for all functions, it does appear to be the best all-round solution.

**Table 3: Gartner's ERP Vendor ratings**

| | Functionality | Baan | IFS | Intentia | J.D. Edwards | Oracle | PeopleSoft | SAP |
|---|---|---|---|---|---|---|---|---|
| 1 | Demand planning | 4 | 2 | 2 | 2 | 2 | 3 | **4** |
| 2 | Collaborative planning | 1 | 0 | 0 | 0 | 1 | 1 | **1** |
| 3 | Inventory planning | 1 | 1 | 1 | 1 | 2 | 3 | **3** |
| 4 | Manufacturing planning | 3 | 2 | 2 | 3 | 2 | 4 | **4** |
| 5 | Plant scheduling | 4 | 4 | 4 | 4 | 2 | 0 | **3** |
| 6 | Network design | 4 | 0 | 0 | 2 | 0 | 1 | **2** |
| 7 | Capable to promise | 1 | 2 | 2 | 0 | 2 | 3 | **3** |
| 8 | Transportation Management | 1 | 0 | 0 | 0 | 0 | 0 | **2** |
| 9 | Warehouse management | 1 | 1 | 1 | 4 | 1 | 3 | **3** |
| 10 | CRM[11] integration | 1 | 2 | 2 | 0 | 1 | 4 | **1** |
| 11 | Supply chain analytics | 0 | 0 | 0 | 0 | 5 | 3 | **3** |

**Scale:** 5 = Equal to Best-in-Class, 4 = Close to Best-in-Class, 3 = Adequate, 2 = Developing Functionality, 1 = Immature, 0 = Nonexistent

Founded in 1972, SAP is the recognised leader in providing collaborative business solutions for all types of industries and for every major market. Headquartered in Walldorf, Germany, SAP is the world's largest inter-enterprise software company, and the world's third-largest independent software supplier overall. SAP R/3 stands for Systems, Applications and Products, Real time, 3-tier architecture. SAP is the name of the company that develops the system, as well as the name of the system itself. SAP employs over 28,900 people in more than 50 countries – including South Africa (SAP, 2003).

[11] Customer Relationship Management

## 1.7 Telkom's new SAP Order Management System

In fulfillment, it is not the master production schedule or the forecast, but rather the customer order that is the driving force of daily activities in Telkom. It is the order in which each line item may require multiple shipping dates to multiple sites that triggers inventory shifts between distribution centers. It is the order that starts the process of value-added operations and the release of new purchase orders to suppliers. It is the order that is most closely tied to customer service, and to the proper handling of internal and external customer wishes. Telkom's new order management system (OMS) in the form of SAP R/3 and/or Enterprise Buyer Professional (EBP) is expected to improve customer service and make the enterprise more competitive. EBP, a SAP product, is a web based Internet browser (minimum requirement Internet Explorer 5) used for requisitioning only. The primary reason for not using SAP R/3 for all requisitioning is the fact that each SAP R/3 user costs Telkom ± R14 000 per year, and in contrast, each EBP user costs ± R4 000 per year. In Telkom there are currently ± 4 200 users on the SAP system and for obvious reasons (i.e. ± R4 000 vs. R14 000), the large majority are EBP users.

When integrated with real-time fulfillment systems, an OMS can also provide an accurate, available-to-promise capability. This is a way to increase the order value quickly and provide customers with additional customer service. It not only enhances customer service, but also avoids the extra cost of back ordering. Telkom's OMS Value Chain is shown in figure 3.

The great appeal of this OMS is that Telkom employees enter information only once and that everyone in the company can make decisions based on accurate real-time information.

**Figure 3: Telkom's - Order Management System Value Chain**[12]

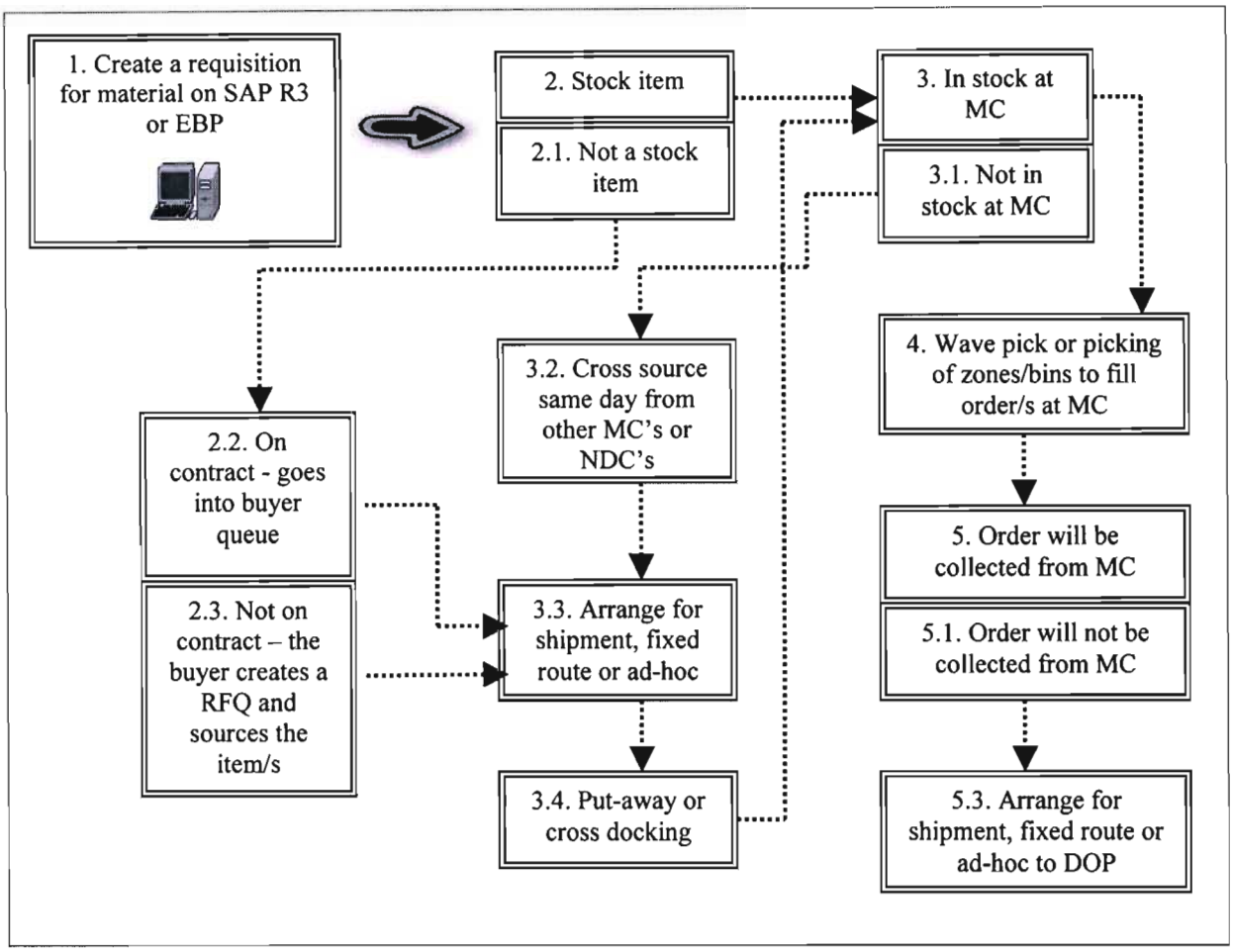



**Table 4: Order Management Value Chain - Acronyms & Vocabulary**

| **Acronyms & Vocabulary** | |
|---|---|
| **EBP** | Enterprise Buyer Professional |
| **MC** | Material Centre (warehouse) |
| **RFQ** | Request for quote |
| **DOP** | Drop-off-point |
| **NDC** | National Distribution Centre |
| **Fixed route shipment** | Contract in place with third-party – delivers once a week to MC's |
| **Ad-hoc shipment** | Requires a RFQ for VTP items - less-than-truck-load orders |
| **Put-away** | The movement of received goods to a storage area |
| **Wave pick** | Zones are picked at the same time and the items are later sorted and consolidated |
| **Picking** | The process of selecting items from a warehouse |
| **Zones** | Areas in a warehouse that is set up to make picking easier and more efficient |
| **Cross docking** | The movement of goods directly from a receiving position to an outbound carrier |
| **Bin** | A bar-coded location in a warehouse where a material item is stored |
| **Order** | A group of lines to be picked together and shipped to a customer |
| **VTP** | Vital to Production |

[12] The acronyms and/or vocabulary used in figure 4 are explained in table 4.

### 1.8 Purchasing cards and SAP R/3

With over 160 purchasing cards having been issued in Telkom to date, it would appear that this relatively new method of purchasing low-cost, high-volume consumables has really hit its mark. Natie Venter (Telkom Senior Manager, Business Systems Management, Procurement Services) reports that in the near future, the purchasing cards will be linked to the SAP R/3 system. Introduced by Procurement Services in July 2002, the convenient purchasing card system has built-in control measures and drastically streamlines the usual purchasing process by allowing end-users to make purchases directly from Telkom's preferred suppliers. ABSA Bank then makes the payment on the Company's behalf, reducing expensive transaction costs.

**Concluding remarks:**

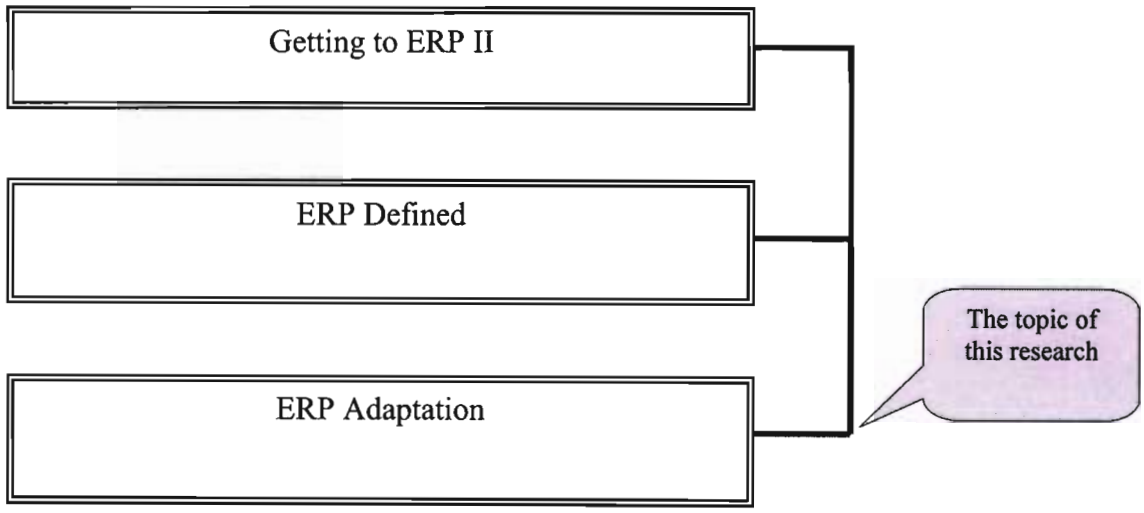
This dissertation is organised as follows: Chapter 1 sets the background to Telkom's implementation of the SAP R/3 system. Chapter 2 reviews the existing literature, sets the background regarding the changes in the ERP environment and sharpens the research focus. Chapter 3 outlines and justifies the methodology used in this research project. Chapter 4 reports the research findings followed by a discussion on the findings. Chapter 5 answers the research questions and discusses the implications and limitations of the research. Chapter 6 provides a conclusion to the dissertation and presents possibilities for future research.

# 2. LITERATURE REVIEW

## 2.1. INTRODUCTION

This chapter examines relevant literature and the views of key informants. The review begins by outlining the transformation of materials requirements planning (MRP) to ERP II, followed by defining ERP. The objective of this chapter is to develop a theoretical framework on the type and extent of ERP adaptation that offers the most benefits with the fewest problems. In so doing, the review justifies the research focus. This issue is important, because at the post-implementation stage, the opportunity is there for both researchers and practitioners to examine ERP adaptation implications (i.e. benefits, risks, challenges, costs, etc.) associated with implementing ERP software prior to the commitment of formidable amounts of money, time and resources. The literature review process is shown in figure 4.

**Figure 4: The literature review process**



## 2.2 GETTING TO ERP II

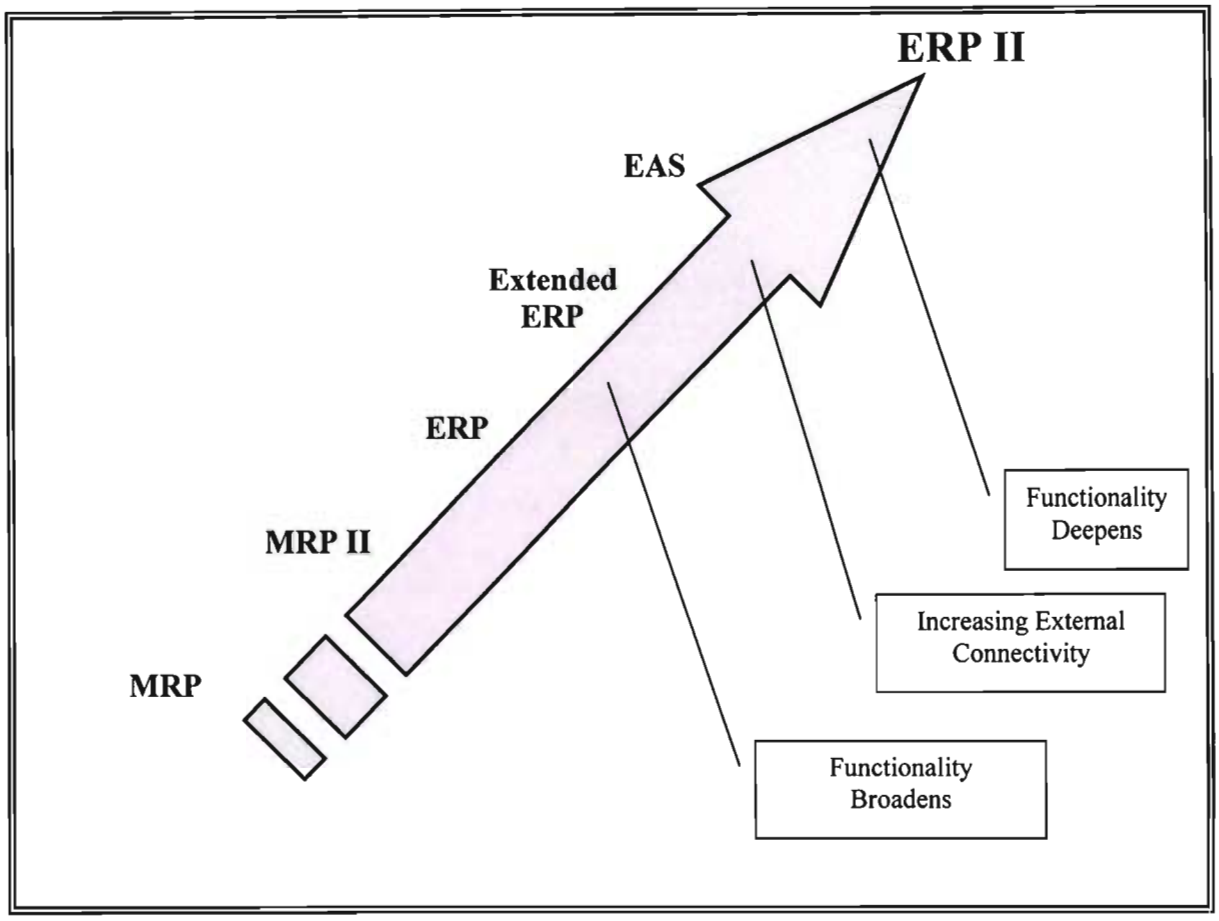
### 2.2.1 The march to ERP II is on

Many of the inherent drawbacks associated with MRP and manufacturing resource planning (MRP II) systems have been overcome through implementation of ERP systems – this statement will be examined next. This issue is important because it provides an understanding of the need to recognise that the supply chain extends far forward to customers, and back, to suppliers and their suppliers – and that earlier systems were not able to effectively track supply chain performance and efficiency outside the four walls of the organisation. The march to ERP II is on – shown in figure 5 (Rayner, 2001, p. 10).

Rayner (2001, p. 10) explains that in the 1960's inventory control assumed prime importance and most of the software at that time was designed to help in inventory management - typically, this was handled by tools called Bill of Materials (BOM) processors. The focus shifted in the 1970's to MRP as the complexity of manufacturing operations increased (Rayner, 2001, p. 10).

Micklovic (2002a, p. 5) reports that before the recognition of business processes, users deployed applications that automated manually intensive, calculation-oriented functions like financials or MRP. These functionally oriented point solutions worked well, but they lacked integration. Rajagopal (2002, p. 89) reports that MRP II systems were used mostly at individual manufacturing facilities or manufacturing facilities in isolation of one another and were not so successful when an organisation had multiple and dispersed production facilities. Rajagopal (2002, p. 89) explains that problems became more pronounced as organisations grew by mergers and acquisitions and as firms transcended beyond their natural boundaries, the disparity among their computer hardware and software systems kept increasing. Such incompatibility among the various computer hardware and software systems in a global context only encumbered their performance (Rajagopal, p. 89). Earl and Khan (2001, p. 64) report that in the 1990's companies had to cope with new business drivers (such as business process re-engineering and globalisation) while addressing new technologies and techniques (such as client-server computing and IT outsourcing). This forced the IT function to adopt new agendas and practices and to reassess its core purpose and capabilities.

**Figure 5: The march to ERP II is on**




After becoming "process aware" in the mid 1990's enterprises quickly realised that simply assembling existing functions into processes would not be efficient; thus, users launched business process re-engineering (BPR) efforts - the integrative requirements of these new processes drove enterprises to ERP for process integration (Micklovic, 2002, p. 5). Hong and Kim (2002, p. 26) emphasise that the ERP philosophy is process-based, rather than function-based, therefore ERP necessitates disruptive organisational changes.

Rayner (2001, p. 10) reports that after advancing from MRP I to MRP II, Gartner's 1990 articulation of ERP established a new vision for resource planning: This vision centered on resource planning, inventory accuracy and visibility beyond the plant and throughout the manufacturing enterprise - regardless of whether the enterprise was a process manufacturer, discrete manufacturer or both. With this in mind, ERP systems allow companies to replace their existing information systems, which are often incompatible with one another, with a single,

integrated system. In this context, Telkom's SAP R3 system replaced 39 systems in Telkom's support environment. An ever better example is that of Owens Corning, who adopted an ERP system to replace 211 legacy systems (Davenport, 1999, p. 173).

According to Rayder (2001, p. 10) the above mentioned ERP capabilities have since evolved beyond manufacturing and resource planning to "extended ERP," where other industries turned to ERP systems to provide "backbone" financial transaction processing capability. As ERP deployment became less capable of providing competitive advantage, enterprises looked to applications such as supply chain management (SCM), customer relationship management (CRM) and, more recently, e-business functions to jump ahead of their competitors (Rayder, 2001, p. 11). ERP vendors responded by pursuing the vision of the enterprise application suite (EAS) either through partnerships, acquisitions or product development - however, EAS's unwritten mantra of providing "all things to all people" within the enterprise renders it ill suited for a future that will demand focus and external connectivity (Rayder, 2001, p. 10).

