UNIVERSITY OF NAIROBI

School of Computing and Informatics

MEASURING ERP POST IMPLEMENTATION SUCCESS.

BY

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Submitted in partial fulfillment of the requirement of Master of Science in Information Systems (MSc.IS) of the University of Nairobi.

Declaration

I Edward C Buhasho, do hereby declare that this research project is entirely my work and where there is contribution from other individuals, it has been duly acknowledged. To the best of my knowledge this research work has not been submitted to a degree course in any other university.

Signature..... Date 19-7-2010

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P56/70364/2008

This project has been submitted as part fulfillment of requirements for the Master of Science in Information Systems in the School of Computing and Informatics of the University of Nairobi with my approval as the University Supervisor.

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Dedication

Beatrice Buhasho

Giannah Sifa

And

Favor Gloria

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"ERP implementation is a long journey of fine turning, upgrading and continual learning, not a sprint." (Muscatello 2008).

"Going live is the end of the beginning"
(Deloitte 1998).

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List of abbreviations

IT	Information Technology
ERP	Enterprise Resource planning
CSFs	Critical success factors
SQ	System Quality
IQ	Information Quality
II	Individual Impact
OI	Organizational Impact
VQ	Vendor Quality
WI	Workgroup Impact
BPR	Business process reengineering

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ABSTRACT

Enterprise Resource Planning (ERP) systems are the most popular information technology software being adopted in many organizations globally. While success stories of ERP implementation abound due to its potential in resolving the problem of fragmented information, a substantial number of these fail to meet intended goals. Some are abandoned altogether and others contribute to the failure of an organization. The increasing popularity of ERP system in organization coupled by huge financial resources required has resulted in several studies investigating their implementation. However very few studies have discussed ERP beyond the implementation phase.

This research study provides empirical evidence on critical success factors to consider during implementation and key dimensions to be adopted in measuring post implementation success by evaluating the adoption of ERP in G4S. Quantitative data was gathered mainly through interview, reviewing of past records and questionnaires forwarded to 120 samples selected.

The findings confirmed that top management, among the 7 factors identified is the most critical factors to consider during implementation. 34 measures that can be adapted to evaluate post implementation success were identified and mapped into 6 dimensions. The findings also confirm ICT member's views on ERP measurement success dimension are at variance with other stakeholders. While other department views organization impact as a key dimension, for ICT, it is the system quality.

Overall the findings of this study will contribute to the growing body of knowledge on ERP success assessment in general. It is envisaged that the study will be valuable to researcher and practitioners and may serve as a base for future research in this area.

CHAPTER 1 INTRODUCTION

1.1 Background

ERP is a complex business IT package designed to integrate business processes and functions, and it is capable of presenting a holistic view of a business by permitting the sharing of common data and practices in a real-time environment (Ifinedo, 2006).It integrates a company's departments and functions into a single program running on one database, a valuable step forward for improving efficiencies, because integration speeds up business processes (Sounders T). ERP was designed mainly to provide a total, integrated company's resource to manage the business process efficiently and effectively.

Today, many public and private organizations worldwide are implementing ERP systems in place of the functional legacy systems that are not anymore well-compatible with modern business environment. The IS literature provides accounts of the benefits of ERP packages. Holland et al (1999) summarizes the claimed benefits as follows: Firstly, ERP provides an elegant, controlled approach to replacing large, inflexible legacy systems. Through inclusion of best practices, ERP offers potential for reducing IT development staff yet maintaining currency in IT capability. With high level of functional integration, the packages are also seen to offer reduction in inventories, lead times and costs, market responsiveness, improved control,' increased competitiveness and improved organizational communication.

Despite the benefits that can be achieved from successful ERP system implementations, there is already evidence of failure in projects related with the same (Davenport, 1998). The success or failure of ERP implementation is closely related to how the companies handle the process. The ERP implementation process could differ in every company. The differences might occur due the implementation goals, the scope, or the available resources. But among all the differences in the every implementation process there are some general points that are important in the process and would strongly result in the success or failure in the implementation. Those important points were identified as critical success factors (Laudon & Laudon, 1998).

Critical success factors are defined as "those few critical areas where things must go right for the business to flourish" (Rockhart, 1979). Understanding the critical success factors in ERP implementation would give some guidelines on what factors that should be given more attention in order to bring the implementation process into success. The critical success factors (CSFs) could either be a risk or opportunities, depends on how the organizations handle them.

In spite of its importance, the post implementation stage and its issues have not been sufficiently addressed in literature (Botta-Genoulaz et al.,2005). Problems could emerge after the implementation process and could result into several problems including total failure. The underutilization of the system and rejection of the system by users are but a few symptoms of more serious problems that have to be addressed during post implementation stage.

Given the potential benefits that an ERP system can generate for a company and huge financial commitment that is required, it is important to understand and to investigate the critical success factors during implementation. Equally important is the identification of various dimensions that can be used to measures post implementation success of the ERP software from different stakeholders point of view.

There are various of ERP's in the market such as SAP, Oracle, JD Edwards, Navision, Scala, Baan, Nova, Movex, i2, Proteus,

This study uses the experience of G4S securicor Ltd to provide insights into critical factors to take into consideration during implementation and measurement dimensions after implementation. The company was selected because of the willingness of top management to unreservedly avail information on the implementation in all its divisions.

1.2 G4S

G4S Security Services is the leading security, cash services and courier solutions provider in Kenya. It is part of the global G4S plc, operating in over 100 countries worldwide.

G4S has nearly 15,000 staff in kenya. The mission of the company is to ensure it remains the preferred supplier of security & logistics solutions expertise in Kenya through the delivery of world Class outsourcing activities in Cash management, integrated security and distribution marketplace.

To realize this mission, the company went through restructuring late 2007. All the operations were split into 3 autonomous divisions to ensure maximum focus on customer satisfaction namely:

a) Courier Services
   With over 120 collection destinations in Kenya and a fleet of fast and reliable vehicles, G4S provides overnight or same day delivery nationwide and everyday.

b) Cash Services
   working in partnership with leading banks, retailers and wholesalers, G4S Kenya cash services provides outsourced cash, management, transportation, storage and ATM services. From many of the high profile banks in Kenya, to PesaPoint ATM's over 20,000 retailers benefit from our leading position and expertise in cash services.

c) Security systems
   G4S Kenya provides trusted security services for some of the leading companies, embassies, banks, retails chains, universities and sporting events.

G4S has over 120 nationwide locations in Kenya. The diagram below illustrates the various branch networks in the country. Data is captured from all the location and relayed to head office.

Figure 1.1 **G4S Branch network**

1.2.1 Purpose of implementation of ERP in G4S

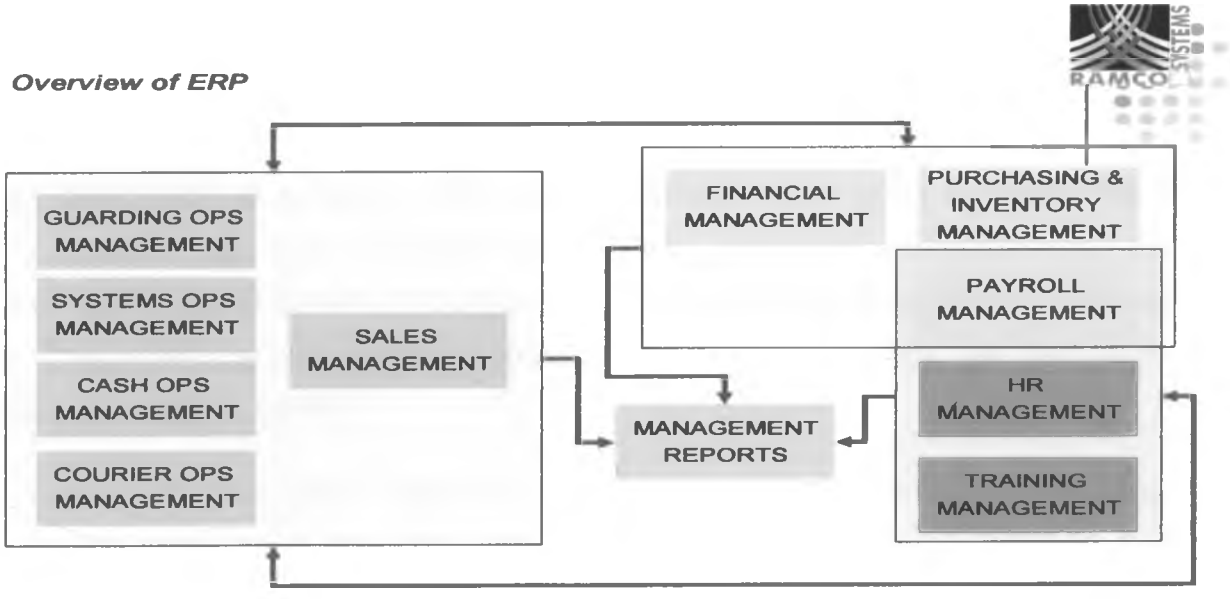
Prior to 2007, the company was using Scalar software in managing all the operations. The software was just an ordinary accounting tool hence most of the business processes were based on inefficient manual processes and the few systems that had been implemented were not integrated. This resulted in revenue leakage especially in courier services. The software had 5 modules namely receivables, payables, general ledger and inventory. Management reports were prepared manually and there was no