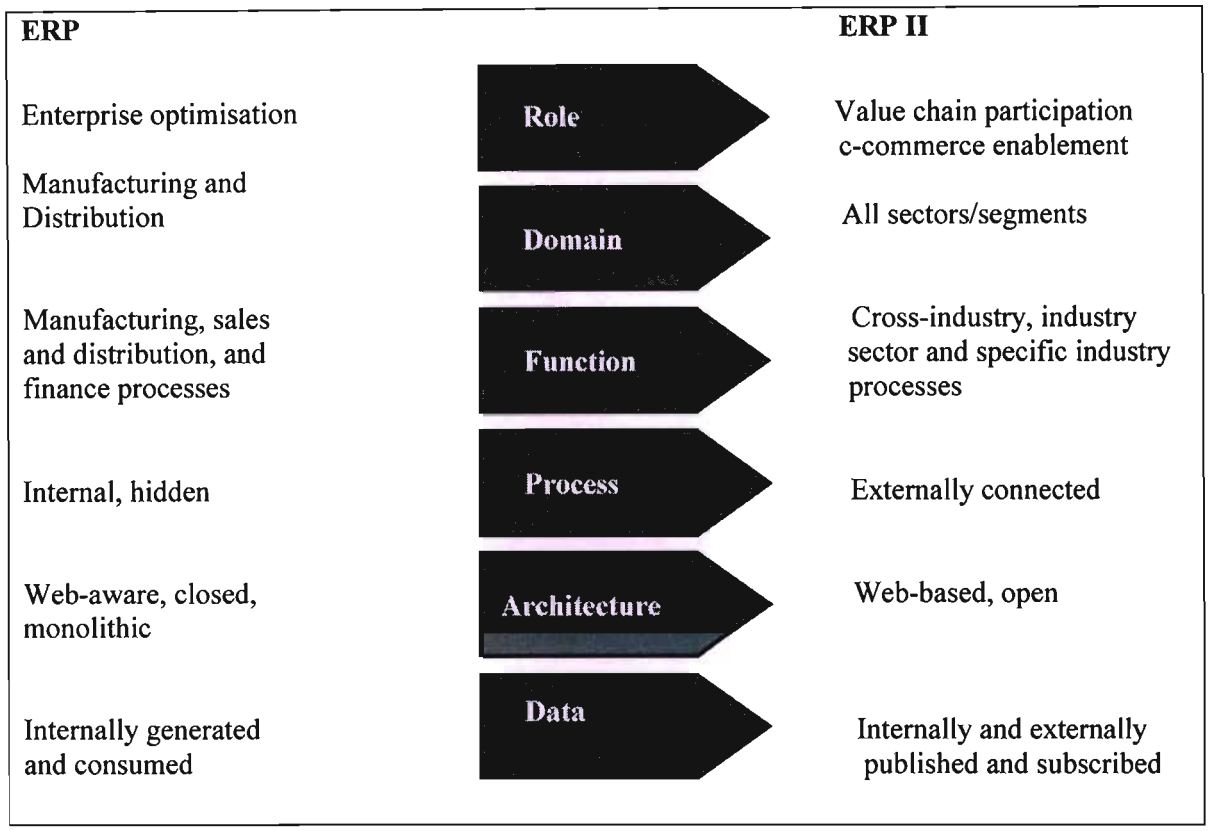
Miklovic (2002a, p. 10) explains how one-to-one (1:1) one-to-many (1:M) processes relate to ERP: 1:1 processes are extensions of existing ERP processes that provide direct links to the most important partners in the supply chain. Past 1:1 automation efforts (e.g., EDI)[1] have been hampered by high costs, minimal standards, lack of ERP integration and reliance on batch processing. ERP II changes this by reducing deployment costs (using the Internet), using standards (XML)[2], integrating the communication and enabling real-time processing. 1:M processes are a different type of process extension, reliant on ERP II that enables greater supply chain visibility and collaboration between multiple partners.

Miklovic (2002a, p. 5) explains that now, with processes both automated and integrated, users continue to seek ways to apply new technologies to improve business processes: Enter collaboration - while collaboration, in the purest sense, has always been an integral part of business, the application of technology to collaboration is truly new. Applying these technologies to business processes is the next area for process improvement. Miklovic (2002a, p. 5) emphasises that enterprises that do not deploy ERP II will be significantly impaired when

[1] Electronic data interchange – computer-to-computer exchange of standard business documents.
[2] XML is an Internet protocol markup language – it is a mechanism to express transactional content in a document, it offers the opportunity for intelligent transaction handling.

participating in collaborative supply-chain initiatives and, therefore, lose market share or incur higher costs to remain competitive. Figure 6 illustrates how the ERP roles, domains, functions, processes, architecture, and data elements changed (Rayner, 2002, p. 11).

**Figure 6: ERP II Definition**




**Summary:** It has become obvious that that the Web-centric, designed-to-integrate architectures of ERP II products are so different from ERP architectures as to eventually require complete transformation. ERP II data expands from enterprise-centric ERP, which attempts to store all within the enterprise, to integrating data throughout a supply chain. It is expected that in order to accommodate the externalisation inherent in ERP II will mean the enterprises focusing on ERP and excluding ERP II will have to come back again and re-implement to participate in e-business.

## 2.3 DEFINING ERP

In this section, the views of several key informants will be explored.

According to Ng et al. (2003, p. 89), ERP systems provide the opportunity, infrastructure and advanced technologies that allow organisations to:

1. Gain competitive business advantage by preparing the organisation for future challenges and the need to remain competitive.
2. Dynamically adapt, grow and extend business and adopt new business strategies or develop new partnerships by having an open system and the capacity to operate worldwide.
3. Increase customer responsiveness, data access and satisfaction by reducing customer service time and facilitating worldwide access and distribution of information about company, product and sales by using the customer relationship management (CRM) application.
4. Build cost leadership by achieving economies-of-scale through streamlined processes.

**Six definitions from existing literature on ERP are shown below:**

1. ERP is a suite of application modules that can link back-office operations to front-office operations as well as internal and external supply chains. ERP software conjoins functional areas and business processes in an integrated environment that provides a broad scope of applicability to organisations (Verville et al., 2003, p. 203).
2. Laughlin (1999, p. 33) defined ERP as "software packages that affect everything from order capturing to accounting and procurement to warehousing. They grew out of the need to plan, manage and account for recourses in predominately discreet manufacturing environments."
3. ERP systems allow companies to replace their existing information systems, which are often incompatible with one another, with a single, integrated system. By streamlining data flows throughout an organisation, these commercial software packages, offered by vendors like SAP, promise dramatic gains in a company's efficiency and bottom line (Davenport 1999, p. 159).

4. ERP is a new generation software with applications directed toward managing entire supply chains with links to facilitate the delivery of seamless information both internally and inter-organisationally (Green, 2001, p. 9).
5. ERP II, at the core of the c-commerce infrastructure, continues as the critical transaction system that manages and controls fulfillment while acting as the key data repository for the collaborative commerce community (Rayner, 2002, p. 9).
6. The functionality of ERP allows organisations to do business in multiple currencies and languages, and the uniform interface of ERP product across national borders have helped to facilitate progress toward globalisation and global market development (Ng et al. 2002, p. 89).

Radovilsky (2001, p. 4) suggests that ERP systems are designed to provide the following benefits to (a) customers, (b) the enterprise and (c) suppliers:

Customer ERP integration benefits could be the following:

- Provide quick delivery times.
- Enable permanent access to the enterprise selling capabilities.
- Lower cost for the Internet-related purchases.
- Access detailed and accurate order status information, resulting in higher customer satisfaction.
- Transform from a supply-centric to a customer-centric demand chain, in which actual customer demand drives design, production, and replenishment.

For the enterprise, the main link in a supply chain, the e-commerce integration with ERP systems might provide the following benefits:

- Quickly and easily compare suppliers on a global basis.
- Match supply and demand through integrated and collaborative planning tools.
- Reduce inventories.
- Collaborate with partners and optimise supply planning and execution across enterprise boundaries.
- Achieve faster responsiveness to unanticipated demands.
- Introduce new products and promotions with efficiency and accuracy.

- Increase planning accuracy and real-time location of products around the world, improving customer service.
- Respond to changing customer requirements quickly and efficiently.

For the suppliers, the value proposition in the integrated ERP and e-commerce supply chain could mean:

- Better capabilities for planning and scheduling supplier production.
- Faster responsiveness to unanticipated demands.
- Collaboration with customers on forecasting, new product design, and delivery schedules.

Miklovic (2002a, p. 2) argues that because of natural selection and survival of the fittest, things that do not adapt to changes in their environment do not survive - the same is true of ERP. Miklovic (2002a, p. 2) explains that ERP II is the evolution that adapts ERP to the Internet-based global business world of today - and tomorrow, through changes in functionality, technology and architecture: Functionality changes to become more specific to industry requirements. Technology evolves to leverage the Internet for both inter-enterprise connectivity and a unification of the end-user experience. Architecture changes to allow for easier integration and interoperability. These changes will also cause vendors and users to evolve; the continuing drivers of ERP II are shown in figure 7 (Rayner, 2001, p. 15).

Rayner (2001, p. 12) explains that the view of ERP II success will change from an internal view to one that considers the entire supply chain - thus the scope of most measures changes to consider the supply chain – this is shown in table 5.

Today, suppliers are often at the end of their customer's whip. Thus, daily requirements are often ignored because they change so frequently. Companies like Telkom will put a premium on stable and accurate requirements passed through the supply chain.

**Figure 7: Continuing Drivers of ERP II**

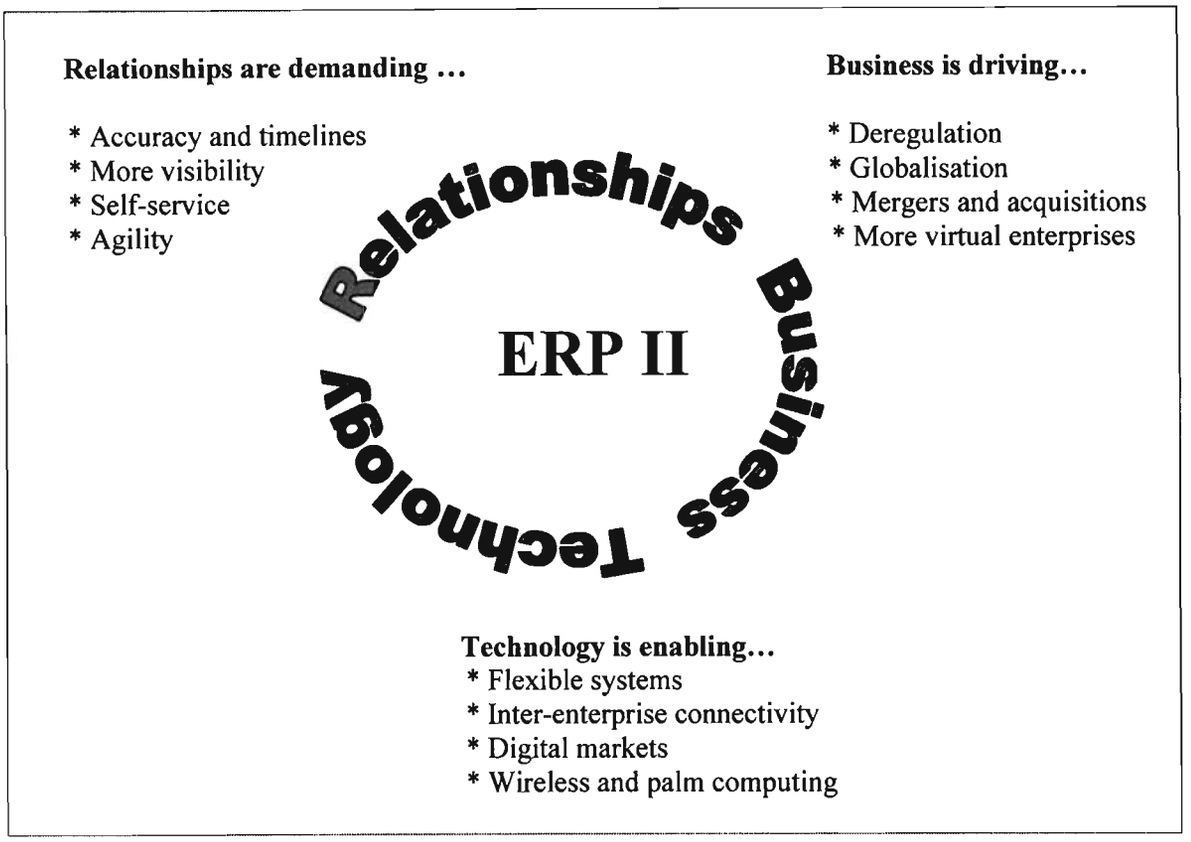



**Table 5: ERP Success Defined**

| Measures | Internal View | Supply Chain |
|---|---|---|
| **Data is** | Accurate, audited and visible within the organisation | Accurate, audited and visible across the supply chain |
| **Users** | Trust the system | Trust the supply chain |
| **Transactions are** | Timely, to meet the needs of business | Timely, to meet the needs of the supply chain |
| **Training is** | Ongoing | Ongoing |
| **Customisations are** | Limited to competitive areas | Minimised to speed, integration and maximized to enhance usability |
| **ERP consultants are** | Gone | Integrating organisations and applications |

## Concluding remarks.

In order to illustrate that the wealth of ERP benefits discussed in this chapter have the potential to improve supply chain performance, the top three factors associated with unsuccessful supply chain strategies as identified by Elmuti (2002, p. 55) were compared - with the benefits of ERP as identified by Radovilsky (2001, p. 4).

**Table 6: Factors associated with the Failure of Supply Chain Management Strategies**[3]

| **Factors affecting supply chain management project success in unsuccessful organisations:** | | **ERP Benefits could mean:** |
|---|---|---|
| **1** | Lack of cooperation within the supply chain activities | Collaboration with customers on forecasting, new product design, and delivery schedules |
| **2** | Lack of information sharing within the supply chain activities | Collaborate with partners and optimise supply planning and execution across enterprise boundaries. |
| **3** | Lack of integration in behaviour and functions | Match supply and demand through integrated and collaborative planning tools. |

Based on the ERP benefits identified in this research, sought from ERP implementation, it is expected that an ERP system will have a positive influence on the factors identified in table 6.

[3] A detailed description of all the factors involved (in total 14), can be found in Elmuti (2002, pp. 49 – 57)

## 2.4 ERP ADAPTATION

### 2.4.1 Introduction

The ERP definitions examined earlier in this chapter showed that ERP systems offer the potential of major benefits. This research will reveal that the very quality of the systems that makes those benefits possible – their almost universal applicability – also presents a danger.

Davenport (1999, p. 167) explains that when developing information systems in the past, companies would first decide how they wanted to do business and then choose a software package that would support the proprietary process. They often rewrote large portions of the software to ensure a tight fit. With ERP systems, however, the sequence is reversed. The business often must be modified to fit the system. Davenport (1998, p. 167) highlights the fact that an ERP system is, after all, a generic solution: its design reflects a series of assumptions about the way companies operate in general. Vendors try to structure the systems to reflect best practices, but it is the vendor, not the customer, that is defining what "best" means. In many cases, the system will enable a company to operate more efficiently than it did before. In some cases, though, the system's assumptions will run counter to a company's best interests.

**What is ERP package adaptation?** [4]

Hong and Kim (2002, p. 28) categorised ERP adaptation types into configuration, extension, and modification. Hong and Kim (2002, p. 28) define ERP adaptation as: ERP configuration (also called customisation) is to choose among the reference processes and set the parameters in ERP without changing the ERP source code. ERP extensions utilise a specialised programming language and third-party bolt-on software to fill the gap between ERP functionality and organisational requirements - in contrast, ERP modification changes the ERP source code.
Ng et al. (2002, p. 88) define configuration as an effort to configure the ERP system using switches/tables provided by the vendor, in order to adapt part of the system to support an organisation's preferred business processes, practices and requirements (Note the typical ERP

[4] This research does not consider all the technical issues associated with ERP adaptation.

contains 800 - 1000 business processes, and 8000 or more configurations tables. Customisation is done by choosing among these business processes and setting the configuration-table values). Davenport (1999, p. 183) explains that configuring an enterprise system is largely a matter of making compromises, of balancing the way you want to work with the way the system lets you work. According to Ng et al. (2002, p. 88) the term "modification" refers to changes made to the existing ERP standard code, software properties and functionality. The definitions examined above are summarised in table 7.

**Table 7: ERP Adaptation**

| **ERP Adaptation involves the following:** | |
|---|---|
| **1. ERP extensions** utilise a specialised programming language and third-party bolt-on software to fill the gap between ERP functionality and supply chain requirements. | **2. ERP modification** refers to changes made to the existing ERP standard code, software properties and functionality to fill the gap between ERP functionality and supply chain requirements. |
| Note: In this research ERP adaptation will be restricted to extension and modification because customisation or configuration does not change the basic ERP identity. | |

### 2.4.2 The type and extent of ERP adaptation approaches

Shang and Seddon identified four strategies for achieving ERP fit that reflect an organisation's preparedness to change business processes, on the one hand, and to customise the ERP software, on the other (Talbert, 2002, p. 11).

1. **Process replication** uses the software to duplicate or automate existing business processes. Management feels that existing processes are effective and that the software adequately supports business objectives, or managers may have limited time to explore the new process options the software offers. The company benefits from automation, but old process problems persist.
2. **Process modification and enhancement** changes organisational processes to adapt to the software - usually because management believes the software's underlying processes are more effective. Executives may see the enterprise system project as an opportunity to learn a best practice and implement BPR. The company gets new business processes,

but typically at the cost of more operational and change-management problems: data errors, work mistakes and employee resistance.

3. **Software modification and enhancement** configures and customises the enterprise application software to fit existing organisational processes as closely as possible, possibly requiring new program code. The company deems some part of the software insufficient to support business objectives, although it may be committed to using the package as a whole. Although the switch to the new system is relatively painless, subsequent software maintenance and upgrade costs will be much higher.
4. **System exploration** reviews all opportunities for better process performance. Companies may tailor some parts of the software to fit important business requirements, but they may also change some organisational processes to exploit attractive software features. The strategy requires considerable extra effort: Key team members often find themselves doing two jobs – building the new system and running the old one – as they attempt to identify best fit solutions.

### 2.4.3 Which ERP adaptation strategy is the most effective?

There are two alternative approaches to implementation of packaged software: package adaptation to organisational needs and organisational adaptation to the package (Hong and Kim, 2002, p. 27). To find the answer to this question, the opinions of key informants are reviewed:

Kinzel and Strenger (2002, p. 2) propose the following: Organisations going through the implementation of an ERP system soon realise that an off-the-shelf solution will likely never fit an organisation's business processes perfectly. Even when using a spreadsheet or word-processing program, there are functions within the application that a user may not like, and he or she may have to adjust practices or change habits to accommodate them. Furthermore, every organisation is different, and there will likely be some customisation required. However, the fit with an off-the-shelf product will come about not only through the customisations but also as business practices and attitudes about these practices become more pliable and adaptive. Thus, an important part of change management from a business perspective is letting go of past processes. Do not allow the organisation to be caught up in the "we've always done it this way" mentality. From an information technology perspective and the business perspective, an

organisation will find a solution to be much less costly if the organisation will modify its business processes to accommodate the solution off-the-shelf. Throughout the selection and implementation process, gaps between current business processes and software capabilities may be identified. For many organisations, it is beneficial to consider and employ business process improvement methodology instead of requiring numerous and extensive customisations and bolt-on type applications.

What happens when the options allowed by the ERP system just are simply inadequate? Davenport (1999, pp. 184 - 185) suggests the following: A company had two choices, neither of them ideal - it can actually rewrite some of the ERP systems code, or it can continue to use an existing system and build interfaces between it and the ERP system. However, both of these routes add time and cost to the implementation effort - moreover, they dilute the integration benefits. Davenport (1999, p. 184) claims that the more customised an enterprise system becomes, the less able it will be to communicate seamlessly with the systems of suppliers and customers. Although configuration tables allow customisation of the system to some degree, options will be limited - if a company has an idiosyncratic way of doing business, it will likely find that that it is not supported by an ERP system. Davenport (1999, p. 174) reports that for most companies, however, differences in regional markets remain so profound that strict process uniformity would be counterproductive. The system's complexity makes major modifications impractical – as a result, most companies installing ERP systems will need to completely rework their processes to fit the requirements of the system (Davenport, 1999, p. 168). It will often be in a company's interest to go ahead and rework its processes to fit the system requirements. The alternative – customising the system to fit the processes or writing proprietary application modules – will simply be too expensive to justify (Davenport, 1999, p. 171).