effective system in place to support detailed business analysis. The software was rigid without options to create and generate user driven reports.

The continued expansion of G4S's business meant that the volume of transactions to be processed and the amount of data to be analyzed had grown exponentially. The manual processes could not effectively cope with these volumes and consequently the system was highly error prone. A customer satisfaction survey was done and it revealed that one of the most common customer complaints was incorrect invoicing.

Hence new ERP project was launched with intention of automating and integrating all facets of G4S operations – Sales & Marketing, HR & Personnel Management, Operations, Rostering, Payroll & Billing, Financial transactions, and MIS as shown in figure 1.2 below.

Figure 1.2 **G4S ERP Modules**



Source: - G4S ERP Feasibility study 2005

The new system was designed to enable the company optimizes its business processes and allows for necessary management analysis and appropriate decision making in a quick and efficient manner. In turn, this would improve the company's ability react to market changes and increase its revenues.

1.3. General statement of the Research problem

Over the past three decades, organizations worldwide are facing pressure from changing business environment. To confront this challenge, many firms are adopting sophisticated, off the shelf information technology (IT) applications rather than build their IT systems in-house (Ifinedo.2006).These software packages can be customized up to a certain limit to the specific needs of each organization. Unfortunately, many ERP projects have not been effective enough and hence have been unable to achieve all the results envisaged. Of great interest is the existing imbalance in the ERP literature (Botta-Genoulaz 2005). Most of the studies tend to focus on the issues relating to the implementation and adoption of ERP systems with only few investigations on the other aspects of the system (Nelson & Somers, 2001).

For some organization going live (that is turning off their old legacy system and turning on ERP), helps create a reenergized organization, with customers, shareholders and employees more empowered than ever to drive new business value. For others, it has resulted into fatigued staff due to long implementation experience and uncertain of their direction or their future with it (Deloitte 1998).

Far from being over, at going live, ERP enabled transformation occur in waves that if properly managed can help companies to maximize, accelerate and sustain the full benefit of ERP enabled system. Unfortunately, some companies loose focus once they go live. Thus while one ERP enables a company hits the tide perfectly, the next might miss the boat (Deloitte 1998).

While many companies spend significant amounts of time and money researching, analyzing, and justifying an enterprise resource planning (ERP) purchase, they give only a token look (if any) at how well the application actually performs once it's installed. Trish Sounder stated "*When it comes to measuring the performance of their business application suite, many companies start down the road of good intentions and get sidetracked. If this sounds like your company, you might just need a better road map.(*Sounder T*).* For many companies, it's all about choosing the right product," she says, "but if you don't establish specific performance metrics, it will be very hard to gauge how well that product is working to meet your objectives, let alone correct any

performance gaps. Further evidence of this lack of knowledge regarding how firms assess the benefits of their ERP systems is provided in the survey of 232 respondents in American organizations that Robbins- Gioia (2006) conducted. The survey reported that "46% of the participants noted that while their organization had an ERP system in place..., they did not feel their organization understood how to use the system to improve the way they conduct business." Indirectly, this information might be suggesting that ERP adopting firms do not know what to assess or evaluate to ensure that the technology enables them realize their organizational goals.

Given that ERP technology is so expensive, you might wonder why more companies don't engage in a thorough, after-the-fact audit. Reasons range from a lack of involvement by senior management to anxieties about whether the project will live up to its promise—and whose feet will be held to the fire if it doesn't (Sounder T). And somewhat surprisingly, after-the-fact audits are often skipped because no one agrees on what precisely constitutes a successful ERP program. Hence this study seek to fill the gap by identify dimensions that can be adopted to measure how successful the ERP program is and to obtain empirical evidence on critical factors during implementation.

1.4 Scope and significance of the study

The research is limited to investigation of critical factors during implementation and ERP post implementation success. Our concept of success refers to the utilization of such system to achieve organization effectiveness- that is the extent to which an ERP system contributes to achieving organizational goals. The study excludes performance indicators (for example profit measures) because of the difficult of isolating the effect of the ERP effort from the other effects which influence performance.

To our knowledge, this could be among the first in the literature to focus on ERP system success assessment focusing on developing countries. To that end, the significance of our effort related to the insights it offers to both practitioner and researcher communities from this particular angle. To some extend, the procedures used in this study and insights will help researchers to overcome the purported lack of knowledge with regard to assessing the success or effectives of their acquired ERP systems and related technologies. They will also gain valuable knowledge about their

influence of selected contingences and the perspectives of the organization actors in relation to ERP success.

1.5. Problem statement

To investigate, identify and confirm:

a) Critical success factors during implementation,

b) Success measurement dimensions that can be used to assess ERP software after implementation phase.

1.6. Purpose statement

The purpose of this study is to identify and confirm the critical factors of ERP Implementation. It also seeks to understands and confirm the key EPR systems success measures after the implementation.

Given the perverseness of ERP Implementation worldwide, it is hoped that this study will investigate the success of such systems in adopting firms hence benefit both practitioner using such systems and to the researchers with interest in technology. Management of firms that have adopted ERP will gain insights from such an effort highlighting relevant factors and relationships in the context of ERP success assessment.

More importantly, the proposed integrative ERP Success assessment framework of this work will serve as a foundation for future research .Against this backdrop, we can say that the most significant contribution of the research will not lie on what will have been achieved, so far, but in how it paves was for development of future theoretical framework of ERP Post implementation assessment in developing countries.

1.7 Research Objectives

In general, the research will seek to identify and confirm ERP keys success assessment dimensions.

Specifically, the study seeks to:

a) To propose an integrative ERP systems success assessment framework.

b) To investigate and confirm the perceptions of ERP success from the viewpoints of differing organizational stakeholder groups.

c) To investigate and confirm the relationship among the dimensions in ERP success measurement model.

d) Identify and confirm key critical factors in the ERP implementation and understand the criticality degree of each factor from user's perspective.

1.8. Research Questions and Hypothesis

1) What are the key dimensions and measures used in ERP success models.

2) Which dimensions may serve as the best surrogate of ERP success?

3) Does any relationship exist among dimension in ERP success model?

4) Do different organization stakeholders group assess ERP system success differently?

5) What are the critical success factors in the implementation of ERP?

6) What is the criticality of each factor in ERP implementation?

ERP systems harmonize processes from the different departments within the organization and thus it is to be expected that their impacts would be palpable across the various sub-units, workgroups, and departments in the organization. Gefen and Ridings (2002) found that when users have contact with the ERP technical implementation team, the assessment of the new system tends to be more favorable than for instances where such contact was low.

Hence the need to determine the nature of relationships between the dimension of ERP success model. Hence with respect to the interrelationships between the dimensions of ERP success, the researcher formulated relevant hypotheses (H1- H10) indicated below adopted from Ifinedo (2006).

- H1: The higher the *Vendor/Consultant Quality*, the higher the *System Quality* of the acquired ERP system.