Hong and Kim (2002, p. 26) suggests that the ERP philosophy is process based, rather than function-based - ERP implementation must be managed as a program of wide ranging organisational change initiatives rather than a software installation effort. Such IT-driven initiatives require change of the organisation's socio-technical system, which is an intertwining of technology, task, people, structure and culture (Hong and Kim, 2002, p. 26). Which direction is desirable depends on one's point of view and various implementation contingencies - typically, ERP vendors recommend process adaptation and discourage ERP adaptations for the

fear of potential performance and integrity degradation as well as maintenance and future upgrade difficulties (Hong and Kim, 2002, p. 27). Hong and Kim (2002, p. 37) explain that in this study they discovered the following: **1.** We found that organisational fit of ERP is indeed critical in explaining ERP implementation success. **2.** In addition, we found that both ERP and process adaptations interact with organisational fit of ERP on ERP implementation success. **3.** We learned that ERP and process adaptation are only effective when organisational fit of ERP is relatively low - beyond a certain level of organisational fit, more adaptation will only lead to lower implementation success. **4.** We also learned that, since ERP adaptation also shows a significantly negative direct correlation with implementation success (while process adaptation only shows interaction effect), as many ERP vendors have claimed, process adaptation may be a safer choice than ERP adaptation when organisational fit of ERP is low.

Mult and Scheer (2003, p. 1) argues that ERP integration calls not only for the right tools but also knowledge of the process contents: Business processes are the basis of integration, ultimately ensuring the proper interaction between components and thus in effect serving as a blueprint for assembling and integrating the components. This is triggering an IT paradigm shift: the value of IT will no longer be measured in terms of the technology but the quality of the business processes. In other words: the focus is shifting from technical properties to business contents.

Sheina (2003, p. 1) suggests that despite the BPR hype and the wide-scale adoption of ERP for standardised functions, companies now realise that it is the continuous optimisation of their core business processes that creates productivity improvements: "Companies need to replace their data-centric view of the business with a process-centric view - process is the DNA of a business, from a competitive standpoint it is what differentiates it from others."

Buchanan et al. (1999, p. 2) state the following: The design and intent of ERP systems are such that business processes will change, so the organisation considering such a system needs to determine if it is willing to change as well. For example, ERP systems can automate tactical processes, such as purchase orders, allowing end users to access and facilitate the buying process. A change of this nature involves underlying issues, such as a shift in responsibility that the organisation needs to address prior to implementing a new system. Many organisations

participate in a thorough process mapping exercise before considering ERP so there is consensus on which business processes can be targeted for change. This has grown increasingly important due to the rapid evolution of electronic commerce and electronic retailing.

Although most ERP II projects have a guiding principle to "use the package as delivered," enterprises often find reasons to stray from that directive, and, in those decisions, they put their projects at greater risk for failure, because customisation efforts often take longer and cost more than planned (Zrimsek and Phelan, 2002, p. 7).

Unlike any other IT tools, ERP does not just result in computerisation or a mere automation of the existing business processes but brings about changes that enable radical breakthroughs in performance, which is the fundamental purpose of re-engineering the business processes (Rajagopal, 2002, p. 98). Brynjolfsson and Hitt in their paper about productivity paradox found that organisations might not be able to realise the full benefits of a technology unless they make the necessary changes in organisational structure, strategies and processes (Rajagopal, 2002, p. 88). Many renowned scholars in Management Information Systems (MIS) including Grover, Teng, Segars, Fiedler, Henderson, Venkatraman, Scott-Morton, Lucas and Barourdi have called for changes in business processes and such management related issues in order to take full advantage of the implemented information technologies (Rajagopal, 2002, p. 88).

Training and/or process change will often suffice where ERP customisations are required - users should resort to customisation of the application as a last resort after all other alternatives have been explored (Rayner, 2001, p. 4). Looking into the future, Rayner (2002, p. 12) predicts that customisations will take a different shape: Users will avoid customisations in areas that affect integration outside the enterprise. At the same time, users will request more customisations to increase the usability of the system (reports, screen changes) to positively impact on productivity.

Ng et al. (2002, pp. 89) reports that like packaged software in general, ERP is a generic enterprise solution, often requiring customisation and (some) unavoidable modifications - alternatively, organisations will accept some degree of misfit. Two of the most important ERP implementation critical success factors (CSFs) are: **(1)** choosing the right business processes to

redesign, and **(2)** ensuring minimal customisation and modification take place (Ng et al., 2002, p. 90). It is argued that each change to ERP can cause more extensive ripple effects and impacts on its existing (or other integrated application modules) than typical standalone in-house application software (Ng et al., 2002, p. 90).

One of the most important strategic decisions that a firm can make is not deciding how to use IT to improve business processes, but instead to first understand what business processes need improvement (Laudon and Laudon, 2000, p. 79). ERP systems require extensive organisational change - diverse business processes must be coordinated and redesigned, impacting organisational structure, culture, job design, and procedures (Laudon and Laudon, 2000, p. 597).

Laughlin (1999, p. 34) argues that matching the ERP's functionality to the way the enterprise does business requires compromise and balance: an enterprise must be willing to do things the way the ERP application requires. Only in cases of "competitive advantage/differentiation" should an enterprise consider complex ERP application configurations or bolt-on applications. Because both increase implementation cost, timelines, and risk, an enterprise must think twice about any adjustments to the original package.

Lheureux (2002, p. 7) argues that having the right organisation is more important than having the right technology.

An executive of one company that has adopted SAP's system sums it up by saying, "SAP isn't a software package; it's a way of doing business." The question is, is it the best way of doing business? Do the system's technical imperatives coincide or conflict with the company's imperatives? (Davenport, 1999, p. 168). Although the system's complexity makes major modifications impractical, some degree of customisation is allowed by the system. With this in mind, the conclusions drawn for the opinions reviewed by the selected key informants are summarised in table 8.

**Summary:** Based on the information obtained in this literature review thus far, it is expected that low ERP adaptation will be strongly associated with improved supply chain performance. It is also expected that ERP implementation involves business process change to align the software with the existing business processes and that the more customised an enterprise system

becomes, the less able it will be to communicate seamlessly with the systems of suppliers and customers.

**Table 8: High and Low ERP adaptation summary**

| | |
|---|---|
| 1 | **Low adaptation of ERP** will be strongly associated with improved supply chain performance and business process change. |
| 2 | **High adaptation of ERP** will be strongly associated with low supply chain performance improvement (i.e. system benefit degradation) and low business process change. |

## 2.5 ERP and Process Improvement

### 2.5.1 Introduction

It will be recalled that customisation to Telkom's new SAP R3 software solution was minimal, resulting in a need to adapt existing business processes to fit the requirements of the ERP system. Since the process changes induced by ERP implementations relate directly to effective ERP implementation and it is the implementation strategy Telkom opted for, this literature review will be concluded by presenting a framework to help in classifying a few important aspects to implementing business process improvement. The business process improvement aspects presented in this section of the literature review, will all be related to actions taken by Telkom. Telkom used business process management (BPM) software to modify its business processes to fit SAP R3.

**But what exactly is BPM?** Sheina (2003, p.1) reports that BPM has grown up from its heritage of workflow automation, conceived in the early 1980s to manage the flow of documents within an application and between IT systems - now it has evolved into a business discipline to automate processes across people, departments, applications and systems. Logan (2003, p. 6) describes BPM as a general term describing a set of services and tools that provide for explicit process management (for example, process analysis, definition, execution, monitoring and administration), including support for human and application-level interaction.

BPM is the automation of common business processes by implementing them in software - this has been done, more or less crudely, for decades; but today's BPM tools are much more

powerful, and make it easier for non-programmers to define and modify business processes (Welsh, 2003, p. 1). According to Gartner's BPM analyst Jim Sinur: "At the business level, BPM is the management of explicit processes from beginning to end. These processes generally contain a long-running set of business activities such as those required to underwrite a policy or deliver an order under varying numbers of business scenarios" (Stamper, 2003, p. 1). However, Stamper (2003, p. 1) adds that, "The technology definition is another story. Because BPM has multiple uses, from simple personal flow to deep system-to-system flow under performance constraints, it is hard to find a common definition." Stamper (2003, p. 1) explains that while BPM not only enables the automation of processes but also enables them to be abstracted away from the underlying technology - crucially, it also adds the ability for even non-technical users to model new processes, as well as the ability to monitor, manage and subsequently optimise a company's numerous processes.

Logan (2003, p. 6) explains that BPM can be used do perform the following:

- BPM leverages tools to analyse and model processes, using a graphical process designer targeted for business analysts who extract process flow and architect new business process flows. A runtime execution engine (underlying state machine) executes the defined process flow step by step.
- As the process flow is executed, applications (for example, legacy, packaged, external B2B, Web services) may be invoked, as will tasks that humans have to complete. The runtime environment maintains the status (state) of each process instance. As the many instances of multiple process types execute, they can be monitored (for example, process performance, degree of completion, out-of-bounds conditions) and administered (for example, for process termination, load balancing or re-routing). Post-completion analysis also is possible because the state data is archived for business intelligence potential. Even if an enterprise does nothing else, looking for the critical path and optimising the one path that brings it the most value in the shortest time with the lowest risk and costs will pay dividends.

Howard Smith and Peter Fingar, authors of Business Process Management: The Third Wave, position BPM as a revolutionary movement on a par with the introduction of database management 30 years ago - just in case this fails to stir up controversy, their next book will be

entitled IT Doesn't Matter: Business Processes Do (Welsh, 2003, p. 1). Welsh (2003, p. 1) also reports that the implications are clear: "BPM is a radically new way of using computers to run businesses, and the sooner everyone starts using it the better for them."

### 2.5.2 Process, business process, and BPR – defined

Business process is defined as " a set of logically related tasks performed to achieve a defined business outcome" (Ng et al., 2002, p. 89). The Oxford English Dictionary defines process as *a continuous and regular action or succession of actions, taking place or carried out in a definite manner, and leading to the accomplishment of some result; a continuous operation or a series of operations.* In its simplest form a process has an input and an output and is made up of a sequence of individual activities through which this input passes to become an output (Peppard, 1999, p. 300). Rajagopal (2002, p. 98) defines a business process as "an activity in the organisation fundamental to operating the business that serves an internal or external customer and has a well-defined outcome or series of outcomes". BPR is intended to re-organise a company so that it can best create value for the customer by eliminating barriers that create distance between employees and customers. It involves fundamental rethinking and radical redesign of a business process (Pearce and Robinson, 2000, p. 412)

### 2.5.3 Background to Telkom's process improvement approach

Chuck Wright (Telkom Executive – Finance and SAP Systems Support) explains that as far as the process improvement approach is concerned: Telkom's approach followed in the project was the Systematic Approach, which involved documenting an "As Is" view of our business processes which was signed-off as part of the Blueprint phase of the project and then a "To Be" that followed the options in the SAP Standard Configuration. Then a "Gap Analysis" was performed to determine the quantity of work to be done.

Ilse Geldenhuys (Telkom SAP, ARIS Custodian) reported the following: The "as-is" business processes were signed-off in the Blueprint phase of the SAP R/3 implementation. The processes then went through a cycle of enhancement as gaps were identified and addressed. Workshops were held to update documented processes during the lifecycle of the project. Existing policies and procedures, work instructions, business control points, archiving processes and training requirements were added. Source documents for the modelling of the business processes during

the project phase consisted of Vision flows. The tool used and still being used for the documenting of the business processes relating to SAP R/3 is ARIS, i.e. Architecture for Integrated Information Systems. Ilse Geldenhuys (Telkom SAP, ARIS Custodian) explained that the Architecture for Integrated Information Systems (ARIS) is recognised worldwide as the leading conceptual framework for describing businesses and application software. Developed by IDS Scheer, the ARIS Toolset and its add-on modules enable the enterprise-wide definition and design of business and e-business processes, as well as their analysis and optimisation. ARIS provided Telkom with realistic simulations of resource utilisation and activity-based cost calculations, as well as web-based communication of modeled and optimised processes. It also provided a business process modeling framework, or concept, for describing the interrelationships between objects in business and business application software. ARIS also provides several ready-to-use e-business model methods that are used to describe e-commerce process models. The number of processes changed as part of Telkom's SAP R/3 implementation is shown in table 9.

**Table 9: Number of processes changed**

| **Total number of processes changed as a result of Telkom's SAP R/3 implementation** | |
|---|---|
| Asset Management | 34 |
| Finance | 59 |
| Cost Controlling | 18 |
| Sales and Distribution | 41 |
| Treasury | 15 |
| Materials Management | 146 |
| Human Resources | 176 |
| **Total** | **489** |

### 2.5.4 ARIS Modelling

ARIS was used for mapping and/or modelling of the processes identified in the blueprint for Telkom's SAP implementation. Ilse Geldenhuys (Telkom SAP, ARIS Custodian) explains that process mapping typically involves identifying the steps, activities, and interrelationships associated with performing a specific task. This process serves as the basis for all that follows. It is important that all of the "current states" or processes that may be modified, replaced, or affected by the new software be mapped during this phase of the project.

Telkom felt that this was the best time to affect any BPR initiatives that they intended to perform. The Business Process Modelling formed an integral part of the design and the implementation of business processes as part of Telkom's SAP R/3 implementation.

Ilse Geldenhuys (Telkom SAP, ARIS Custodian) explains that Business Process Models used by Telkom provided the following:

- A visual description of the business environment.
- A common language (definition) for business owners, system implementers and team members.
- Linked business processes and technology functionality.
- The integration and completeness of all business processes.
- Impact analysis and exception reporting that is essential for maintenance of the repository (deliverables).

Ilse Geldenhuys (Telkom SAP, ARIS Custodian) explains that a full and comprehensive view of the business architecture enabled Telkom to:

- Identify opportunities for business improvement.
- Facilitate business change and the determination of the impact thereof using the architecture as an integration and control platform (The repository[5] enables the change and configuration management of deliverables).
- Develop integrated solutions.
- Structure the implementation and maintenance of information systems.
- Identify the degree of coverage of company specific processes by a package solution as well as the timely identification of possible weaknesses.

Ilse Geldenhuys (Telkom SAP, ARIS Custodian) also explains that Telkom realised that it was of utmost importance to model all the key information as well as the integration and interdependencies between the components to ensure that the benefits discussed above materialised. A complete, consistent and integrated architecture enabled Telkom to manage and control the SAP R/3 implementation project. Telkom's implementation team used these models

[5] Repository – also referred to as central database.

to clearly understand integration areas, plan the workload of individual team members, develop training programs, facilitate business change and develop user profiles. Telkom's objective was to identify all integration requirements; especially interfaces in order to manage integration and to minimise future re-work. The approach considered the following:

- Integration between Telkom's business processes (internal and external integration).
- Integration between SAP functionality.
- Integration between Telkom's organisational units.
- The impact of other initiatives within Telkom.
- The interfaces between applications.

**Critical Success Factors**

According to Ilse Geldenhuys (Telkom SAP, ARIS Custodian), it was important to address at least the following critical success factors as part of Business Modelling:

- Ensure a maintainable integrated set of deliverables during and after the implementation of SAP R/3 through the establishment of a modelling office, configuration management process and repository management procedures.

- Customise the business analysis and requirement definition method to support the repository-based approach.

- Set up an integrated modelling environment (including licensing), and repository management procedures (including configuration management) to support the method and future maintenance of the deliverables.

- Train and mentor the Business Architects and Business Analysts as well as team members to understand the method and to use the modelling tool.

- Select resources for the modelling office for management of the method, mentoring of the Business Analysts, quality assurance of the content of the repository, technical support and repository management (including configuration management).

### 2.5.5 Process improvement approaches

Peppard (1999, p. 305) explains that having examined many BPR initiatives; two broad approaches can be identified: (Telkom followed the systematic approach).

1. **Systematic approach:** In adopting this approach, an organisation maps out and attempts to understand an existing process and then work through it systematically to create a new process to deliver the desired outcomes.
2. **Clean sheet approach:** This approach demands a fundamental re-think of the way that the product or service is delivered and design new processes from scratch.

### 2.5.6 Rules for redesigning processes

Peppard (1999, p. 305) proposes that when redesigning existing processes, the rules for doing this can be best summarised using the acronym ESIA:

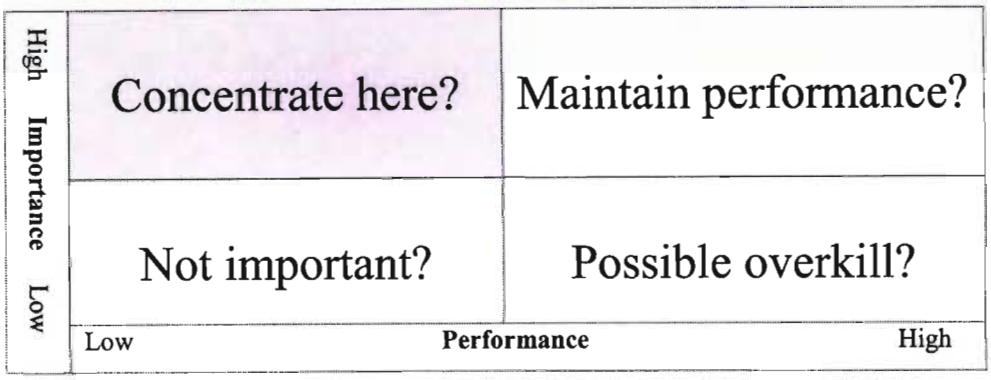
- **Eliminate** all non-value adding activities.
- **Simplify** aspects of work where possible.
- **Integrate** elements of the process
- **Automate** where appropriate.

According to Ilse Geldenhuys (Telkom SAP, ARIS Custodian), Telkom placed emphasis on the elimination of no-value adding activities and the streamlining of the value-adding ones.

### 2.5.7 Identifying processes for re-design

Sheina (2003, p. 1) reports that Companies are sharpening BPM deployments on people- and paper-intensive processes, targeting tactical areas as diverse as order management and fulfilment, claims management and adjudication, contract management, complaint handling, account initiation and procurement. Telkom pointed BPM at critical areas of their business that can demonstrate quick return on investment. To identify potential candidates for redesign it is useful to examine the importance of the processes and plot this against the supply chain's performance in these processes vis-à-vis competitors. Peppard (1999, p. 311) suggests that using a performance-importance matrix (see figure 8) helps focus attention on those areas that are in most need of improvement.

**Figure 8: The importance-performance matrix**




### 2.5.8 ERP's effect on control and structure

When ERP implementation involves adapting the existing business processes to the standard business processes of ERP, other organisational components (e.g. organisational structure, etc.) and their interactions must also be changed together (Hong and Kim, 2002, p. 29). Davenport (1999, pp. 171 – 172) explains that on the one hand, by providing universal, real-time access to operating and financial data, the ERP systems allow companies to streamline their management structures, creating flatter, more flexible, and more democratic organisations. On the other hand, they also involve the centralisation of control over information and the standardisation of processes, which are qualities more consistent with hierarchical, command-and-control organisations with uniform cultures. In fact, Davenport (1999, p. 171) argues that the reason ERP systems first emerged in Europe is that European companies tend to have more rigid, centralised organisational structures than their U.S. counterparts. Simon Govender (Telkom Senior Manager, Procurement) reports that before the SAP R/3 implementation - Telkom's procurement environment streamlined their management structures by reducing their number of Executives form ten to six.

### 2.5.9 Resistance to change

Many of the most problematic issues of implementing BPM deal with business, organisational and cultural practices. While resistance to organisational change is nothing new, process improvements can shake-up normal business practices, resulting in resistance from many levels. Telkom ran a change management program in parallel with the SAP R/3 implementation. ERP implementation affected most of Telkom's business functions and influenced users directly.

Telkom realised that resistance to change could stem from the change in the job content and uncertainty of the new SAP R3 system. According to Ilse Geldenhuys (Telkom SAP, ARIS Custodian), Telkom focused on the users by conducting the following initiatives:

- **Communication** - about the project to the enterprise, on a regular basis, throughout the project.
- **Consistency** - of messages originating from the project team, creating a consistent view of the project within the enterprise.
- **Inclusion** - of users not directly involved in the project in such activities as validation of design and conference room pilots; because ERP may affect users from other enterprises, these external parties will also require attention and involvement.
- **Education** - helping the users understand why the project is important and what the organisational benefits will be; providing them with the knowledge required to assist in achieving the benefits.
- **Training** - preparing users for the changes to their daily activities.