- H2: The higher the *Vendor/Consultant Quality*, the higher the *Information Quality* of the acquired ERP system.
- H3: The higher the *Vendor/Consultant Quality*, the higher the *Individual Impact*.
- H4: The higher the *Vendor/Consultant Quality*, the higher the *Workgroup Impact*.
- H5: The higher the *Vendor/Consultant Quality*, the higher the *Organizational Impact*.
- H6: Increases in *System Quality* will cause increases in *Individual Impact*.
- H7: Increases in *Information Quality* will cause increases in *Individual Impact*.
- H8: Increases in *Individual Impact* will cause increases in *Workgroup Impact*.
- H9: Increases in *Workgroup Impact* will cause increases in *Organizational Impact*.
- H10: Increases in *Individual Impact* will cause increases in *Organizational Impact*.

CHAPTER 2 LITERATURE REVIEW

Introduction

The purpose of this chapter is to acknowledge the work that has been done in this area by other researchers. In the first section, we provide brief background on ERP software. The Second section focuses on the key implementation factors and final section focuses on contribution by other researches on the post implementation assessment.

2.1 What is ERP?

In answering the above, authors tend to describe the functionality of ERP systems because there is no singularly accepted definition of such systems. For brevity's sake we include just a few of them: Davenport (2000, p.1-2) describes ERP systems as information systems capable of supporting the "flow of information seamlessly across diverse business functions, business units, and geographic boundaries."

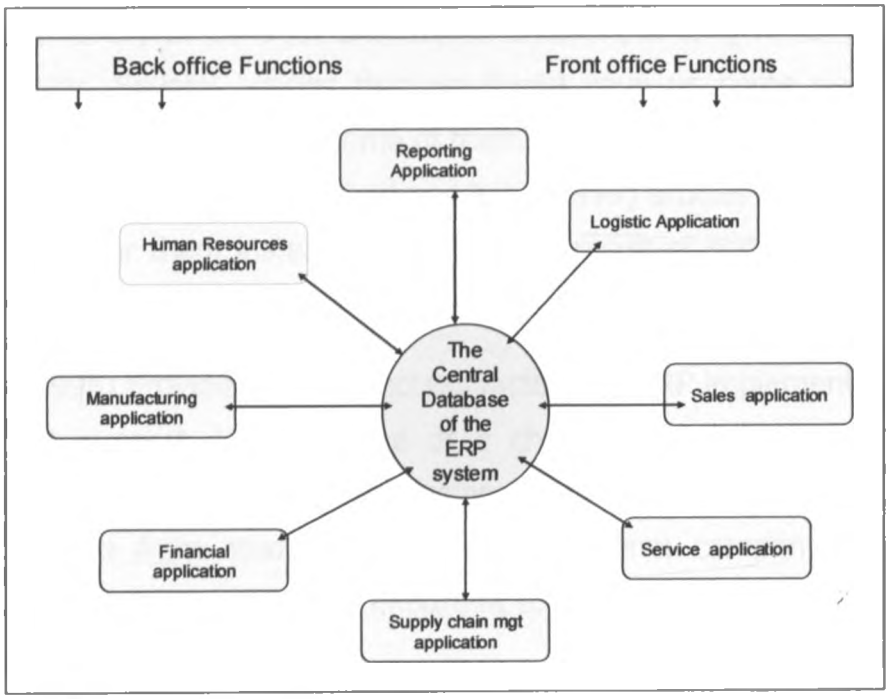
Klaus et al. (2000, p.141) describe ERP systems as "... comprehensive, packaged software solutions [that] seek to integrate the complete range of a business processes and functions in order to present a holistic view of the business from a single information and IT architecture."

Nah et al. (2001, p.285) describe an ERP system as "a packaged business software system that enables a company to manage the efficient and effective use of resources (materials, human resources, finance, etc.) by providing a total, integrated solution for the organization's information processing needs. It supports a process-oriented view of the business as well as business processes standardized across the enterprise."

Finally Ifinedo (2006) describe ERP as a complex business IT package designed to integrate business processes and functions, and it is capable of presenting a holistic view of a business by permitting the sharing of common data and practices in a real-time environment. Essentiality, an ERP system builds on one database to ensure information quality (i.e., regardless of where the data is input, it becomes available to every organizational member real-time).

To illustrate the anatomy of an ERP system (Figure 1), we adopted the schematic illustrations provided by Davenport (1998) and Cotteleer (2001). According to Davenport (1998, p.124), "At the heart of an [ERP] system is a central database that draws data from and feeds data into a series of applications supporting diverse company functions. Using a single database dramatically streamlines the flow of information throughout a business."

Figure 2.1 The anatomy of an ERP system



Source: Adopted from Davenport(1998 and Cotteleer (2001)

2.2.0 ERP Critical success factors

Since they were introduced in the early 1900s, ERP systems and theirs complicated implementation have given rise to numerous publications, many initiatives coming from both the academic and professional communities. Several authors have written about the success and failure of ERP implementation but they merely focus only on limited area of study, such as in business strategies, technology or organizational fit (li Fang & Sylvia 2005).

Critical success factors (CSFs) are often used to identify and state the key elements required for the success of a business operation. CSF can be understood as the few key areas where things must go right for the implementation to be successful. Past studies have identified a variety of CSFs for ERP implementation, among which related context consistently appear. Several articles that we found gave us some perception about critical success factors in ERP. Since some of them are referring researchers such as Kuang, Lau, & Nah's (2001) and Holland and light (1999) articles as their main source, we decided to look for them instead. Below are the result of some major research on ERP implementation success factors.

Bancroft et al. (1998) provided critical success factors for ERP implementation including top management support, the presence of a champion, good communication with shareholders, and effective project management. This is derived from discussions with 20 practitioners and from studies of three multinational company implementation projects. Before implementing ERP it is important to develop key IT capabilities.

According to Feeny and Willcocks (1998) there are nine core IT capabilities required for successful ERP implementation as shown in table 2.1. A competent internal IT group is established along with a systems view of organization. This view makes it easy to understand BPR. These core capabilities are based on skilled employees

Table 2.1 Core IT Capabilities Needed for ERP implementation Success

Capability	Impact
IT leadership	Develop strategy, structures, processes, and staff
Business systems thinking	Adopt systems view
Cooperate with business user	Cooperate with business user
Architecture planning	Create needed technical platform
Technology fixing	Troubleshoot
Informed buying	Compare vendor sources
Contract facilitation	Coordinate efforts
Contract monitoring	Hold suppliers accountable
Supplier development	Explore long-term mutual benefits

Source: *Feeny and Willcocks (1998)*

Willcocks and Sykes (2000) proposed several scenarios and use cases to prove these scenarios. According to the two researchers, unlike the development of new simple software applications the main target of ERP is to fulfill BPR (Business Process Reengineering). Many companies failed on this aspect of ERP implementation. This failure was driven by the need for major change in human, culture, and organization relationships. The following table displays three factors associated with ERP failure.

Table 2.2 Factors in ERP implementation failure

Scenario	CIO/IT focus	Typical Outcome
Technological determinism	Technical	Failure to gain business benefits
Supplier/consultant driven	Disregarded	Cost overruns
Outdated relationships & capabilities	Insufficient talent	Chaos

They emphasizes Feeny and Willcocks (1998) nine core IT capabilities and believe these nine core IT capacities must be retained in-house, since in some cases the companies have to outsource human resources to work closely with the in-house team and ensure that a transfer of learning takes place. In order to obtain necessary IT capabilities, they suggested some strategies to manage the ERP implementation:

a) User versus technology

With business requirements changing rapidly, further learning and innovation is required. As IT becomes more organizationally pervasive, development will not rely on IT specialists or external IT suppliers. Users themselves will approach IT through multifunctional teamwork, personal relationship, and business goals.

b) Governance and staffing

Effective business innovation requires high-level support and a project champion. An efficient team combination is recommended including:

- Full-time, high-performing users
- In-house IT specialists
- People with bridge-building interpersonal skills
- Fill-in external IT staff and knowledgeable users/managers

c) Time-box philosophy

They recommend decomposing implementation into smaller projects. This approach can help reduce project risk. This is also known as converting "whales" (large unmanageable projects) into "dolphins" (smaller and more manageable projects).

d) Supplier/ consultant role in ERP

First, consultants fill in the in-house shortage of skills. Secondly, the company may choose to outsource the entire IT project to decrease the risks.