### 2.5.10 Process improvement guidelines for success and pitfalls

Laudon and Laudon (2000, p. 412) report that the failure rate among business process engineering (BPR) and ERP is very high: a number of studies have indicated that 70 percent of all business processing re-engineering projects fail to deliver promised benefits. Likewise, 70 percent of all ERP projects fail to be fully implemented or to meet the goals of their users. Laudon and Laudon (2000, p. 412) also claim that both BPR and ERP problems are part of the larger problem of organisational implementation and change management. With this in mind, table 10 provides the guidelines for success and pitfalls in undertaking a BPR initiative (Peppard, 1999, p. 307).

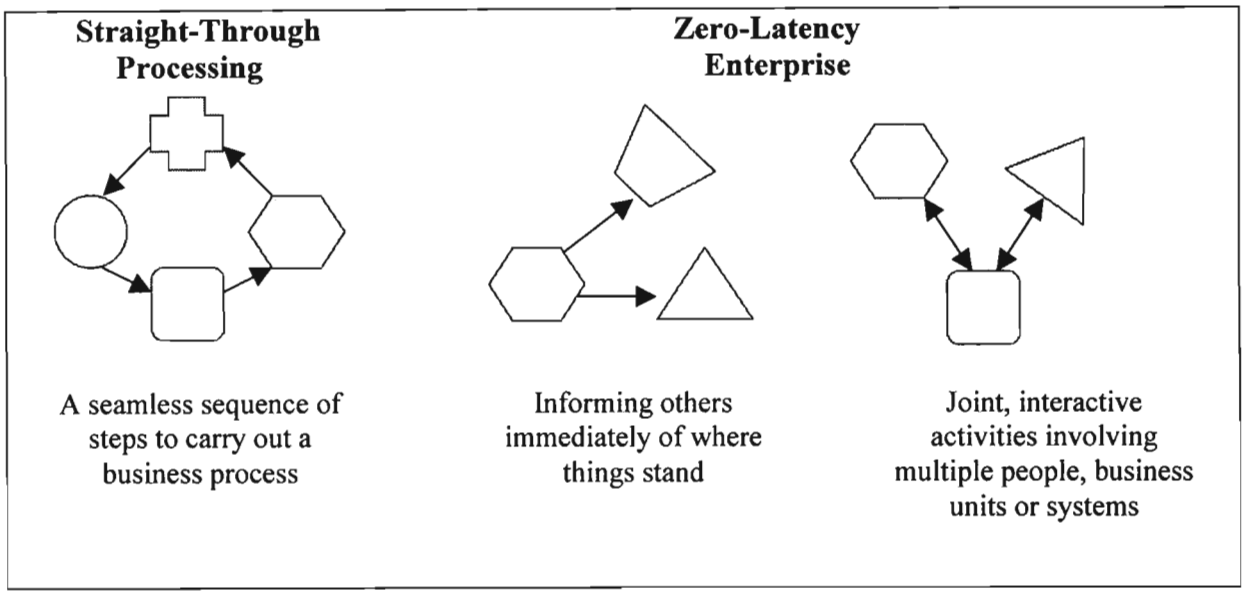
**Table 10: Process Improvement guidelines for success and pit falls**

| **Guidelines for success.** |
|---|
| Initiative must be driven by top management and requires effective management. |
| It is imperative to communicate to employees during all stages of a BPR initiative. |
| Treat people fairly and with respect. |
| Ensure that the right sponsor is chosen. |
| Be clear about the purpose of the redesign. |
| Set aggressive re-engineering performance targets. |
| Understand the concept of the process being redesigned. |
| Treat BPR as a holistic philosophy. |
| Aim for quick hits. |
| Ensure that the processes "match" the needs of the markets they are to serve. |
| Involve customers and suppliers in the redesign process. |
| Dedicate resources to the project. |
| Recognise that ERP provides opportunities for new and innovative designs. |
| **Pitfalls to avoid.** |
| Divorce re-engineering effort from the main goals of the organisation. |
| Underestimate the changes required to achieve a process orientation. |
| Run before you can walk. |
| Do not expect too much to soon, benefits may take time to manifest themselves. |
| Appoint the IT department as BPR agent in the company. |
| Not piloting the new processes. |
| Concentrate on ERP packages to do the re-engineering. |

## 2.6 Concluding remarks

**What will Telkom's new process look like?** According to Lheureux (2002, p. 12) two themes, straight-through processing and zero-latency enterprise (see figure 9) are profoundly changing the nature of business. These principles are the basis of supply chain management, just-in-time (JIT) inventory, vendor-managed-inventory (VMI), the "event" driven enterprise, time-based competition and many other modern management strategies.

**Figure 9: Two principles for process improvement**




Lheureux (2002, p. 12) highlights the fact that both of these principles require advanced forms of integration technologies, such as ERP. Both strategies deliberately forge new links across the boundaries between disparate business units (sometimes in separate companies) to enhance the speed and effectiveness of business processes. Lheureux (2002, p. 14) explains that the benefits associated with straight-through processing and zero-latency enterprise process design involves the following:

**Straight-through processing** is a popular goal for finance, utilities and a growing number of industries. It is sometimes labeled "flow-through provisioning," "paperless acquisition," "lights out" or "hands free" processing. Its premise is that a transaction - such as a payment, trade, purchase order or change to a customer's phone service - is entered only once. Thereafter, it proceeds in an automated fashion through its life cycle, potentially involving dozens of steps in various locations. The goal is to avoid re-keying data, thereby reducing input errors, improving service delivery and, usually, shortening the time to completion ("taking the air out of the process"). **Zero-latency enterprise strategies** take the concept of a system and the goal of timeliness to their logical conclusions. They aim for instantaneous awareness and appropriate responses to events across an entire virtual enterprise. In the supply chain arena, a primary goal of the zero-latency enterprise is to make the goods pipeline more visible. It helps answer basic questions such as: "Where are the goods?" and "When will they arrive at their destination?"

According to Mult and Scheer (2003, p. 1), the dominance of SAP, for example, can be traced back to the fact that the company realised from a very early stage that various enterprise functions interact via a given business process, which requires a common database with common database definitions as support for this business process - this led to the integration approach behind SAP R/3. This is good news for Telkom.

The critical challenge of ERP implementation is believed to be the mutual adaptation process between the ERP system and the user. This study found that this mutual adaptation process will bring the organisation's existing business processes and ERP's functionality into the following desirable alignment for optimal use:

1. It is expected that by undertaking business process improvements first, followed by ERP implementation, the full benefit of ERP implementation will be realised.
2. It is also expected that by using the options allowed by the ERP system (i.e. customisation or configuration), the benefits of ERP will not be diluted – because this does not change the basic ERP identity.

This study found that the **Process Modification and Enhancement** ERP adaptation strategy is clearly the safest option given the reference to existing literature on this topic. With this in mind, the substance of this statement and the resulting themes and issues that emerge as a catalyst for future investigation, can now be examined. It will be recalled that Telkom's SAP R/3 adaptation strategy is a process modification and enhancement strategy.

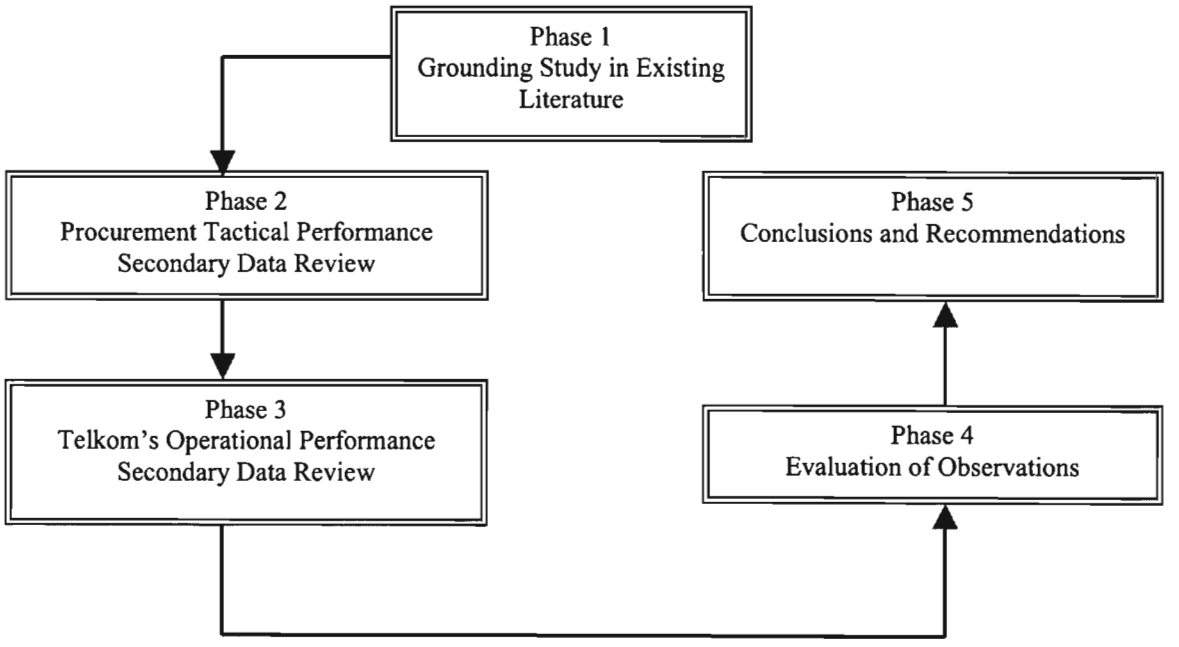
# 3. RESEARCH METHODOLOGY

## 3.1 Introduction

This chapter outlines and justifies the methodology used in this research project. In so doing, it justifies the suitability of the method used to resolve the research question. It was sought to use a research methodology that allows for the measuring of tangible benefits in the evaluation of Telkom's ERP adaptation strategy. The selected key performance indicators (KPI's) and benchmarking metrics used in the proposed research methodology incorporates this aspect.

This research will focus on analysing and synthesising existing literature, interpreting secondary data and findings, and arguing the research question and resulting themes on such interpretations. The research design is illustrated in figure 10.

**Figure 10: Research design**



### 3.2 Introducing the research strategy

The research question requires a data collection and analysis method that would allow for the measurement of differences across time periods. The objective was to develop a fact-based approach to measure the impact of SAP R/3 on Telkom's supply chain, considering a variety of tactical and operational KPI's in the evaluation process. The research technique used in this study requires statistical and quantitative data. Telkom's pre- and post-SAP R/3 implementation supply chain performance data will be compared against benchmark performance metrics for SAP installations, to establish whether or not Telkom's ERP adaptation strategy yielded the expected results. It is expected that benchmark performance metrics will provide measurable evidence that this ERP implementation had an expected demonstrable effect on Telkom's supply-chain performance.

Shah and Singh (2001, p. 37) report that performance measurement is an essential and powerful management tool, but its power relies on the ability to identify those measures that drive supply chain success – benchmarking is one way of assessing performance based on those measures. Smeltzer and Carr (1999, p. 16) tested the relationships between benchmarking and a firm's performance and found that benchmarking is positively related to a firm's performance. According to this study, firms do obtain valuable comparison information and have the opportunity to learn if they use the benchmarking information.

The primary reason for not opting for a more qualitative technique was the relative newness of the ERP system to Telkom employees – i.e. it was implemented on 1st April 2002. In this context, the request for material (RFM) was previously entered into the old system by procurement clerks for the requestor – which with the new system in place, does not happen anymore. The new ERP system allows the requestor to capture his/her own material requirements – currently there are ± 4 200 users in Telkom who capture the own RFM's. The users on the new system have no previous hand-on experience with the old order management system (OMS). With this in mind, and although face-to-face interviews with users of the new system might produce rich data, the attainment of a sample of reliable and representative responses across time and context for analysis, is unlikely. Although no measure has 100% validity and reliability, it is argued that the largely quantitative technique applied to this research is likely to yield statistically significant results.

Specifically, it develops a value metric, based on tangible benefits derived from ERP implementation, for assisting in the preferred ERP adaptation strategy decision-making process. The proposed methodology could also be useful to direct attention to areas where benefits are greatest or to potential problem areas.

### 3.3 Summary of the research steps to be followed:

1. Identify KPI's with a measurable and quantifiable business benefit.
2. Determine values of KPI's, before and after SAP R/3.
3. Compare the before and after SAP R/3 KPI situation.
4. Benchmark KPI results against a suitable peer group.
5. Examine and interpret results.

### 3.4 Research paradigm

**Positivist:** Will conduct a quantitative data analysis, using objective criteria – shown in tables 11 and 12.

**Interpretive:** Will analyse data to determine outcome in relation to Telkom's process modification adaptation strategy.

### 3.5 Credibility, reliability and validity

Does the secondary data used for this research meet the conditions of credibility, reliability and validity? The same data used in this research is used throughout Telkom for regional and national tracking of Telkom's operational performance against predetermined targets, from executive level all the way down to operational manager. This data also forms part of Telkom's annual group results in the form of operational highlights. With this in mind, it is expected that proof exists that this data has been tried and tested. The Benchmarking performance metrics were obtained from Deloitte Consulting's fact-based data repository. Deloitte Consulting publishes several benchmarking reports each year that provide purchasing and supply management professionals with information about the most recent performance metrics.

### 3.6 Procurement Performance - Secondary Data Review

The procurement performance data used in this research was provided by: Garon Kenchenten (Telkom Manager, Procurement Services), Dennis Thomas (Telkom Manager, Procurement Services), and Fiona Doubell (Telkom Operations Manager, Procurement Services). The selected procurement KPI's are shown in table 11.

**Table 11: Procurement Key Performance Indicators**

| | |
|---|---|
| 1 | Procurement Operating Cost |
| 2 | Stock turns |
| 3 | Inventory levels |
| 4 | Freight costs |
| 5 | Stock accuracy |
| 6 | Reduce material management FTE's |
| 7 | Time taken to generate invoices |
| 8 | Time taken from request to quote |
| 9 | Order cycle time |
| 10 | Number of calls to complete an order |
| 11 | Number of call to confirm an order |

### 3.7 Operational Performance - Secondary Data Review

Kobie Van Heerden (Telkom Senior Manager, National Operations) provided the operational performance data used to evaluate the KPI's shown in table 12.

**Table 12: Telkom's Key Performance Indicators**

| | |
|---|---|
| 1 | Mean time to repair corporate voice |
| 2 | Mean time to repair business voice |
| 3 | Mean time to repair residential voice |
| 4 | Mean time to install corporate voice |
| 5 | Mean time to install business voice |
| 6 | Mean time to install residential voice |
| 7 | Customer satisfaction rating |

### 3.7.1 Telkom's customer satisfaction rating - Secondary Data Review

Telkom's customer satisfaction rating was obtained from the 2003 South African Satisfaction Index (SAS Index), an independent internationally comparable customer satisfaction measurement developed by the Centre for Proactive Marketing in line with both the American Customer Satisfaction Index (ACSI) and the European Customer satisfaction Index (ECSI). The overall customer satisfaction ranking of the telecommunications industry in SA will be used as a benchmark baseline to perform a comparative analysis.

## 3.8 Data Analysis

Telkom's supply chain performance data and benchmark metrics for peer group SAP R/3 installations will be compared against each other over time to establish whether or not Telkom's ERP implementation strategy produced the expected return on investment (ROI). Percentage changes will be recorded against measured supply chain performance and benchmark metrics – to establish the sum of deviation between the observed and expected scores. The research findings presented in time series charts and tables will be examined, interpreted, discussed and converted into conclusions and recommendations.

## 3.9 Concluding remarks

This chapter outlined and justified the methodology used to generate data for analysis and to answer the research question. Chapter 4 examines the data set by means of a statistical analysis and findings for discussion and debate are outlined in Chapter 5.

# 4. RESULTS

## 4.1 Introduction

This chapter examines the data gathered and provides the results of the statistical analysis in relation to the research question and resulting themes identified in chapter 2:

- Has Telkom's ERP process adaptation strategy resulted in its supply chain becoming more responsive and cost-efficient?

1. It is expected that by undertaking business process improvements first, followed by ERP implementation, the full benefit of ERP implementation will be realised.
2. It is also expected that by using only the options allowed by the ERP system (i.e. customisation or configuration) and by avoiding ERP adaptation, the benefits of ERP will not be diluted – because this does not change the basic ERP identity.

Data collection for this research was difficult and some of the figures provided have, by necessity, been estimates. Telkom's records for initial KPI values before the SAP R/3 project were in some cases unavailable, due to poor record keeping, or simply being completely new, which means that there was no baseline. With this in mind, and the fact that benchmark metrics for several of Telkom's KPI's were not available - the number of measurable KPI's for this study were limited to eighteen. In addition, Telkom decided not to use SAP for forecasting. Telkom felt that their existing forecasting system was superior to the SAP product - this issue will be discussed in more detail in chapter five. In this context, the part of the SAP ERP solution typically used to optimally prepare a company to evolve and integrate into extended collaborative areas such as customer relationship, product life cycle, optimising supply planning with suppliers, and supplier relationship management, was not assessed.

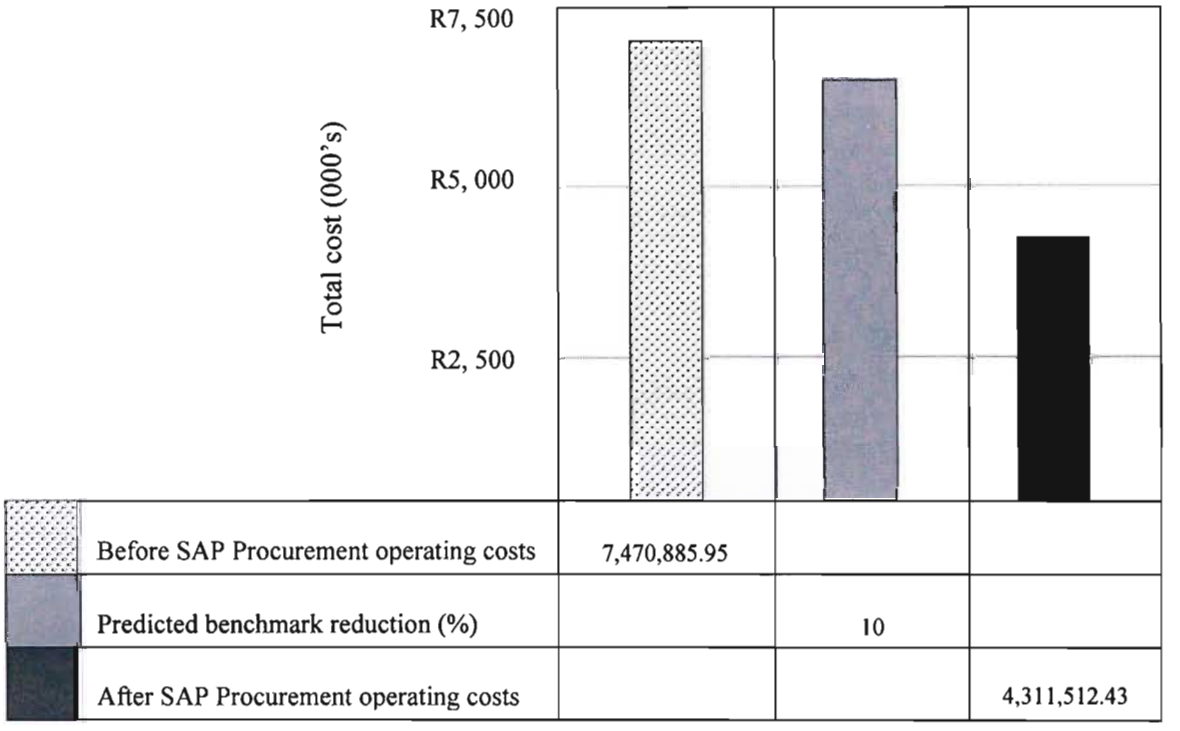
The research findings presented in a series of charts will be examined next.

## 4.2. Telkom's procurement performance

The procurement performance data used in this research was provided by: Garon Kenchenten (Telkom Manager, Procurement Services), Dennis Thomas (Telkom Manager, Procurement Services), and Fiona Doubell (Telkom Operations Manager, Procurement Services).