As we looked through Kuang, Lau, and Nah's (2001) article, we perceived that the article is quite comprehensive and could give us a good blueprint in understanding about critical success factors in broader perspective. They identified eleven key critical factors for ERP implementation success, aiming to give practical suggestions to the companies in the process of ERP implementation (Kuang et al., 2001). These factors were listed randomly, from business strategy to technological issues.

Table 2.3. Critical success factors in ERP implementation

1 ERP teamwork and composition 2. top management 3. business plan and vision 4. effective communication 5. project management 6. appropriate business and legacy systems	7. project champion 8. change management program and culture 9. business process reengineering and minimum customization 10. software development, testing and troubleshooting 11. monitoring and evaluation of performance

Source: ***Critical factors for successful implementation of enterprise systems*** **(Kuang**

Holland and light (1999) in their research presented a number of success factors in ERP implementation and suggested their division into strategic and tactical factors. The model was illustrated on a sample of two ERP implementation projects. Among the 12 factors, the author highlighted the critical impact of legacy systems upon the implementation process and importance of selecting an appropriate ERP strategy.

Holland and Light emphasized the need to align business processes with the software during the implementation. Further on they said that naturally, strategies and tactics were not independent of each other. Strategy should drive tactics in order to fully integrate the three main management processes (planning, execution and control). The framework is shown in Table 2.4 below.

Table 2.4. A critical success factors framework for ERP implementation

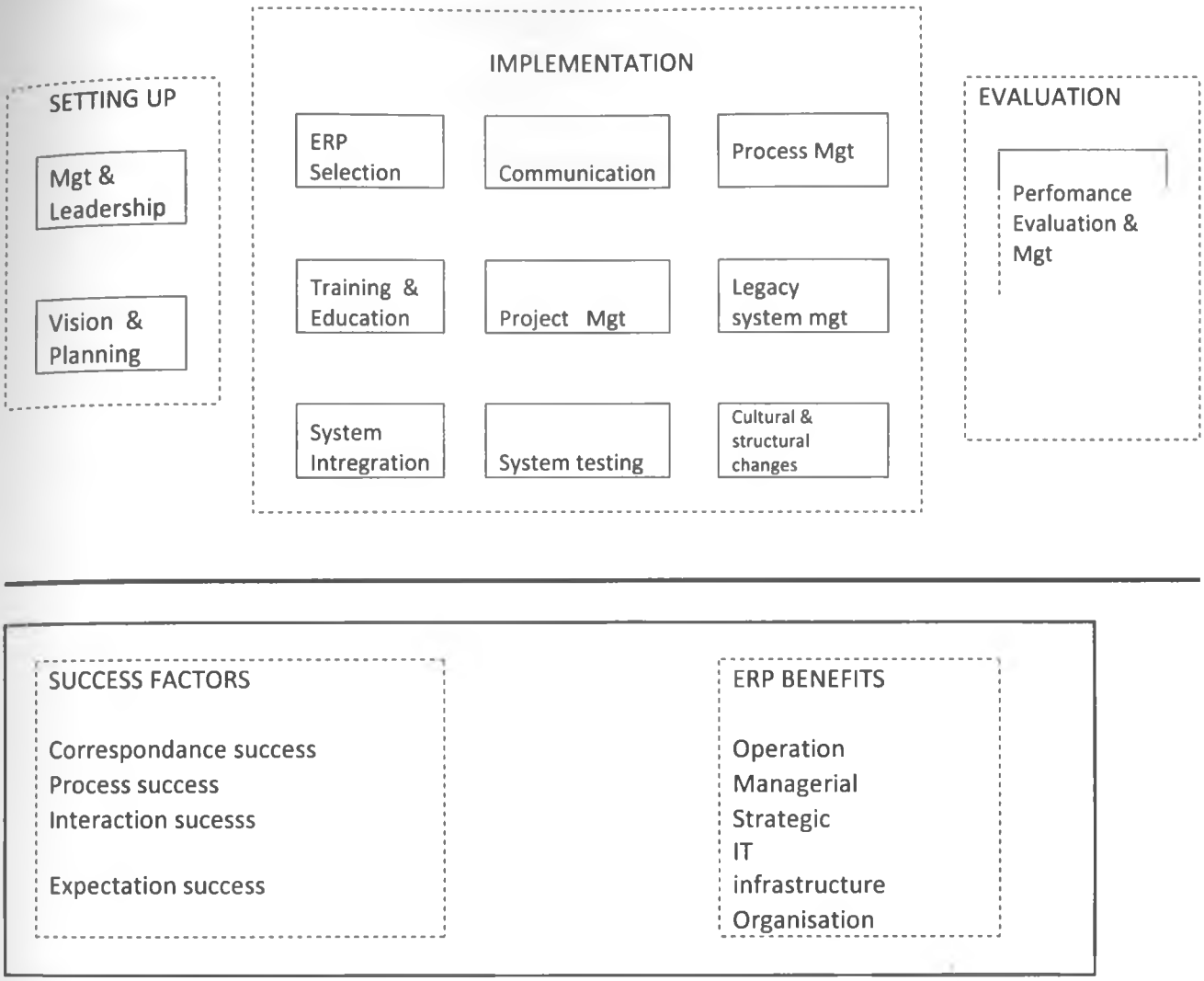
Strategic	Tactical
1) Business vision	5) Client consultation
	6) Personnel
2) ERP strategy	7) Business process change & Software Configuration
	8) Client acceptance
3) Top management support	9) Monitoring and feedback
	11) Communication
4) Project schedule/plan	12) Trouble shooting

Source: *Holland and Light (1999)*

Majed Al-Mashari (2003) in his research paper discusses the theoretical basis of ERP systems in relation to the benefits realization process. This paper presents a novel taxonomy of the CSFs in ERP implementation process. Set-up, implementation and evaluation are the three main phases. Figure 2.2 shows the inter-relationship between core business strategy According to Majed Al-Mashari et al, the measuring and evaluation of performance are very critical factors in ensuring the success of any organization.

It is suggested in the taxonomy that measurement take place in a balanced perspective and for the purpose of proving useful information that can facilitate the decision making process, deliver the corporate objectives and forward the business competitively. To obtain this system, the authors advise that regular auditing and benchmarking should be considered for optimization of the potential available to all aspects of business. Furthermore, external benchmarking may bring new ideas, knowledge and better practices on dealing with deficiencies in ERP systems, de-bottlenecking, streamlining the processes, optimizing and redesigning for more extensive benefits (Yingie 2005).

Figure 2.2 Taxonomy for ERP critical factors



In their contribution Elisabeth J. Umble, et al (2003) they point out that commercially available software packages promise seamless integration of all information flows in the company-financial and accounting information, human resource information, supply chain information, and customer information. However, managers have struggled, at great expense and with great frustration, with incompatible information systems and inconsistent operating practices.

In their contribution towards this area of research, the identified and divided CSFs into 10 categories shown below.

- Clear understanding of strategic goals.
- Commitment by top management.
- Excellent implementation project management.
- Great implementation team.
- Successfully coping with technical issues.
- Organizational commitment to change.
- Extensive education and training.
- Data accuracy.
- Focused performance measures.
- Multisite issues resolved.

2.3. ERP Critical success factors in ERP implementation

After revising various contribution from different researchers (paragraph 2.2), the researcher identified the following key elements from the literature used in this study.

Top management support

Several researchers, including Somers and Nelson (2004) have noted the crucial nature of securing top management support and commitment in order to ensure the success of IT projects (and ERP projects) in organizations. In fact, top management support is critical for the success of IT projects in organizations because of its influence and role in providing:

- financial resources,
- relevant guidelines (Leadership),
- establishing objectives for ERP system
- developing capabilities and limitations of IT
- And communicating the corporate strategy to all employees.

Furthermore, a positive relationship between top management support and IS effectiveness or success has been reported in the literature (Ifinedo, 2007d). The shared vision of the organization and role of the new system and structures should be communicated between managers and employees.

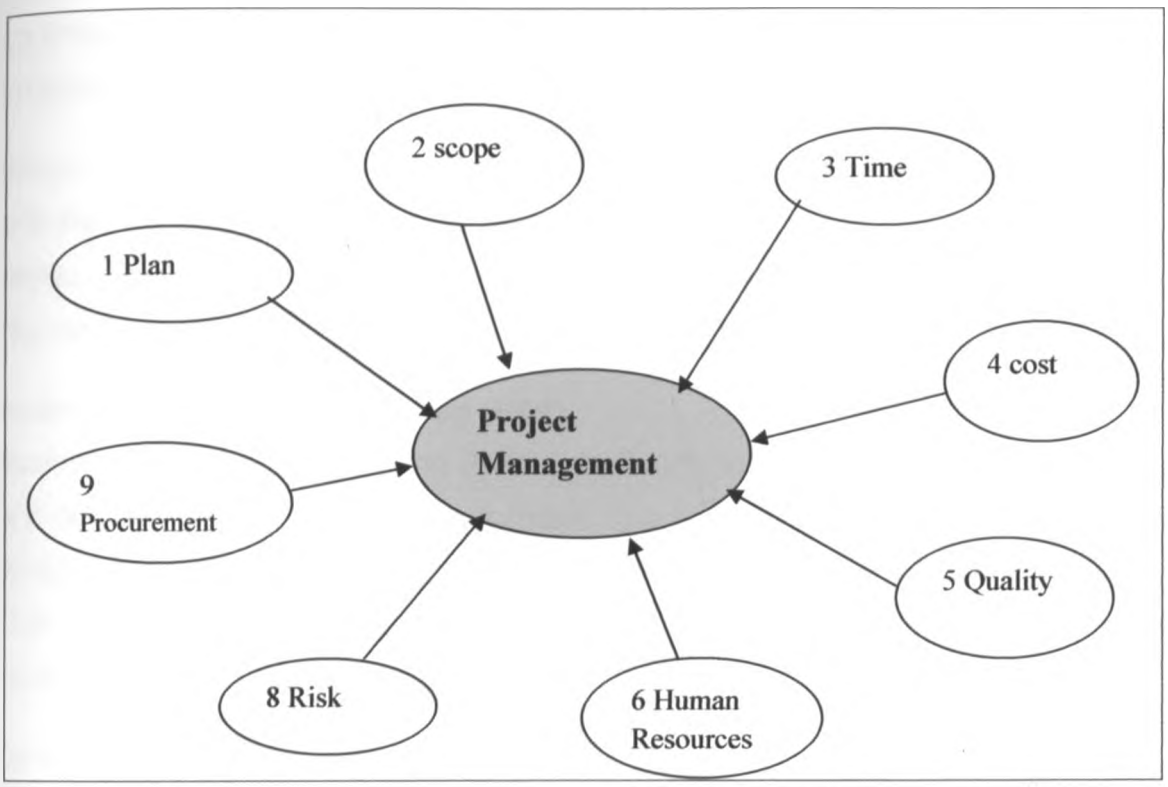
Al-Mashasri et al (2003) argued that top management support does not end with initiation and facilitation, but must extend to the full implementation of an ERP system. Furthermore, top management support should provide direction to the implementation team and monitor the progress.

Effective Project Management and Project Champion

Project management is the application of knowledge, skills, tools, and techniques to project activities to meet project requirements. Project management is accomplished through the use of the processes such as initiating, planning, executing, controlling, and closing (Jiang, 2005).

Project management goes beyond one single factor because management is required through all the implementation. It covers the following areas such as integration/plan, scope, time, cost, quality, human resource, communication, risk, and procurement. Usually if we balance and control all the factors correctly, the project will be successful.

Figure 2.3 The areas of Project Management



Source *Jiang (2005*

Project management activities span the life of the project from initiating the project to losing it .One expert or a group of experts should be assigned to manage the project and drive success throughout project management Jiang (2005).

Remus (2006) noted that project champion is one of the most important factors in the ERP implementation. Project champion should own the role of change champion for the life of the project and understand the technology as well as the business and organization context.

A plan with goals and objectives is the initial phase of any ERP project. Sometimes the ERP fails since it is unable to meet the stakeholder groups' expectations. When proposing the goal, this expectation should be carefully thought-out to guarantee this expectation is within the ERP's ability.

In order for the ERP system to progress it is critical to clarify the ERP project's and every participators' scope and ensure consideration of all the required work. The schedule and cost budget cause trouble for most implementing firms. These are two contrary factors since more investment in resources such as consultants can propel the progress, but this also leads to extra expense.

People always wish the ERP implementation could be finished sooner while maintaining a limited budget. In fact this time and cost may be estimated during the beginning plan phase. The control of time and cost budget depends on the project management. Human Resources is always vital for the implementation (Jiang, 2005).

Business process re-engineering (BPR)

Business process re-engineering (BPR) is defined (2001) as "the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance such as cost, quality, service and speed" (Jiang, 2005). BPR analyzes the process of an organization's business in order to identify the best way of doing things.

Re-engineering has continually reduced workforce size and others created short-term cost saving, with less impact on developing computer-based automation. It is ERP that rescues the idea of BPR and forces the company to redefine and design work flows to fit the new software.

BPR has some implicit risks. Sutcliffe (1999) proposes the following difficulty of implementing BPR:

- Employee resistance to change.
- Inadequate attention to employee concerns.
- Inadequate and inappropriate staffing.

- Inadequate developer and user tools.
- Mismatch of strategies used and goals.
- Lack of oversight.

Almost every analyst of the ERP implementation process strongly advises companies to avoid modifying the software. Companies are advised to maintain existing ERP functionality and to change their procedures to adapt to it (Markus & Tanis 2000).

To gain full benefit of ERP systems, it is imperative that business processes are aligned with the ERP systems, since both reengineering literature and the ERP implementing literature have proven that the ERP itself can not improve the firm's performance unless the firm reengineers the business process per ERP systems.

Modification of the software causes problems, such as code errors and difficulty in upgrading to new versions. Many organizations have made unnecessary, complex customization to ERP software because the people making the changes do not fully understand the organization business practices (Nah 2003).

Each company needs customized software, but the organization must keep customization to a minimum, since any modification will lead to higher related cost. According to Somers and Nelson (2004), the business model and reengineering that drives technology choice is an enabling factor that can give to ERP success.

Education and Training

In ERP implementation process many projects fail in the end despite of millions of dollars and hundreds of hours due to lack of proper training (Jiang, 2005). Usually the end-user can get used to the ERP system within one year. One of the earlier researchers, Ang, et al. (1994) found out that lack of training led to difficulties in ERP systems implementation.

A thorough training program is necessary to make the user comfortable with the system. This factor is too often ignored. It is a challenge for a company implementing

such a system to find an appropriate plan for the training and education of the end-user. In most cases, consultants are included during implementation process, and while all the aspects of the system should be explained and transferred to the end-users, the main goal of ERP training is that the users understand the various business processes behind the ERP application (Majed Al-Mashari, et al 2003).

Generally it is easy to train new employees of a company. Employees with many years of experience may need more time to change their habits.

Another problem is time limit. Sometimes firms rush to finish the ERP project within a certain time period, and have no time to completely change the organization's culture. Training new users of the ERP system also has some difficulties, including the diversity of the users, the complexity of the new systems, and the variety of training methods available. New ERP systems change nearly all of the organizational business processes, meaning all kinds of users in all aspects of the business will be impacted. Since all kinds of factors should be considered, the training fee can be quite expensive, ranging from 10 to 20 percent of the total implementation cost (Mabert, et al 2001).

Not only does the system user need training, but also those in the firm responsible for implementation. They must also receive appropriate training. This is especially important for those companies that want to implement ERP in-house. Those implementing the ERP system should receive training so that they understand how to design processes and configure the software (Jiang, 2005).

User involvement

User involvement is one of the most cited critical success factor in ERP Implementation project. User involvement refers to participation of the user in the process of ERP implementation. The functions of the ERP system rely on the user to use the system after going live, but the user is also a significant factor in the implementation. There are two areas for user involvement (Zhang, et al. 2002):

a) User involvement in defining the company's ERP system needs and

b) User participation the implementation of ERP systems.