### 4.2.1 Procurement Operating Cost

**Figure 11: Procurement operating cost**




| | | | |
|---|---|---|---|
| | Before SAP Procurement operating costs | 7,470,885.95 | |
| | Predicted benchmark reduction (%) | | 10 |
| | After SAP Procurement operating costs | | 4,311,512.43 |

Figure 11 indicates a significant cost reduction in operating cost since the SAP R3 implementation. The total post-implementation operating costs of R4, 311, 512.43 shows a 42% overall reduction when compared with the pre-implementation performance. The benchmark baseline predicted that a 10% reduction could be expected – the post-implementation performance is 32% better than this benchmark value. Based on these results, it is expected that the measured cost reductions are due to improved operational management through the use of SAP.

### 4.2.2 Stock turns

**Figure 12: Stock turns**

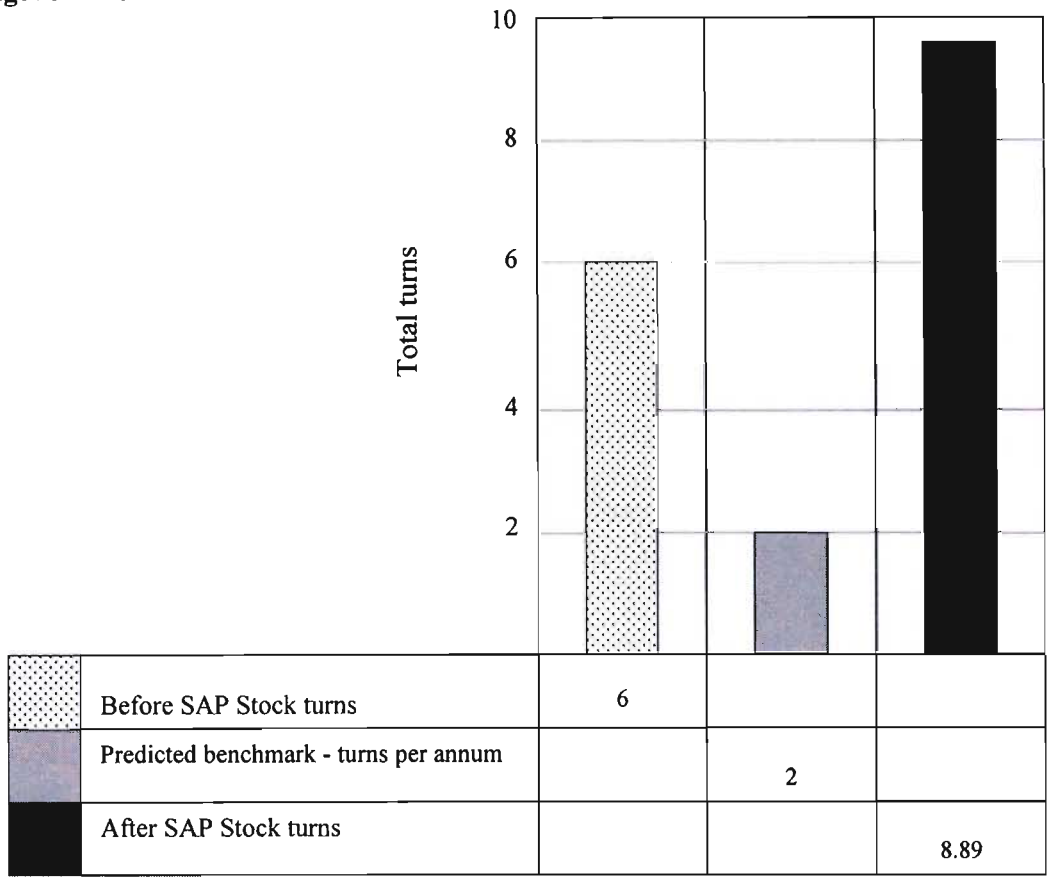



Figure 12 illustrates a significant improvement in stock turns of 33%, when comparing pre- and post-implementation statistics. It is interesting to note that the benchmark metric predicts a value of only 2 turns, which is 66% below Telkom's pre-implementation performance – suggesting that certain elements of this baseline are not directly comparable. The following example of stock turns improvement appears to be more appropriate: From 1995 to 2002, Wal-Mart improved their stock turns from 5.23 to 8.34 (Beth et al., 2003, p. 89) – the end result being a 37% improvement achieved over a five-year period. With this in mind, Telkom's 33% improvement achieved over a two-year period appears to be an exceptionally good accomplishment. SAP R/3 provides procurement with improved visibility across the supply chain, enabling them to make crucial volume adjustments before it is to late. This means less inventory in the MC's and more efficiency overall.

### 4.2.3 Inventory level

**Figure 13: Inventory level**

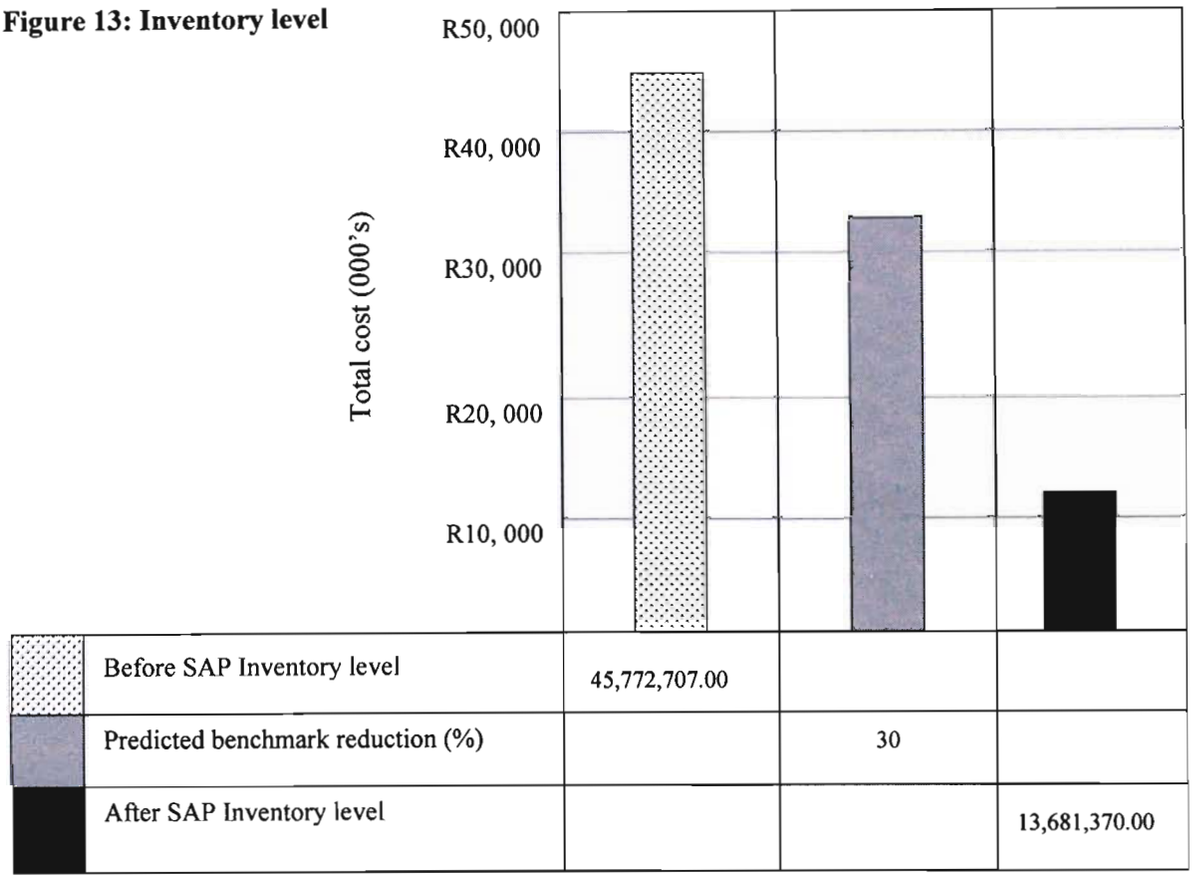



Figure 13 shows that Telkom managed to significantly reduce the inventory buffers that characterised its warehouses before the SAP R/3 implementation. Figure 13 indicates a 70% reduction when comparing pre- and post-implementation inventory levels. In addition, the benchmark value only predicted a 30% reduction – Telkom managed to exceed this expectation by some 40%. Based on the above findings, it is expected that procurement is now moving toward stocking the right quantity, at the right place and at the right time. SAP R/3 provides procurement with detailed real-time visibility of inventory, orders, shipments and events, across its supply chain, offering the viewer the opportunity to determine what is available for immediate delivery. For example, in the event of an emergency, SAP R/3 allows procurement to efficiently find, cross-source and ship an item overnight from MC's – instead of stocking an expensive slow-moving item. Rather than use the typical approach of "art over science" in allocating space for material, SAP R3 can be used to analyse what moves, and then assign space and set inventory levels based on popularity.

### 4.2.4 Freight cost

**Figure 14: Freight cost**

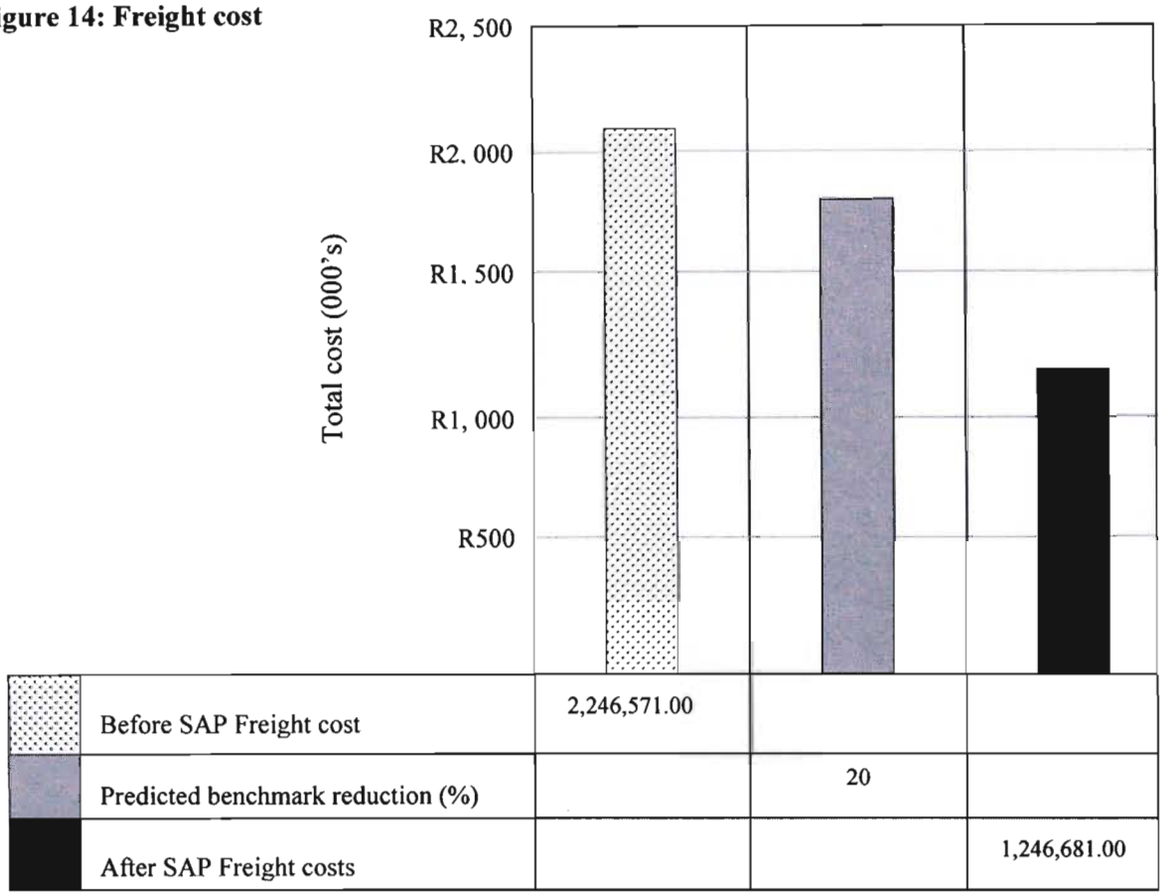
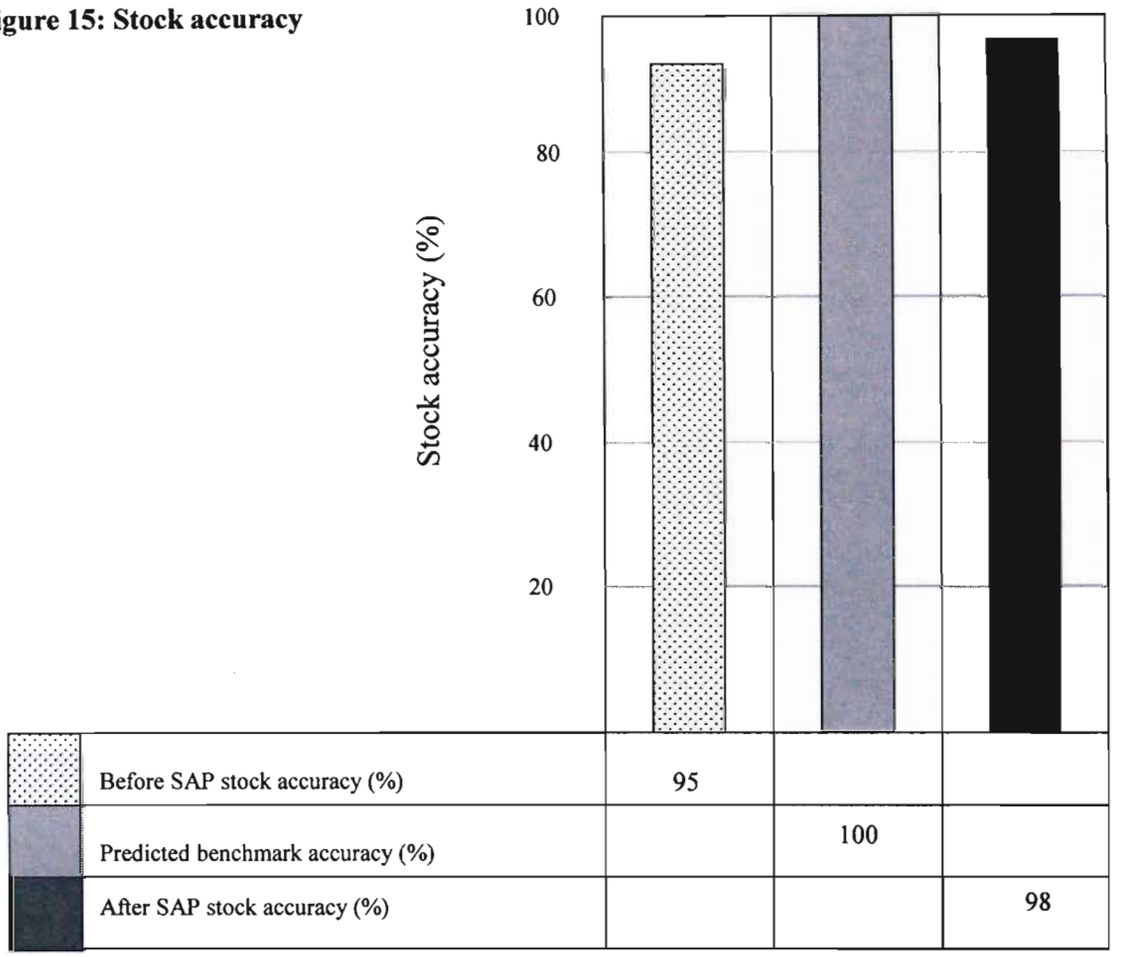



Figure 14 shows a cost reduction of 45% when comparing pre- and post-implementation freight costs. In addition, this freight cost saving is 25% better than the expected benchmark value. The explanation for this outcome may be the fact that Telkom has put a lot of thought into how to optimise its distribution routes and manage shipments across their supply chain. The distribution network consists of the following: a primary route which focuses on the movement of equipment from Telkom's three National MC's to various Regional MC's, and a secondary route which focuses on the movement of equipment from the MCs to the various DOP's. Distribution operates on a fixed route per day system so that all MC's and clients receive a delivery at least once a week. In addition, ad-hoc deliveries can be arranged for vital-to-production items (VTP). Khalik Karim (Telkom, Distribution Manager) argues that Telkom's distribution model was largely responsible for the savings - SAP was used to manage the process.

### 4.2.5 Stock accurancy

**Figure 15: Stock accuracy**




Garon Kenchenten (Telkom Manager, Procurement Services) explains that before SAP the stock accuracy was established by checking the number of items – since the implementation of SAP the stock accuracy is determined by checking the quantities per stock unit. The benchmark value predicts a minimum of 95% and a maximum of 100% stock accuracy – the measured 98% post-implementation performance compares favourably with this. Figure 15 shows a 3% improvement when comparing pre- and post-implementation performance. Telkom has not yet automated their warehouse packing and picking process with bar coding and scanners; therefore, the impact of human error on stock accuracy still exists. Garon Kenchenten reports that it is expected that during 2004 the bar coding and scanner real-time warehouse management system will be implemented

### 4.2.6 Reduce material management full time employees (FTE's)

**Figure 16: Reduce material management FTE's**

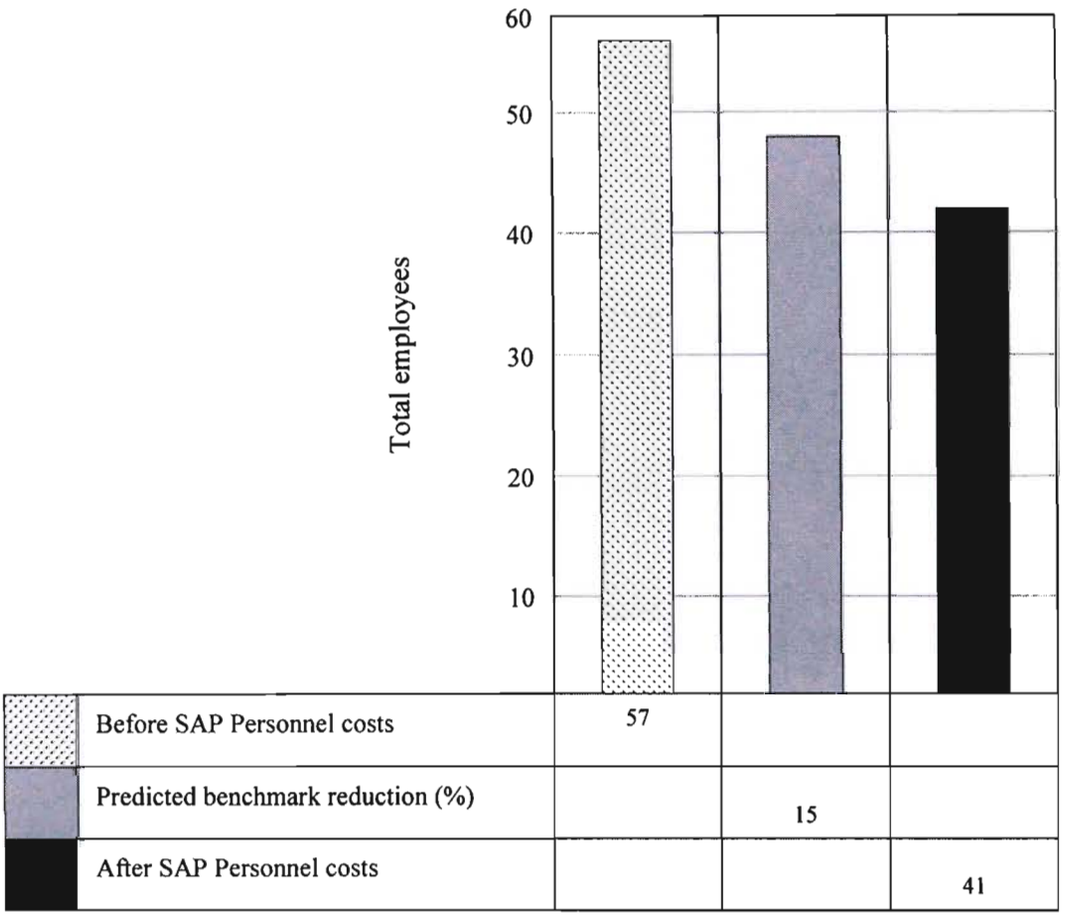
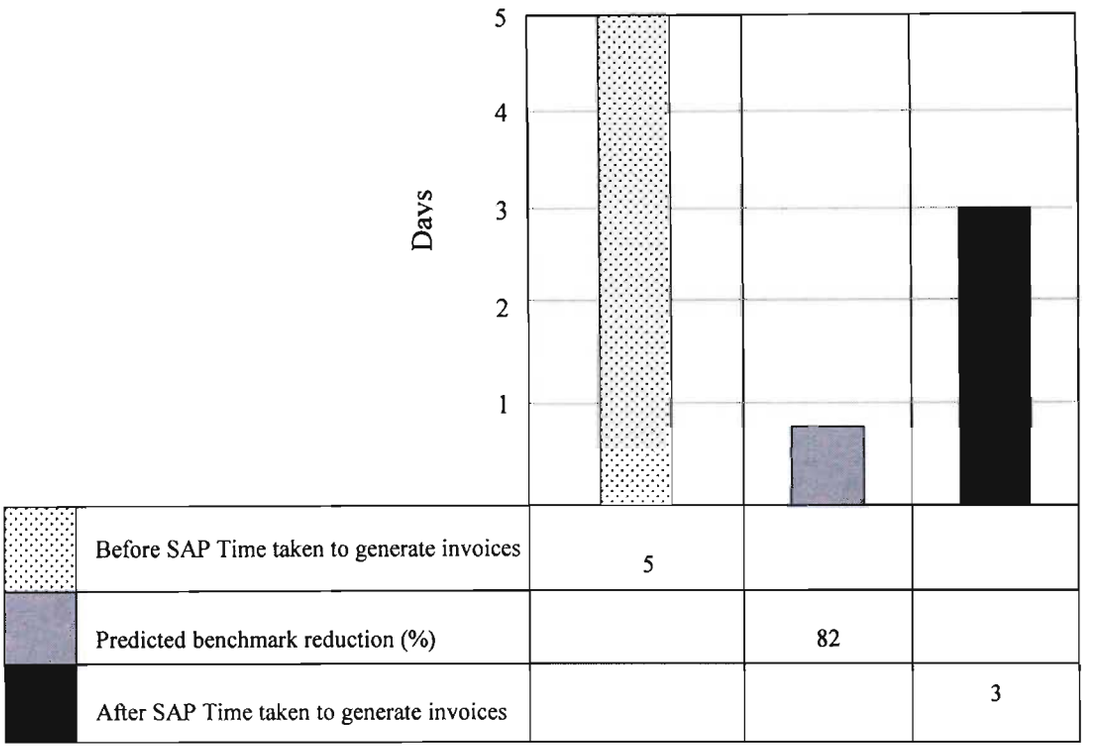



Figure 16 indicates that procurement personnel numbers have been reduced by 28% when comparing pre- and post-implementation numbers - this is 13% better than the predicted benchmark value of 15%. This reduction in staff numbers increased the monthly delivery lines per head count from 158.14 to 219.07. It is interesting to note that despite this, Garon Kenchenten claims that procurement's ability to efficiently streamline their logistic operations for the optimal execution of all orders has not been compromised. The results suggest that procurement is reaping significant productivity benefits from its new processes and the SAP R/3 solution.

### 4.2.7 Time taken to generate invoices

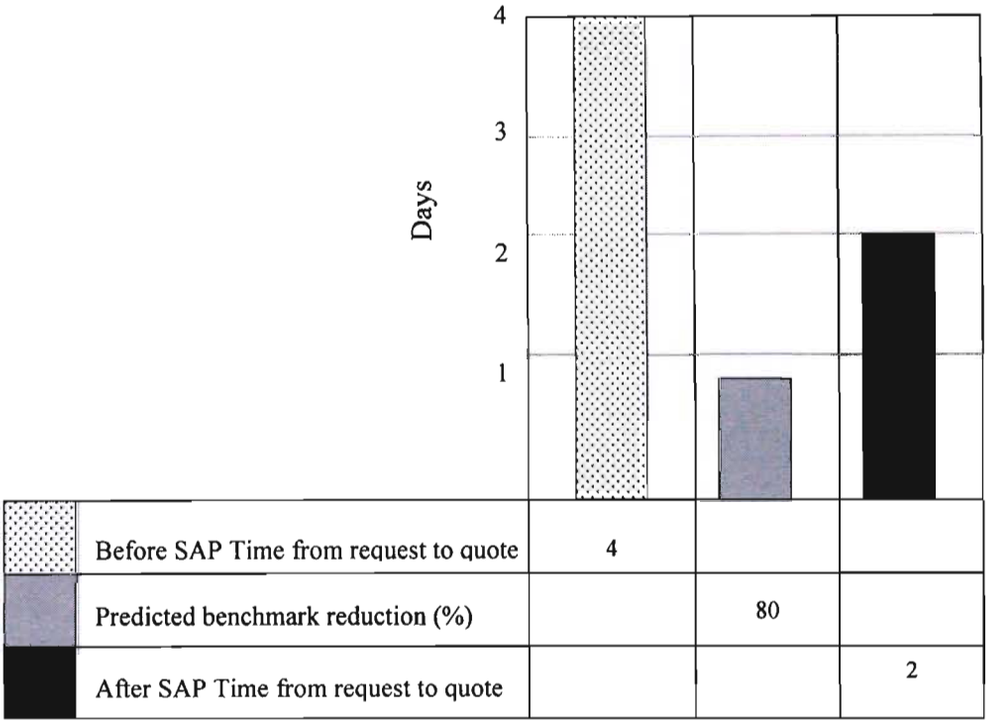
**Figure 17: Time taken to generate invoices**




The data points in figure 17 indicate that when comparing the pre- and post-implementation performance a 60% improvement is evident. However, note that the post-implementation performance is 30% worse than the expected benchmark baseline. Fiona Doubell (Telkom Operations Manager, Procurement Services) explains that SAP R/3 allows for the end-user to capture the goods receipt notification. In the past (before SAP), one procurement person was responsible to deal with this paper intensive activity and he/she was usually overloaded with work - creating lengthy delays. SAP R/3 links the goods received notification and invoice, and once matched, SAP automatically pays. SAP R/3 effectively streamlines this business process from end to end while providing tight integration and transparency of information, the end result being both a faster turnaround time and resource saving. SAP also generates accurate, immediate system messages that allow the end user to take immediate corrective action. It is interesting to note that this process would have been even faster had it not been for the fact that ± 30% of Telkom's suppliers are not yet integrated with the system.

### 4.2.8 Time taken from request to quote

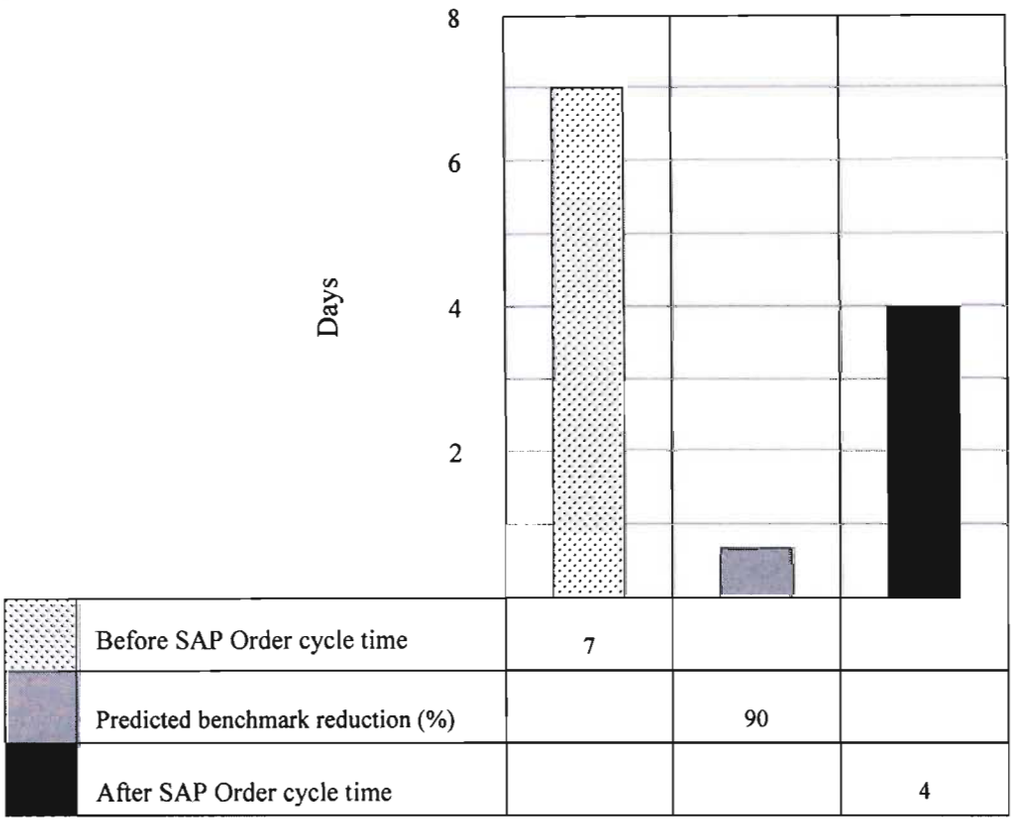
**Figure 18: Time taken from request to quote**




The pattern in figure 18 shows a reduction in time of 50% when pre- and post-implementation performance is compared. On the other hand, note that the post-implementation performance is 30% worse than the benchmark value of 80%. Fiona Doubell provided the explanation for this outcome: Requisitions needing requests for quotes (RFQ) are routed directly to the SAP R/3 buyer bucket, this reduces time in receiving a request. Some of these requests are contract based and are therefore directly converted to purchase orders without sourcing, this saves ± two days on sourcing/order management. Suppliers linked to electronic trade/mail, have RFQ's routed directly to them and are subsequently able to respond electronically. The RFQ process on SAP is not fully integrated yet, only ± 70% of Telkom's suppliers are currently linked. Only when all the suppliers are linked will the RFQ process be 100% electronic, until then part of the process will remain manual i.e. confirming quotes by faxing and/or phoning – therefore causing delays, which explains why Telkom's performance is not as good as the expected benchmark value.

### 4.2.9 Order cycle time

**Figure 19: Order cycle time**




The values in figure 19 show the time involved from the placement of an order to the receipt of the shipment. Telkom improved their order cycle time by 43%, however the benchmark baseline predicted a 90% improvement. It is important to note that the pre-SAP order cycle time data shown in figure 17 is an estimate. The issue of procurement not yet having the luxury of all the suppliers being integrated with the SAP R/3 system is perhaps the reason for this performance being 47% worse than the expected benchmark baseline. Before SAP, to place an order, Telkom had to make many phone calls to different suppliers to get a quote - and to pay for the order, Telkom had to process a series of invoices. Fiona Doubell explains that because SAP automatically transforms requisitions into purchase orders, links and matches the goods received notification and invoice, and automatically pays the supplier; this process takes ± two days less. SAP R/3 also eliminates re-keying data, thereby reducing input errors, improving service delivery and, usually, shortening the order cycle time.

### 4.2.10 Number of calls to complete an order

**Figure 20: Number of calls to complete an order**

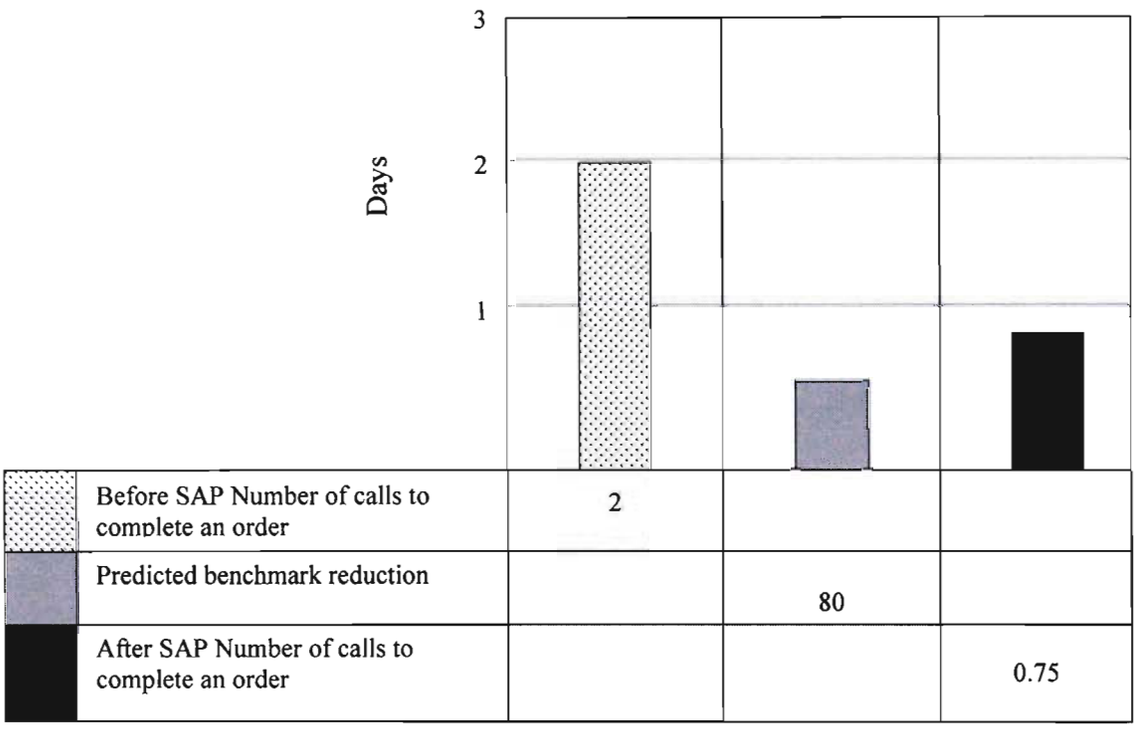
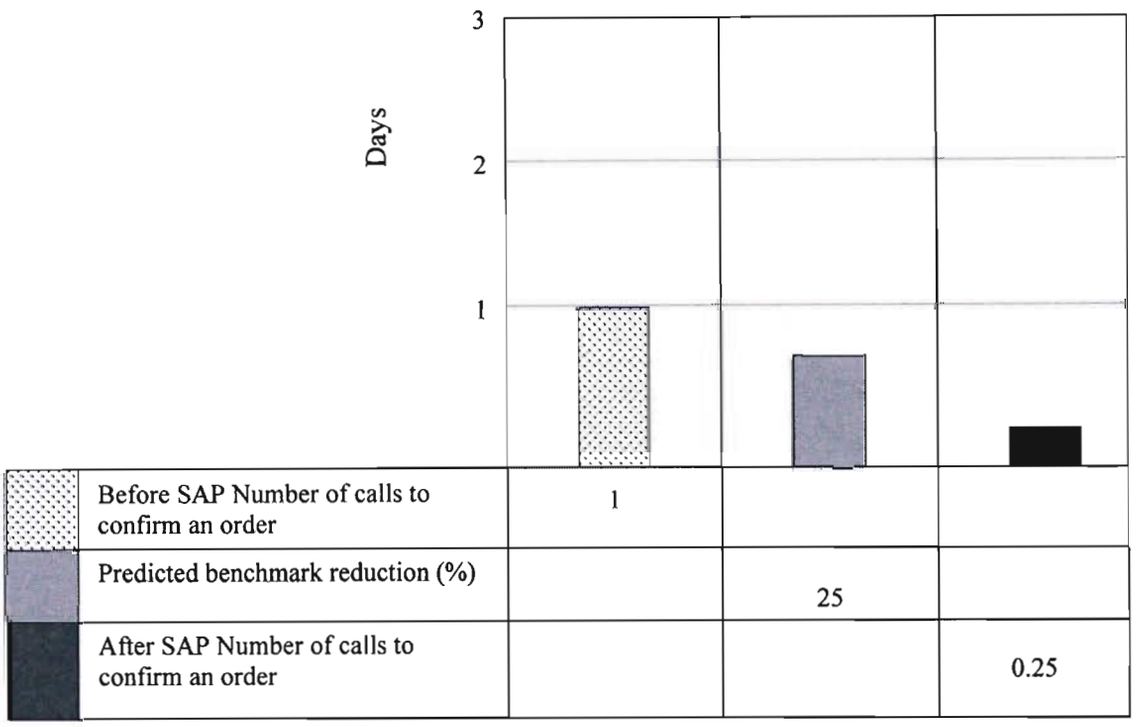



Figure 20 indicates a 75% improvement when comparing pre- and post-implementation performance. This is 5% below than the predicted benchmark baseline of 80%. Fiona Doubell explains that with suppliers linked to electronic trade/mail, this becomes an electronic process. However, as mentioned earlier, only ± 70% of suppliers are currently integrated with the SAP R/3 system. Therefore it was expected that this KPI would show a ± 70% improvement. Before the SAP R/3 implementation the process involved faxing the request to the supplier, followed by a telephone call to establish whether or not the order has been received, and by when the delivery could be expected. The great appeal of SAP R/3 is that the end user enters information only once and that everyone can do his or her bit based on accurate real-time information across Telkom's supply chain.

### 4.2.11 Number of calls to confirm an order

**Figure 21: Number of calls to confirm an order**




The pattern in figure 21 indicates a 75% improvement when comparing pre- and post-implentation performance. When compared with the benchmark baseline, it is interesting to note that this performance is 50% better than the benchmark value. Fiona Doubell explains that suppliers linked to electronic trade/mail, have requisitions routed directly to them and are subsequently able to respond electronically. It is worth noting that with the suppliers not yet integrated with SAP, this process still involves phoning and faxing.