It is possible to avoid resistance to new ERP system by involving the user early on while the project is still being defined, since the user has then also contributed to this decision. By participating in the ERP implementation, the user can understand the new system sooner and give feedback from his or her own point of view. This method can shorten the gap between the old and new systems and make easier for the user to cope with the new system. Since the user understands some of the ideas sooner, the training is more easily accepted. The experienced users who take part in implementation can also communicate with the newcomers.

Another benefit of involving some users early is that it facilitates in-house expert training. In the long-run the company may not be willing or able to rely on consultants or vendors because of the expensive consulting cost. Early users are a good resource if it becomes necessary to train experts in the future (Jiang, 2005).

Business Plan and Vision

A clear business pan and vision is needed to guide the project throughout the ERP life cycle (Loh and Koh, 2004). Project management identifies three competing and interrelated goals namely, scope, time and goals. The primary stage of any project should begin with a conceptualization of the goals and possible ways to achieve these goals.

Nah (2003) stated that one of the biggest problems ERP project leaders face comes not from the implementation itself, but from expectation of board members, and other stockholders. It is important to set goals of the project before even seeking top management support. Many ERP implementations have failed as result of lacking clear plans (Somers and Nelson 2004).

Team work and composition

The ERP team should involve all the best people in the organization. An ERP project involves all the functional departments in the organization hence the need for cooperation of technical and business experts as well as end users (Loh and koh 2004). According to Al-Mashari (2006), the success of projects is related to the knowledge, skills, abilities, and experience of the project manager as well as the selection of the

right team members. It is paramount for the team not only to be technologically competent but also understand the company and its business requirements. They should be familiar with the business functions and products so that they know what needs to be improved to the current system

ERP System Selection

The selection of a suitable ERP system is a challenging and time consuming process. Wei and Wang (2004) stated that there is no one single ERP package that could provide all the functionalities required for the business. There are various ERP packages in the market with similar functionalities but different design for example SAP, Oracle and Baan, hence an organization must select an appropriate vendor that is able to provide a flexible ERP system. Various authors have identified important criteria that need to be taken into account when selecting a new ERP system. For example a study by Everdingen et al (2002) stressed that an ERP system selected has to closely fit with most of the current business procedures. Additionally, the system has to be flexible, user friendly and easy to implement

Vendor/Consultant support

Consultant and vendor support was identified as critical success factors by Raman, Thong, and Yap (1996); and Arens and Loebbecke (1997). Companies frequently search for assistance from external experts when they are having problems with a highly centralized organization structure or lack of experience (Raman et al., 1996).

Vendors can help in information system requirement analysis by assisting companies in making blueprint of their business process from the bottom level until the top management, consultants also can recommend which hardware and software that is most suitable, and assist companies in implementation management(Arens & Loebbecke, 1997).

A close working relationship between consultants and companies' project team can lead to valuable knowledge transfer in both directions (Bowen, 1998).Lack of in-house skills is a common problem of inexperienced companies. Lack of inhouse skills has often been associated with software development (Holland & Light, 1999). The need for

consultants and vendor's support in ERP implementation is stronger than in another IS project because ERP implementation project requires a wide range of skills This include change management, risk management, and also business process reengineering (BPR) in addition to technical implementation knowledge.

Further on, ERP system is based on programming languages and concepts that are most likely new to existing IT staff (Kay, 1999). In that case consultants can help companies because of their previous implementation experience; consequently, they also can act as knowledge providers when knowledge deficiency exists in an organization (Arens & Loebbecke, 1997).

Consultants could provide training as a valuable resource to develop skills that are lacking in house. Later on Ginzberg, Lucas, and Walton (1988) suggested that package implementation was different from custom implementation because the user might have to change procedure to work with the package. The user cannot change some programs in the package to fit the company needs. Hence the user became dependent upon the vendor for assistance and updates. Some of the variables according to Ginzberg et al. (1988) that are associated with the successful implementation of ERP are:

- greater vendor participation in implementation and support
- higher rating of user capabilities by vendor
- Higher rating of user skills by MIS (Management Information System) management.

However, companies should not completely rely on consultants, as consultants also have limited specific knowledge of the companies' operation. This is supported with research findings by Caldas and Wood; they found that the support given by ERP consultants in ERP project is less than adequate (Caldas and Wood, 2000).

2.4 Review on measurement Dimensions

Research assessing the success of information systems has been ongoing for nearly three decades (Gable et al 2003). However, the scope and approach of these IS success evaluation studies has varied greatly, with little consensus on measures of IS success, thus complicating comparison of results across studies. The section summarizes contributions by other researchers in the area of study.

ERP assessment model by DeLone and McLean

In their influential article, DeLone and McLean [1992], reviewed 100 papers containing empirical IS success measures that had been published in seven publications during the seven years 1981-1987. They classified the huge range of IS success measures they found into six categories, and towards the end of their paper present their six categories of success measures in the model shown in Figure 2.4 namely

a) Use

b) User satisfaction

c) Systems Quality (SQ)

d) Information quality (IQ)

e) Individual Impact (II)

f) Organizational Impact (OI)

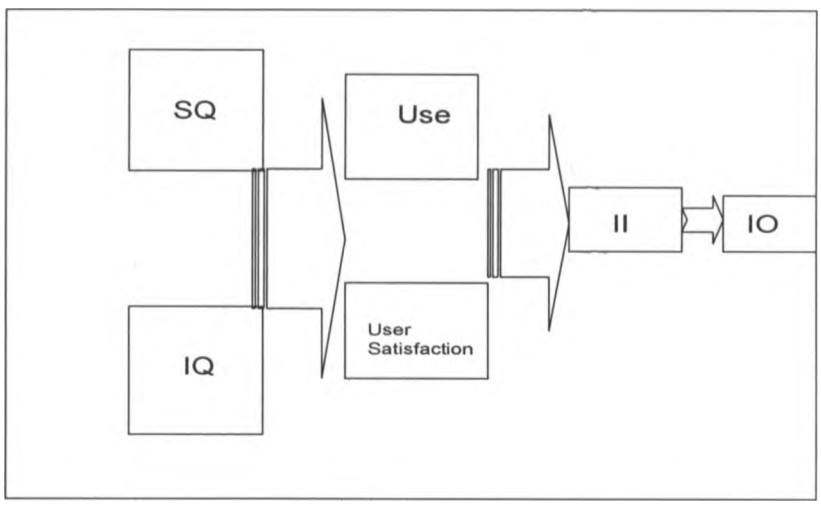
DeLone and McLean argue that when measuring IS success, researchers should "systematically combine" measures from their six IS success categories. They noted that it is unlikely that any single, overarching IS success evaluation measure will emerge and advised that combination of measures are necessary for evaluating is success and they commented,

"Researchers should systematically combine individual measures from the I/S categories to create a comprehensive measurement instrument. The selection of success measures should also consider contingency variables being researched –the organization strategy,

structure, size, and the environment of the organization being studied, the technology in use, and the individual characteristics of the system under investigation".

DeLone and McLean model proposes that *SYSTEM QUALITY* and *INFORMATION QUALITY* singularly and jointly affect both *SYSTEM USE* and *USER SATISFACTION*. Additionally, the amount of *SYSTEM USE* can affect the degree of *USER SATISFACTION* positively or negatively - and the degree of *USER SATISFACTION* also affects *SYSTEM USE*. *SYSTEM USE* and *USER SATISFACTION* are direct antecedents of *INDIVIDUAL IMPACT*. Lastly, this IMPACT on individual performance should eventually have some *ORGANIZATIONAL IMPACT* (Ifinedo 2006).

Figure 2.4 Delone & Maclean IS success Model



Delone & Mclean (1992) IS success model

DeLone and McLean's paper is an important contribution to the literature on IS success measurement because it was the first study that tried to impose some order on IS researchers' choices of success measures. *However*, although it distinguishes between individual impact and organizational impact, the paper does not recognize explicitly that different stakeholders in an organization may validly come to different conclusions about the success of the same information system. In addition the model does not take

into consideration contingency factors that have been proved to have an effect on ERP success.

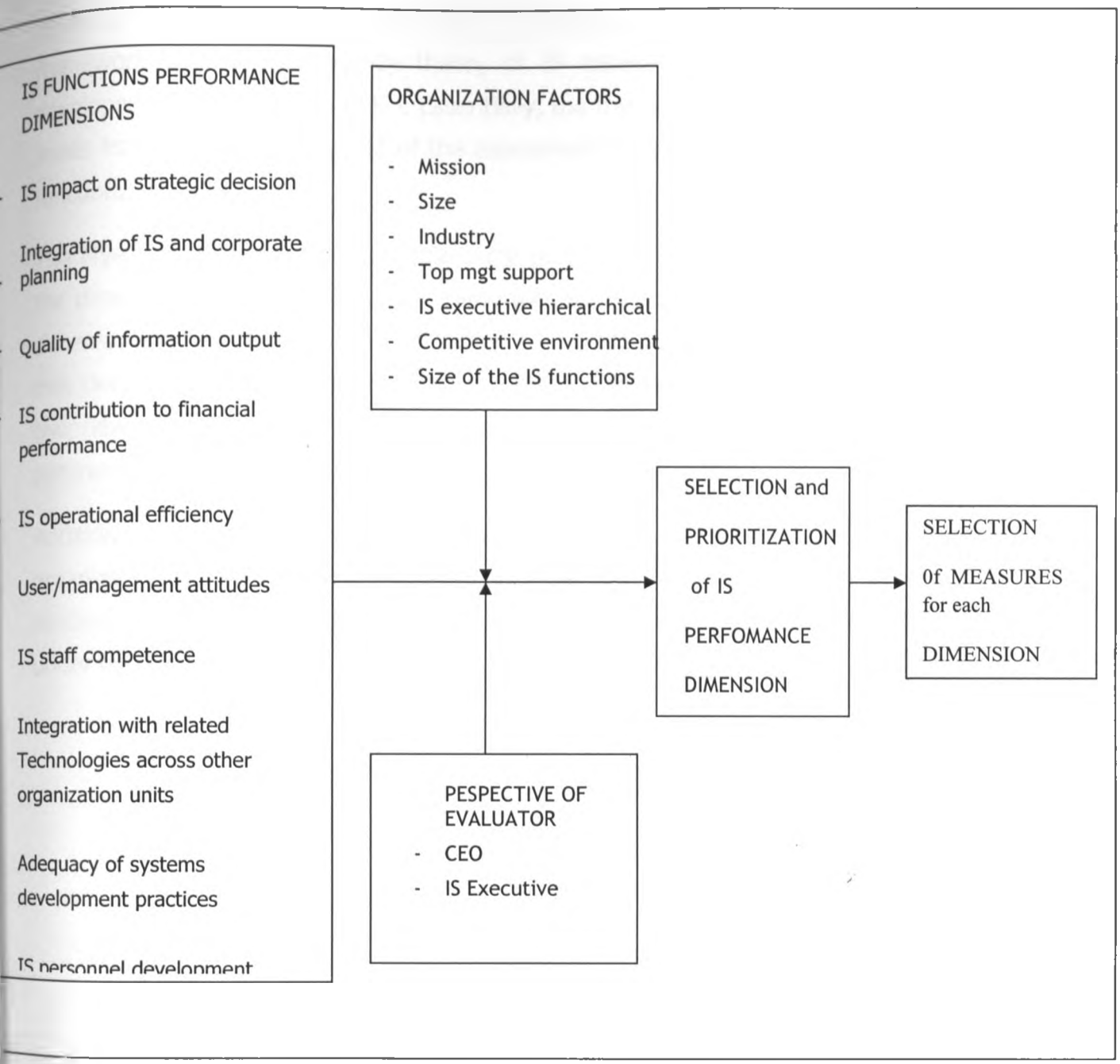
The IS function performance evaluation model Saunders and Jones

Against the backdrop of not downplaying the relevance of the influence of contingencies in the assessment of the performance - success or effectiveness - of the IS function, Saunders and Jones (1992) include contingency variables in their study on the performance of the IS function. The researchers investigated both the organizational factors such as top management support, size, mission, industry, and so forth as well as the peculiar dimensions that might improve the effectiveness or success of the IS function.

They proposed an evaluation model which they termed as "*IS Function Performance Evaluation Model*" (Figure 3.5).

The relevance of the Saunders and Jones (1992) to this study rests on the extent to which it provides support to the view that a conceptual model or Framework can be developed to include both the impact of contingencies factors and the dimensions of effectiveness or success hence fitting very well in the research framework adopted. However the model does not distinguish between Internal and external variables.

Figure 2.5 Saunders and Jones success model



The IS Function Performance Evaluation model by Saunders and Jones (1992).

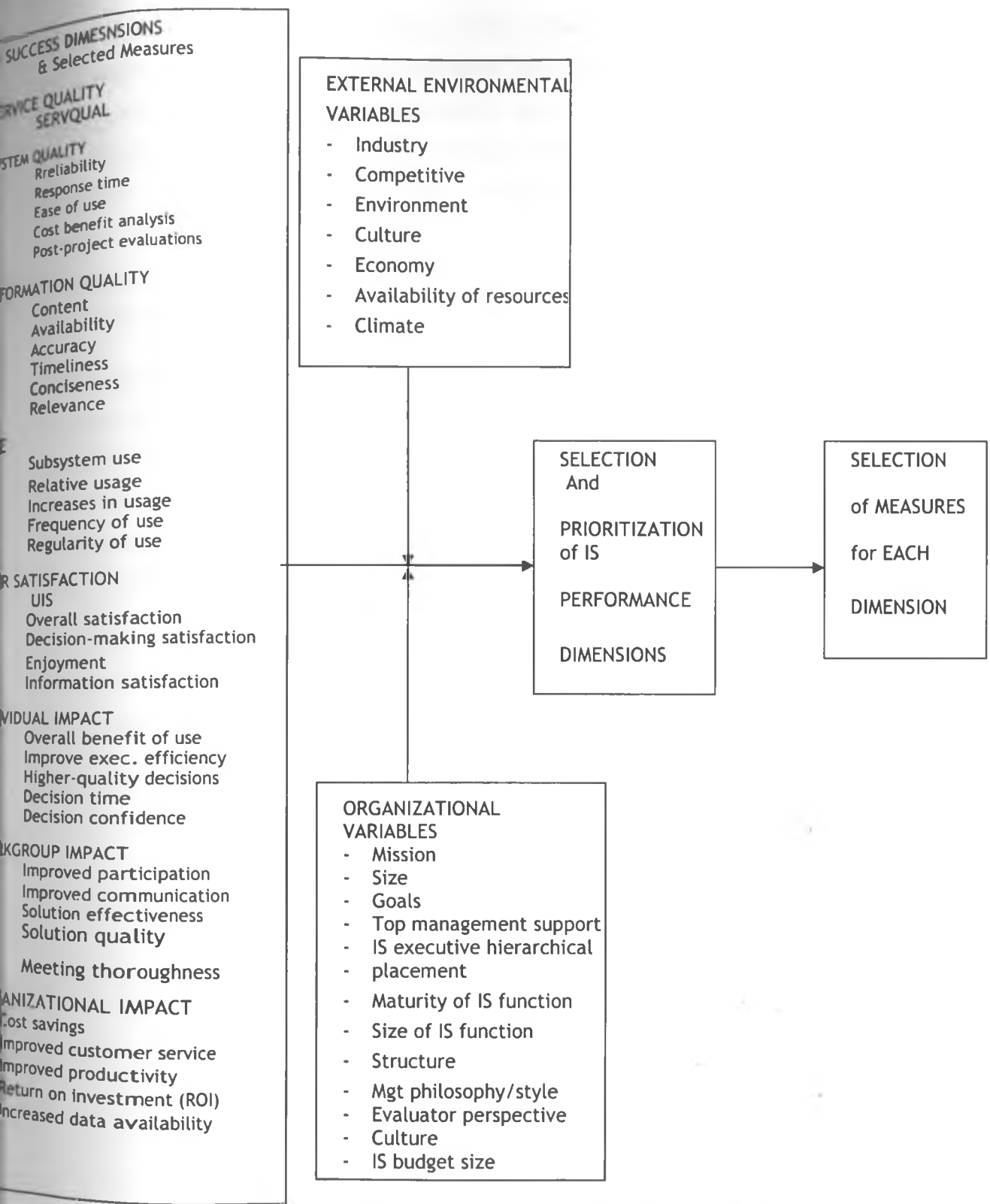
IS assessment framework by Myers B L

Myers et al (1997) build on the work of Saunders and Jones (1992). He developed framework of the "contingency theory of IS assessment" as shown in figure 3.6 developed by Myers et al. (1997). Essentially, the framework extends the Saunders and Jones framework in the context of the assessment of quality and productivity of the IS function.