### 4.2.12 Telkom's customer satisfaction results

**Figure 22: Telkom's customer satisfaction results**

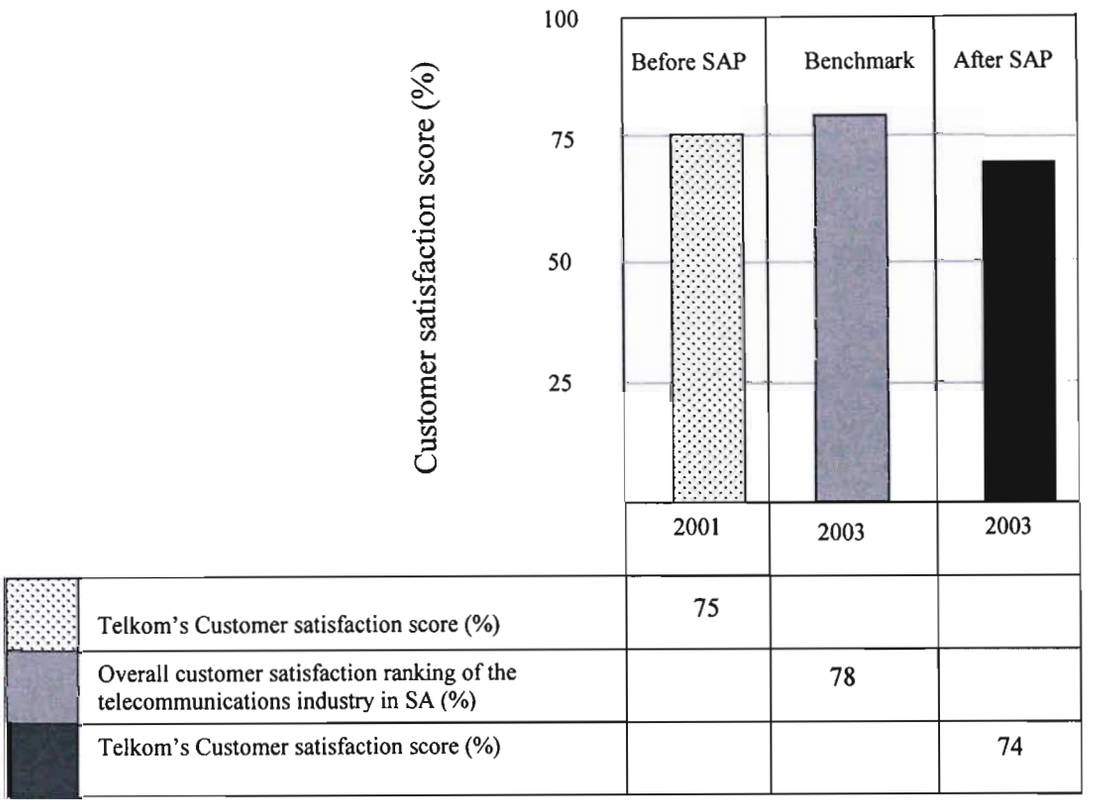
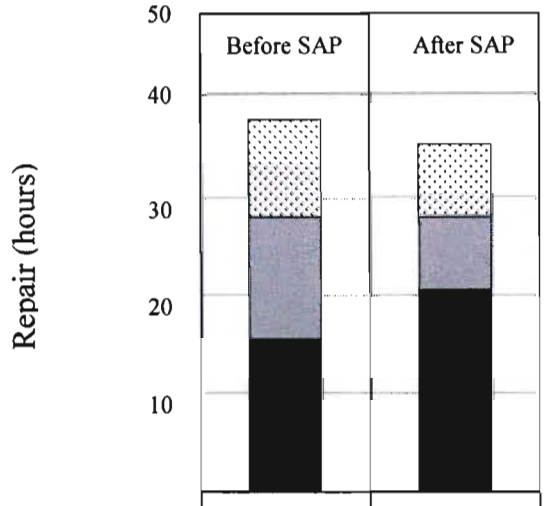



Figure 22 shows that Telkom has achieved 74% in the 2003 South African Satisfaction Index (SAS Index), an independent internationally comparable customer satisfaction measurement developed by the Centre for Proactive Marketing in line with both the American Customer Satisfaction Index (ACSI) and the European Customer Satisfaction Index (ECSI) - the latest study was based on 1029 interviews across the telecommunications industry, with 239 of these conducted with Telkom customers (Weldwick, 2003, p. 1). Telkom's 2003 rating is 1% worse than the 2001 rating and 4% worse than the customer satisfaction rating of the telecommunications industry in SA, which includes the mobile operators. The bottom line is that the SAS Index gives insight into consumer perceptions of the quality of service delivered by companies and industries, and Telkom armed with their SAP R/3 software solution and improved business processes, was obviously not able to positively influence customer perceptions.

### 4.2.13 Mean time to repair KPI's

Kobie Van Heerden (Telkom Senior Manager, National Operations) provided the data used to evaluate the following two KPI's.

**Figure 23: Mean time to repair KPI's**

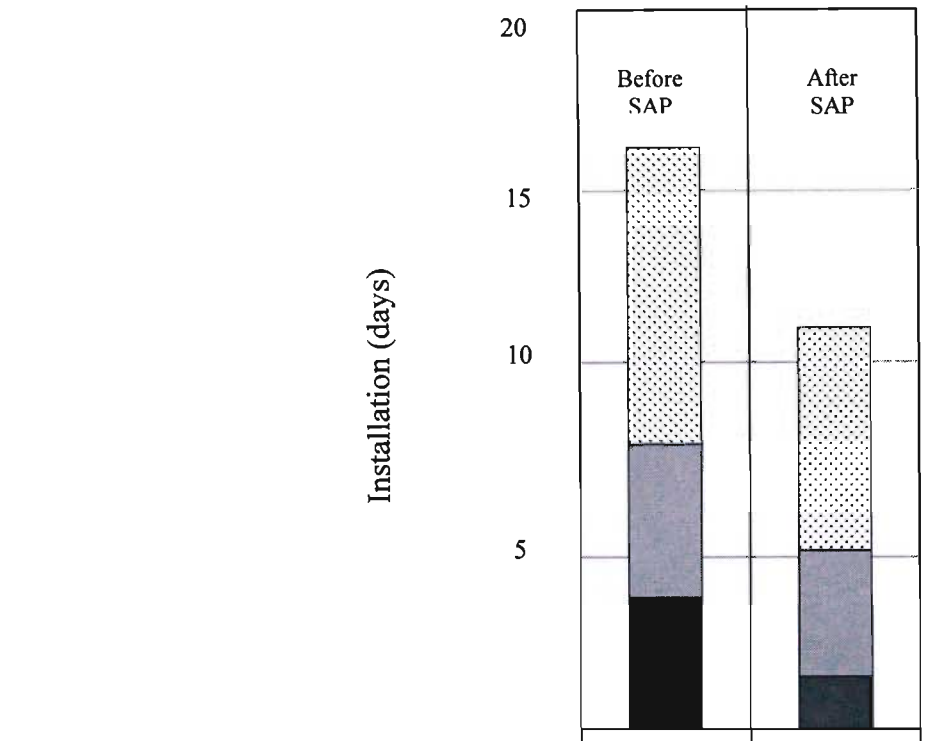



| | 2001/2 | 2003/4 |
|---|---|---|
| Mean time to repair corporate voice | 8.95 | 5.66 |
| Mean time to repair business voice | 11.2 | 8.62 |
| Mean time to repair residential voice | 16.01 | 21 |

It is expected that there is an interaction effect on the relationship between Telkom's supply chain performance and repair times. When service is interrupted, the speed at which repairs are performed are in some cases dependent on the availability of the material required to restore the customer's service. Figure 23 shows that the overall mean time to repair (MTTR) improved marginally by 1% - this despite the fact that the MTTR for residential customers increased by some 24%. The damage done by the poor residential MTTR performance was restored to some extent by an improved corporate and business MTTR performance, reflecting a performance improvement of 37% and 22% respectively. It is argued that the SAP R/3 implementation had a positive influence on this area of Telkom's operations.

### 4.2.14 Mean time to install KPI's

**Figure 24: Mean time to install KPI's**




| | 2001/2 | 2003/4 |
|---|---|---|
| Mean time to install residential voice | 9.8 | 5.81 |
| Mean time to install business voice | 3.55 | 2.87 |
| Mean time to install corporate voice | 3.2 | 2.23 |

It is expected that there is an interaction effect on the relationship between Telkom's supply chain performance and installation times. When orders for new services are made feasible, the speed at which installations are performed are in some cases dependent on the availability of the material required to complete the installation. The pattern in figure 24 shows that the overall mean time to install (MTTI) improved by 33%. The MTTI corporate improved by 41%, the business MTTI improved by 19%, and finally, the residential MTTI shows a 30% improvement. As with the previous KPI, it is argued that the SAP R/3 implementation also positively influenced operational performance in this area.

## 4.3 Concluding remarks

The results of this research are summarised in tables 13 and 14. The pattern in table 13 shows an improved performance in thirteen out of the fourteen KPI's measured when comparing pre- and post-implementation performance – reflecting an average overall improvement of 39%. On the other hand, table 14 shows that six out of a total of twelve benchmark baselines[1] (50%) were not matched or exceeded by the measured post-SAP performance.

**Table 13: Before and after SAP results summary**

| | KPI | Performance | | |
|---|---|---|---|---|
| 1 | Procurement Operating Cost | 42 | % Improvement | √ |
| 2 | Stock turns | 33 | % Improvement | √ |
| 3 | Inventory level | 70 | % Improvement | √ |
| 4 | Freight costs | 45 | % Improvement | √ |
| 5 | Stock accuracy | 3 | % Improvement | √ |
| 6 | Reduce material management FTE's | 28 | % Improvement | √ |
| 7 | Time taken to generate invoices | 60 | % Improvement | √ |
| 8 | Time taken from request to quote | 50 | % Improvement | √ |
| 9 | Order cycle time | 43 | % Improvement | √ |
| 10 | Number of calls to complete an order | 60 | % Improvement | √ |
| 11 | Number of calls to confirm an order | 75 | % Improvement | √ |
| 12 | Customer satisfaction results | -1 | % Worse | × |
| 13 | Mean time to repair average (corporate, business and residential) | 1 | % Improvement | √ |
| 14 | Mean time to install average (corporate, business and residential) | 33 | % Improvement | √ |

**Table 14: After SAP results vs. Benchmark baselines**

| | KPI | Performance | | |
|---|---|---|---|---|
| 1 | Procurement Operating Cost | 32 | % Better than benchmark | √ |
| 2 | Stock turns | 66 | % Better than benchmark | √ |
| 3 | Inventory level | 40 | % Better than benchmark | √ |
| 4 | Freight costs | 25 | % Better than benchmark | √ |
| 5 | Stock accuracy | -2 | % Worse than benchmark | × |
| 6 | Reduce material management FTE's | 13 | % Better than benchmark | √ |
| 7 | Time taken to generate invoices | -30 | % Worse than benchmark | × |
| 8 | Time taken from request to quote | -30 | % Worse than benchmark | × |
| 9 | Order cycle time | -47 | % Worse than benchmark | × |
| 10 | Number of calls to complete an order | -5 | % Worse than benchmark | × |
| 11 | Number of calls to confirm an order | 50 | % Better than benchmark | √ |
| 12 | Customer satisfaction results | -4 | % Worse than benchmark | × |
| 13 | Mean time to repair average (corporate, business and residential) | No benchmark baseline available | | |
| 14 | Mean time to install average (corporate, business and residential) | No benchmark baseline available | | |

[1] Deloitte Consulting Benchmark Reference Guide 2002/2003 used in this research is shown in figure 15 on page 66.

In Telkom, supply chain performance is generally a trade-off between several key factors: the cost of carrying inventory, the cost of transporting it, the ability to forecast demand, and customers expectations of fast service. With this in mind and after examining the results of this research, Garon Kenchenten (Telkom Manager, Procurement Services) made the following interesting comments: Contrary to common belief, Telkom doesn't have to be number one on every measure. In fact, Telkom should not be number one on all metrics. Striving to be number one across the entire span of Telkom's supply chain performance metrics could bifurcate procurement's focus and resources, and create unrealistic expectations for procurement managers. Moreover, such an approach inevitably creates conflicting behaviours that, in turn, could sabotage procurement's ability to align its performance with Telkom's strategic objectives. Rather than striving to be number one on all metrics, procurement should first establish its strategic objectives, and then acknowledge that certain accepted metrics simply will not align with those objectives. For example, procurement could offer its internal customers a four-hour delivery on all material items as a competitive strategy but will have to incur higher transportation costs than its peers who offer a two-day delivery. It is both appropriate and necessary that procurement not be the number-one performer in every metric-related category. The point here is that, in certain areas, even peak performance indicated by some procurement metrics may not provide desirable results. For example, it may be necessary to increase stocking levels, warehousing costs, and transportation costs to increase perfect orders delivered within four hours. Nevertheless, procurement will work to focus not so much on doing things better, but on first doing the right things, and then doing those right things progressively better. For Telkom, the right metrics and the right approach are key to making the right results happen.

This chapter presented an analysis of data and answers the research questions by means of a descriptive statistical analysis. Chapter 5 reports the findings for discussion and debate.

**Table 15: Deloitte Consulting Benchmark Reference Guide 2002/2003**

**Deloitte Consulting**

| No. | Benchmark | Max. | Unit | Context | Source |
|---|---|---|---|---|---|
| 2 | Order cycle time: ERP | 90 | % Reduction | Benchmark extracted from Deloitte Consulting of publication best practices and benchmarks for ERP projects. SAP benchmarks were included in the Research project, as well as global Deloitte Consulting project results. | Benchmarking Partner |
| 3 | Reduction in number of calls to complete order: ERP | 80 | % Reduction | Benchmark extracted from Deloitte Consulting publication of best practices and benchmarks for ERP projects. SAP benchmarks were included in the Research project, as well as global Deloitte Consulting project results. | Benchmarking Partner |
| 11 | Reduced response time to requests for quotes: ERP | 80 | % Improvement | Benchmark extracted from Deloitte Consulting publication of best practices and benchmarks for combined Reengineering and ERP projects. Benchmarks were included from official Research partners, as well as global Deloitte Consulting project results. | Deloitte Consulting |
| 16 | Inventory level reduction | 30 | % Reduction | A Logistics and Distribution ROI metric. Benchmark extracted from Deloitte Consulting publication of best practices and benchmarks for ERP projects. SAP benchmarks were included in the Research project, as well as global Deloitte Consulting project results. | Deloitte Consulting |
| 34 | Reduce Procurement Operating Expenses | 10 | % Reduction | US location | Deloitte Consulting |
| 40 | Reduce time to generate invoices | 82 | % Reduction | Baseline 11 days; target 2 days | Deloitte Consulting |
| 51 | Reduce Material Management FTEs | 15 | % Reduction | Lowest 10% | Deloitte Consulting |
| 65 | Number of calls to confirm an order | 25 | % Reduction | Typical ERP reduction percentage | Benchmarking Partner |
| 92 | Reduce freight cost | 20 | % Reduction | Typical ERP reduction percentage | Benchmarking Partner |
| 118 | Stock turnover | 2 | Times per annum | Benchmark value from a Supply Chain study by Deloitte Consulting in 2001. The Supply Chain study was a summary of project results from the Utility Industry. | Deloitte Consulting Supply Chain benchmark study |
| 122 | Stock record accuracy benchmark | 100 | % Accuracy of lines | A commonly accepted benchmark by industry and management. Minimum level: 90% | Nampak benchmark |

# 5. DISCUSSION AND RECOMMENDATIONS

## 5.1 Introductory remarks

This chapter debates and discusses the research question and resulting themes with reference to the literature review in Chapter 2 and the results obtained and presented in Chapter 4. It also discusses the methodology presented in Chapter 3 and provides commentary to researchers and practitioners interested in the content analysis of Telkom's ERP process adaptation strategy.

There is perhaps one possible misconception that threatens the interpretation of the research results. During Telkom's SAP R/3 implementation many factors changed in parallel with the project, e.g. other business initiatives and other projects – it was initially thought that "witchcraft" might be needed to discern the direct influence on KPI improvements of the SAP R/3 project itself. Critically important in all this is to point out that Telkom's process adaptation strategy was analysed. What this suggests is that the innovative process changes undertaken in parallel with Telkom's SAP R/3 implementation go hand-in-hand with the process modification ERP adaptation strategy.

Chuck Wright (Telkom Executive – Finance and SAP Systems Support) made the following comment: "I consider our SAP project a success. That does not mean that we did not have issues, nor does it mean that we achieved everything imagineable at implementation. It means that we delivered the agreed upon functional scope, within budget and schedule."

## 5.2 Lessons learned from the study

This study set out to ascertain whether or not Telkom's SAP R/3 process modification adaptation strategy resulted in improved supply chain performance. This research has showed that the impact of the process adaptation strategy on improved supply chain performance was positive.

Taking a broad look at the results and comments made regarding Telkom's ERP implementation, it was found that Telkom's implementation strategy resulted in quick

achievements of a positive ROI. Inventory levels, receivables, operating costs, order cycle time and labour and distribution expenditures have all improved.

Telkom decided to focus its efforts on redesigning 489 processes (shown in table 9 on page 35). Each of the processes was redesigned to take full advantage of the new system's capabilities, in particular its ability to simplify the flow of information. Layers of information middlemen – once necessary for transferring information across Telkom's units and systems – were eliminated in order to streamline the flow of work and reduce the likelihood of errors. In this context, it is expected that process improvement emerged as the principal element that enabled Telkom to realise the full benefits of its ERP implementation. Telkom's decision to use BPM software to model their new processes - to look for the critical path and optimising the one path that brings it the most value in the shortest time with the lowest risk and cost, appears to have paid dividends. This focus on process analysis (understanding what has to be done), combined with process execution (controlling the step-by-step execution of what has to be done), best describes how Telkom applied BPM. In this context, it is expected that businesses should not rely on sophisticated software like SAP R/3 to solve their supply chain problems; ERP technology on its own cannot atone for flawed processes.

It will be recalled that there are two alternative approaches to implementation of packaged software: Package adaptation to organisational needs and organisational adaptation to the package. The literature review (chapter 2) on ERP adaptation revealed that the ERP system's complexity made major modifications impractical and put projects at greater risk for failure, because customisation efforts often take longer and cost more. It was also argued that each change to ERP could cause more extensive ripple effects resulting in potential performance and integrity degradation as well as maintenance and future upgrade difficulties. From a resource dependence view, ERP adaptation might be more exposed to more threats and risks than process adaptation, because ERP adaptation requires heavier dependence upon recourses such as consulting firms or ERP vendors than process adaptation. With this in mind, Telkom's decision to modify it processes to take full advantage of the new system's capabilities, in particular its ability to simplify the flow of information, appears to have been good decision.

Has this strategy resulted in Telkom's supply chain becoming more (1) **responsive**, and (2) **cost-efficient?**

1. It was found that Telkom's supply chain has become more responsive in handling both internal and external orders - improved performance observed in the following KPI's made this possible: time taken to generate invoices improved by 60%, the time taken from request to quote improved by 50%, the order cycle time improved by 43%, inventory levels were reduced by 70%, stock turns improved by 33%, and the number of calls to complete an order was reduced by 60%. On the other hand, SAP cannot claim all the credit for Telkom's ability to match supply and demand, this is because Telkom does not use SAP's APO forecasting module. At its most basic level, this SAP implementation resulted in an elimination of unnecessary manual operations, and integrating ± 70% of Telkom's suppliers in a seamless and near-real-time manner. Although certain measured KPI's were below the expected benchmark baseline i.e. time taken to generate invoices (22%), time taken from request to quote (30%), order cycle time (47%), and number of calls to complete an order (5%) – it is still expected that "small" savings in efficiency per transaction by the ± 4 200 EBP users in combination will produce significant returns. SAP R/3 provides procurement with detailed real-time visibility of inventory, orders, shipments and events, across almost its entire supply chain, which contributed positively toward improved information availability and access for decision-making. SAP R/3 and process improvements have enabled Telkom to move from offline to online processing and to extend their processes outside the traditional four walls of Telkom.

2. It was found that all the KPI's measured in terms of cost reductions showed a positive ROI resulting from improved operational management through the use of SAP and process improvements, i.e. reduced operating cost of 42%, lower inventory levels by 70%, reduction in material management FTE's by 28% and reduced freight costs by 45%. It is also important to note also that the above mentioned KPI's were better than the expected benchmark baselines i.e. operating cost (22%), inventory levels (30%), material management FTE's (13%) and freight costs (25%).

Based on the overall performance results, it appears as though procurement is applying its new technology and new process thinking to great advantage. In short, Telkom's supply chain is now leaner and faster.

**This study revealed that Telkom's supply chain performance is tightly related to three areas of concern:**

1. Problems with SAP and c-commerce integration.
2. SAP's forecasting ability remains at a disadvantage.
3. Telkom does not benchmark their supply chain performance.

It is expected that the above-mentioned areas of concern could erode Telkom's improved supply chain performance in the following areas:

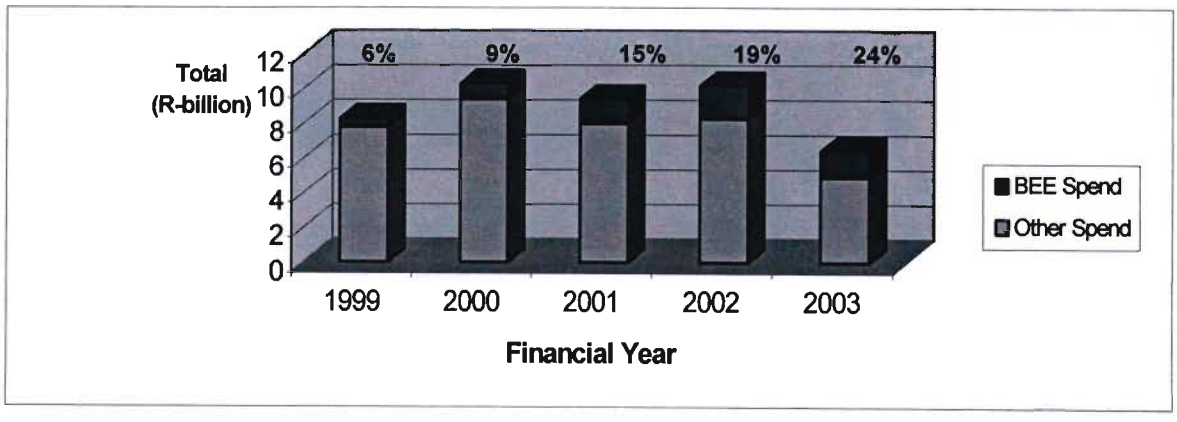
1. **Collaborative Demand and Supply Planning** - enables Telkom and suppliers to collaborate on demand and order forecasting, synchronising plans based on the dynamic exchange of information. Telkom's prevailing supplier integration problem and the issue of not using SAP APO for forecasting (using Manugistics for forecasting does not provide one-system integration) is expected to erode supply chain performance in this area.
2. **Supply Chain Event Management** - monitors every stage in the supply chain process, from price quotation to the moment the product arrives at Telkom - including alerts when things go wrong. It is also expected that Telkom's prevailing supplier integration problem will have a negative impact on supply chain performance in this area.
3. **Collaborative Fulfillment** - enables Telkom to quickly determine where and when to obtain a product, and handles order management, availability checks, and transportation management. As above, Telkom's existing problem with supplier integration will also negatively impact on supply chain performance in this area.
4. **Supply Chain Performance Management** - monitors and reports on KPI's and objectives of supply chain performance, including costs and assets across the supply chain network. By not benchmarking the actual supply chain benefits delivered by SAP R3, Telkom will remain in the dark about industry trends and best practices within and outside industry.

### 5.2.1 SAP R/3 and integration

Each of Telkom's 39 so-called legacy systems may have provided invaluable support for a particular business activity. But in combination, they presented one of the heaviest drags on Telkom's business productivity and supply chain performance. Maintaining many different computer systems has led to enormous costs for Telkom – for storing and rationalising redundant data, for re-keying and reformatting data from one system to another, for updating obsolete software, for programming communication links between systems to automate the transfer of data. But even more important than the direct costs were the indirect ones. If Telkom's systems cannot talk to each other, then management is left to make important decisions by instinct rather than according to detailed understanding. In short, the SAP R/3 system provides Telkom with the opportunity to integrate internal functions and effectively link them with external operations of suppliers. It will be recalled that many suppliers in South Africa are not yet equipped to engage in c-commerce. The fact that Telkom was able to only integrate ± 70 percent of their suppliers on SAP R/3 highlight SAP's inability to provide a one-system integration solution for all supply chain members. This effectively means that Telkom cannot exchange electronic documents with its smaller, lower-technology supply chain members. The existing ERP systems are still unaffordable by the great majority of small and some mid-size companies.

Having another look at figure 1, it is interesting to note that Telkom is spending on an average 4.5% more on BEE each year. What this suggests is that Telkom's integration problem could progressively increase by an average of 4.5% each year.

**Figure 1: Total BEE Spend Relative to Procurement Spend**



In the above context, in a new development on the e-commerce front, Telkom has been awarded a three-year contract by Siemens for the supply of e-marketplace services through Telkom's flagship e-commerce offering, CyberTrade Xchange.[1] This product could ease the integration problems customers experience when switching electronic documents between various ERP systems and may also accommodate the smaller, lower-technology supply chain member. CyberTrade Xchange simplifies this integration and requires only a single link to the platform either via a Telkom access medium or via the Internet. Hosted in the Telkom Data Centre, CyberTrade Xchange allows its members to enter the global trading market in a secure and horizontal electronic B2B trading environment that enables them to collaborate with other trading partners. It would appear at first glance, that this product could potentially solve all integration problems – however, the BEE supplier might not be able to afford the monthly rate for this service and/or the equipment required to connect onto the CyberTrade Xchange landline. In addition, using less expensive c-commerce solutions and applying system integration software to bridge the c-commerce applications with ERP systems - although usually less costly, does not provide one-system integration of ERP solutions and could lead to the continuation of the old practice of managing customers, manufacturing, and suppliers separately. Based on the research findings, one thing is clear, it is expected that by using customised applications means forgoing some of the integration benefits of a pure ERP system.

**Recommendations:** The main idea behind the proposed recommendations is the simplification of the ERP solutions, their cost reduction, and future increase of hosting applications. The main highlights of these improvements are:

1. Considering the fact that Telkom is spending progressively more on BEE, Telkom has to become hawkish about tracking supplier on-time rate and response capabilities. Telkom needs to set standards for particularly the suppliers who are not yet integrated with SAP R/3 and appoint people to identify problems and investigate how this integration might be achieved. Ignoring this problem will mean that safeguarding BEE as a policy and as a strategic business intent will continue to remain a problem.

[1] For more detailed information on this product visit: http://www.telkom.co.za/tbis/xchange.jsp

2. SAP can investigate the development of simplified web-enabled and c-commerce integrated systems for the lower technology, small and middle-size companies.
3. SAP can consider lower applications and implementation costs by selling individual ERP modules (i.e. Sales and Distribution) integrated with c-commerce solutions.
4. As role players in the South African economy, both SAP and Telkom must begin to strategise about how they could achieve closely knit application integration with BEE and c-commerce - to support the disadvantaged communities in the mainstream of economic activities. If Telkom and SAP delay action for too long, they run the even greater risk of being left behind by competitors that have succeeded in making their BEE integration strategy work to their advantage.

### 5.2.2 SAP R3 and forecasting

Alan McCarthy (Telkom Manager, Inventory Management) explains why Telkom elected not to use the SAP R/3 Advanced Planner and Optimizer (APO) forecasting module: Although the functionality from a user perspective is very similar, a survey conducted by Nucleus Research[2] revealed that Manugistics (the forecasting system currently used by Telkom) has shown significantly better business benefits and ROIs versus SAP: Eighty percent of Manugistics customers receive a positive ROI within an average period of 16 months (Nucleus, D16, 2003, p. 2). In contrast fifty seven percent of SAP APO customers believed that they did not achieve a positive ROI from their investment after having used the applications for an average of 2.8 years (Nucleus, D23, 2003, p. 2).

Alan McCarthy (Telkom Manager, Inventory Management) reports that if there were vast functionality improvements associated by implementing APO, it would be worth the effort - but it is expected that there will be no added value. Manugistics is designed to sit on many different ERP platforms, whereas APO is designed to integrate primarily with SAP R3. Getting data into and out of SAP is not as easy as with Manugistics. The usability of Manugistics is intuitive, whereas APO requires a certain level of R/3 knowledge. Due to Manugistics's ease

[2] For more detailed information visit: www.nucleusrsearch.com. - and search for: The Real ROI from Manugistics Research note D16 and The Real ROI from SAP, Research note D23

of use, the total cost of ownership is low. It is a simple system to implement, use, maintain and extract value from. APO has not proven to share the low cost of ownership reputation that Manugistics has. The skills level of planners at Telkom is also a concern, and should there be any complexities they cannot manage using Manugistics, it is expected that they will most certainly struggle more using APO.

White (2003, pp. 3-4) reports that SAP remains at a disadvantage in more-complex distribution chains that are heavily promotion-driven or highly collaborative: SAP is unlikely to develop unique industry offerings to meet the deepest domain requirements – so SAP customers should not shortlist SAP for planning if they have complex distribution networks or a heavily demand-driven business.

**Recommendation:** The implications for SAP's in the above context is that they need to revisit their forecasting offerings or they will continue to lose potential customers to other ERP vendors or non-ERP vendors. Although embracing the support of SAP R/3 provides for best-of-breed application portfolios, potential users could begin to favour incumbent ERP or non-ERP vendors that provide "good enough" forecasting functionality at a reduced price. The lack of an effective forecasting offering may prove to be damaging (that is, costly) to SAP's reputation.

### 5.2.3 Measuring supply chain performance

Although Telkom rigorously measure its supply chain performance against aggressive targets, it does not use benchmarking to set improvement targets and measure progress. With the speed of technology and the changing face of business, organisations are operating in a more competitive atmosphere. To avoid falling behind, it is suggested that Telkom use benchmarking to monitor the activities of internal departments, industry competitors, and the business arena at large.

Both academics and practitioners can use Telkom's supply chain performance improvement metrics from this study, shown in table 16 as a benchmark baseline for their future research - or use these benchmark results to identify where potential cost cutting opportunities exist, quantify the ROI of SAP R/3, set performance goals, and analyse year over year performance

trends. The use of benchmarking performance will help companies like Telkom with the understanding of industry trends and best practices within and outside industry. Using benchmark data in this context will allow Telkom to look beyond a simple performance report card and will help Telkom understand not only where it is today but also how to move to the next level of performance. If companies do not track the performance of the whole supply chain – they will be in the dark about what their supply chain inefficiencies cost.

**Table 16: Telkom's supply chain benchmarking results**

| No. | Benchmarks | Percentage change | |
|---|---|---|---|
| 1 | Procurement Operating Cost | 42 | % Improvement |
| 2 | Stock turns | 33 | % Improvement |
| 3 | Inventory level | 70 | % Improvement |
| 4 | Freight costs | 45 | % Improvement |
| 5 | Stock accuracy | 3 | % Improvement |
| 6 | Reduce material management FTE's | 28 | % Improvement |
| 7 | Time taken to generate invoices | 60 | % Improvement |
| 8 | Time taken from request to quote | 50 | % Improvement |
| 9 | Order cycle time | 43 | % Improvement |
| 10 | Number of call to complete an order | 60 | % Improvement |
| 11 | Number of call to confirm an order | 75 | % Improvement |

## 5.3 Methodological appraisal

The methodology employed in this research provided an excellent basis for future research in this area. Much was achieved in the appraisal of Telkom's ERP adaptation strategy, providing both researchers and practitioners with insight into ERP adaptation implications.

This research was confined to Telkom's ERP adaptation strategy. With this in mind, the generalisation of this study's findings to a greater population in the telecommunications industry is yet to be determined. Due to the issue of Telkom not being a true multinational corporation, this study was not be able to predict whether or not the process adaptation strategy when applied to a multinational corporation's markets will work. However, apart from the above, there is no other obvious reason not to believe that the results of this study do not apply more generally.

Due to poor record keeping some of the records for initial KPI values before the SAP R/3 project were unavailable, this limited the number of available KPI's for this study.

This study did not include management or end user surveys so it is not known whether the measured improved supply chain performance in this research has been achieved at the expense of poor internal customer satisfaction. It may be useful in a future study to combine a number of methods in order to test the research question. Methods such a face-to-face interviews with selected procurement staff and end users, and/or a questionnaire distributed to the ERP implementation project team members may provide a stronger base of evidence for conclusions drawn from this study.

## 5.4 Concluding remarks

The results presented in Chapter 4 and debated in Chapter 5 concur with the type of ERP adaptation strategy argued in Chapter 2. Chapter 6 concludes this dissertation.

# 6. CONCLUSION

Having measured Telkom's supply chain performance metrics, this study revealed that performance improvements were observed in all of the pure supply chain KPI's. Further analysis showed that five out of a total of eleven supply chain benchmark baselines were not matched or exceeded by the measured post-SAP performance. With this in mind, it will be recalled that Garon Kenchenten claimed that Telkom should not be number one in all metrics – and that striving to be number one across the entire span of supply chain performance metrics could bifurcate procurement's focus and resources, and create unrealistic expectations for procurement managers. This study found that that the process modification and enhancement strategy suited Telkom best because it optimally balanced supply chain needs and the best practices that SAP R/3 supports. Despite the fact that Telkom's aim for instantaneous awareness and appropriate responses to all events across its entire supply chain was found to be only ± 70% successful, SAP R/3 and process improvements have significantly improved the flow of information through the supply chain.

It is expected that Telkom's status as a monopoly fixed-line operator will soon be something of the past. Several recent media releases in a variety of publications by the Minister of Communications, Dr Ivy Matsepe-Casaburri indicate that the SNO is expected to start operating in the second or third quarter of 2004. With this in mind, it will be interesting to see how Telkom's SAP R/3 enabled supply chain performs in a competitive and liberalised communications market. Telkom managed to complete their SAP R/3 implementation in the absence of any competitors, giving Telkom time to consolidate its position and an opportunity to seize a potentially unassailable competitive advantage. It hardly seems a stretch to suggest that that Telkom's supply chain armed with SAP R/3 and its new processes will contribute toward the daunting challenges that stand in the way of a competitor taking on Telkom's monopoly.

A discussion on possibilities for future research concludes this dissertation.

**Possibilities for future research**

From the results of the research, one thing is clear, Telkom's decision to use BPM software to modify and enhance their existing processes as part of the SAP R/3 implementation, contributed positively toward enhanced supply chain performance. Although successfully used by Telkom, the abundance of software buzzwords may leave some researchers and practitioners struggling to grasp the concept of BPM - how realistic is this, and is BPM robust enough for other corporations to put their weight behind it yet? This technology applied to an organisation's supply chain with or without ERP may prove to be an interesting topic for future research.

Having placed Telkom's supply chain under the microscope, it was found that SAP R/3 is not yet integrated seamlessly with all of Telkom's suppliers. It will be recalled that the problem lies with the lower-technology BEE supply chain member. The challenge is how to implement BEE without eroding supply chain response capabilities? This may also prove to be an interesting topic for future research.

It may also be useful in a future study to compare Telkom's SAP R/3 enabled supply chain results (shown in figure 16) with other ERP implementations and/or other ERP adaptation strategies. This will establish whether or not the results from this study apply more generally.

During March 2003, Gartner Research performed a Benchmark Peer Comparison on Telkom's SAP R/3 implementation using SAP R/3 installations of comparable size and implementation scope. This exercise focused only on the IT side of SAP R/3 and did not include any of the KPI's analysed in this dissertation. The summary of comments and recommendations made by Gartner may be of interest to researchers and practitioners – refer to appendix 1.

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## APPENDIX 1

**Benchmark results from Gartner's peer comparison of Telkom's SAP R3 installation:**

The Telkom IT organisation appears to deliver a generally efficient and cost effective IT service.

**Data collection for this study was difficult and some of the figurers provided have, by necessity, been estimates:** Telkom should review the current IT asset management and configuration management systems with the intention of improving the accuracy of these systems and improving the integration with finance systems.

**Telkom incur higher costs within the business to support the SAP R3 system compared to that typically seen by Gartner:** Introduce a programme to transfer skills from external consultants to internal staff. Review the skill levels required by internal support staff with the intention of reducing costs

**Investment in large-scale HP-UX[1] and Sun Solaris[2] systems is in line with Gartner recommended best practice and has helped contribute to a cost effective service in this area:** Although the total Telkom staff numbers to support the Midrange UNIX[3] systems are below the peer group average it may be possible to further reduce costs in this area by identifying activities that can be transferred from technical support staff to operations staff.

**The Midrange NT[4] environment consists of a large number of small systems, resulting in high complexity and high costs:** Telkom should undertake an NT server consolidation programme to reduce this complexity and consequently reduce costs.

[1] HP-UX is an operating system - the version of Unix running on Hewlett-Packard workstations.
[2] Sun Solaris is not just an operating system but an "operating environment."
[3] UNIX is a powerful operating system developed at the Bell Telephone laboratories.
[4] NT stands for Network Termination - the NT device provides a connection for terminal equipment (TE) and terminal adaptor (TA) equipment.

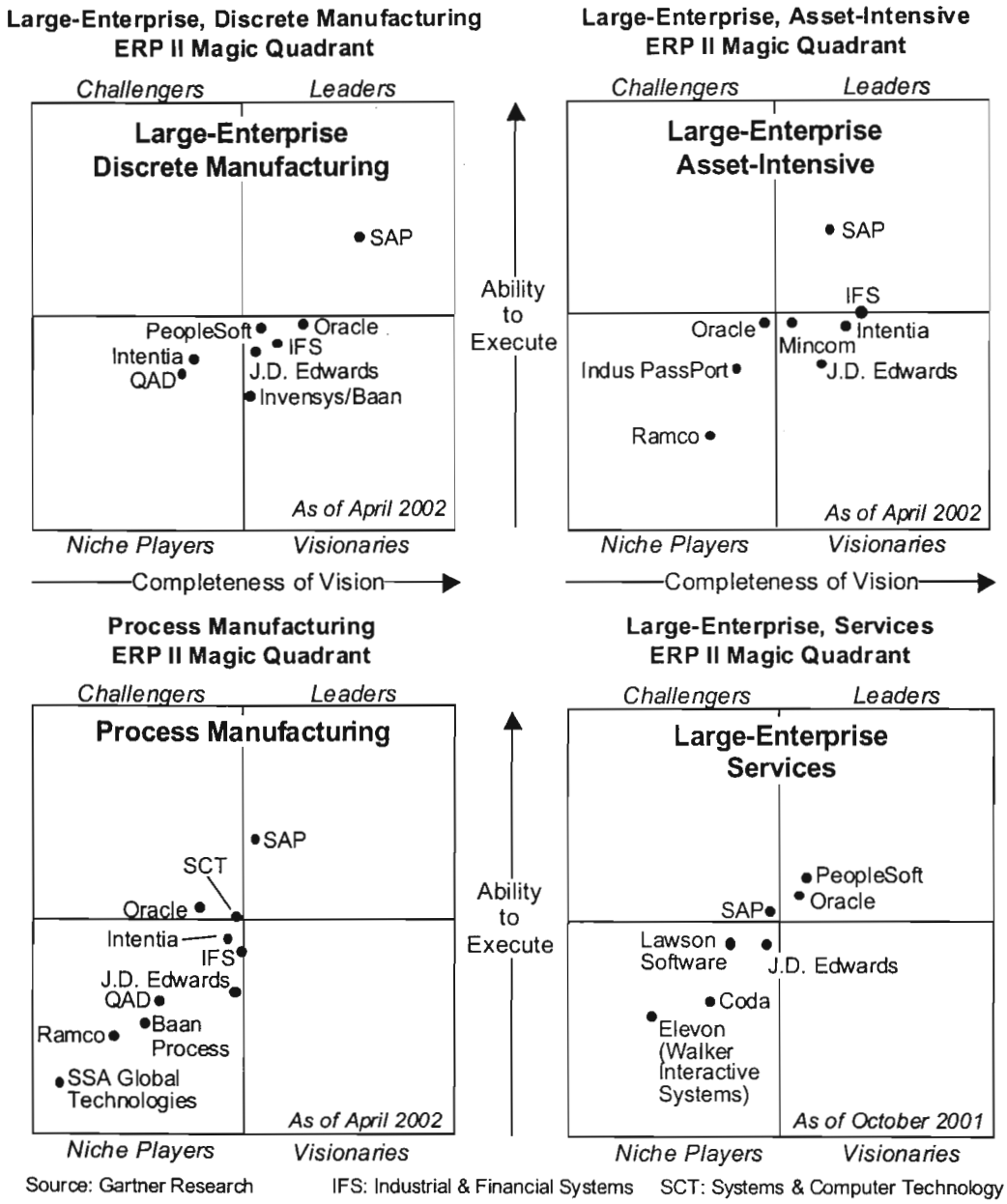
**Low support manpower numbers in the distributed computing area may be a contributor to poor customer satisfaction:** Invest to increase staff numbers and skill levels in this area

**Telkom make less use of third party service providers to supplement IT delivery than comparable organisations:** Consider making more use of third party support contracts, particularly for support small remote sites.

**Low first call resolution levels at the Helpdesk may be a contributor to poor customer satisfaction:** Telkom should undertake a programme to significantly increase the skill levels of first line support staff.

## APPENDIX 2

**Gartner ERP II Magic Quadrants: Vendor Assessments for Specific Industry Domains**




Source: Gartner Research IFS: Industrial & Financial Systems SCT: Systems & Computer Technology

Gartner has developed ERP II Magic Quadrants for each industry domain. Although the top-four revenue-producing vendors - SAP, Oracle, PeopleSoft and J.D. Edwards - appear in each ERP II Magic Quadrant, their relative positions differ significantly across industry domains. Other vendors, such as Agilisys, Mincom and Lawson Software, have strong products, but they focus on fewer, more specific domains.