The Myers et al. model also recognizes the pertinence of both contingency factors and the dimensions of IS success. The framework of Myers et al. (1997) re-organizes the dimensions of success for the IS function to include the six dimensions of IS success that DeLone and McLean (1992) had elaborated. The Myers et al.'s framework includes two new dimensions: Service Quality and Workgroup Impact, which they note are pertinent to their discourse.

Additionally, Myers et al. clearly delineate "external environmental variables" from the organizational factors, which Saunders and Jones (1992) did not do, thus by separating contextual levels into two main parts. He further elaborated variables to be measured under each dimension

Figure 2.6 The contingency theory of IS assessment framework by Myers et al. (1997)



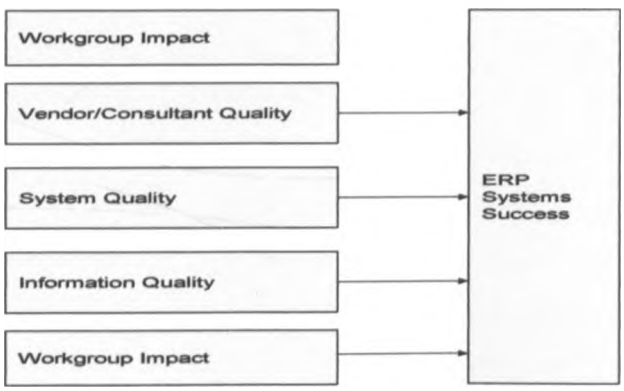
ERP assessment model Gable at el

In his assessment model, Gable et al. (2003) drew from the DeLone and Mclean model to develop an additive model that redefines the original dimensions. In brief, Gable and colleagues eliminated (through multi-stage data collection and statistical analysis) the *Use* and *User satisfaction* dimensions. Arguments against dropping these also appear in literature for example Seddon (1997). Importantly, *Use* can only be a measure of success where IS use is not mandatory, a fact that DeLone and McLean (1992) themselves pointed out by noting that, "...usage, either actual or perceived, is only pertinent when such use is voluntary" (p.68).

With regard to the *User satisfaction* success dimension that is eliminated in the ERP success measurement model proposed by Gable et al. (2003), another study by these researchers conclude that "The statistical analysis of the 310 responses [that they received] and the content analysis of the 16 instruments [that they used] suggest the appropriateness of treating *User satisfaction* as an overarching measure of success rather than a dimension of success" (Sedera and Tan (2005, p.963).

Thus, the ERP success dimensions retained in Gable and colleagues' model are: *System Quality* (SQ), *Information Quality* (IQ), *Individual Impact* (II) and *Organizational Impact* (OI). Their model is also shown in Figure 3.7

Figure 2.7 ERP assessment model by Gable et al (2003)



The Extended ERP Systems Success Measurement Model

Conclusion

A number of researches have been done in this area of ERP success dimension and what is evident is that the key areas to consider are Work group impact, information quality, vendor quality and the organization impact. However all the above research were conducted in developed countries where the some of the environment factor such as IT skill among the population is fundamentally different from developing countries like Kenya. It expected this research will fill in the gap that exists in this are of ERP post implementation assessment by providing empirical evidence from developing countries point of view.

CHAPTER 3 RESEARCH FRAMEWORK

3.1 Introduction

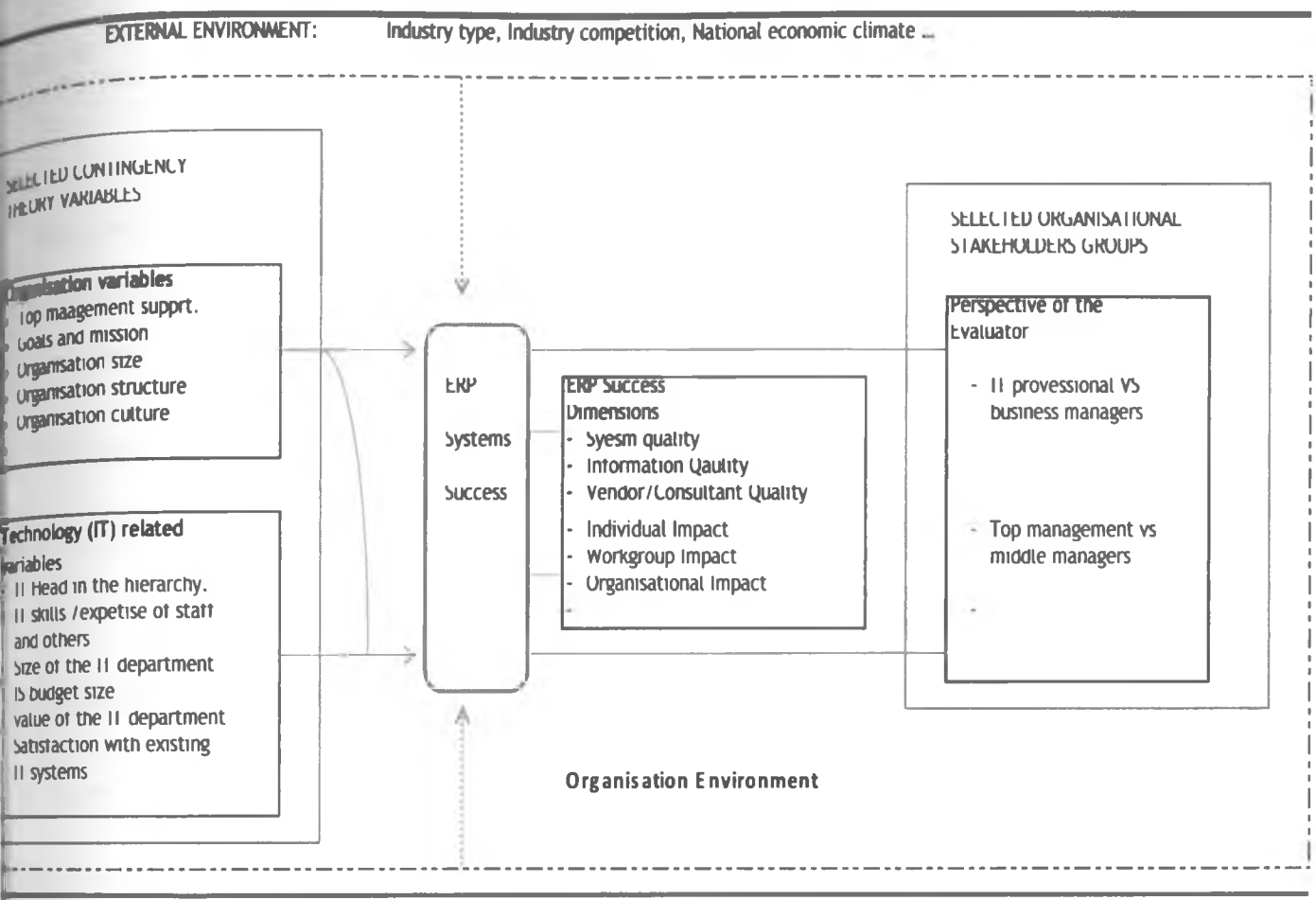
In this chapter the researchers discusses the framework adapted to guide the study. The researcher has heavily relied on the model developed by Princely Ifinedo (2006), hence the model is reviewed in this section. Finally the researcher present the refined framework used in the sturdy.

3.2 Research Frame work by Ifinedo (2006).

In developing our the research framework (Figure 3.2) we consulted the relevant literature for frameworks highlighting IT impacts and benefits on the organizations, including the IT impacts framework (Scott Morton, 1991), a contingency theory for IS assessment (Myers et al., 1997), IS function performance evaluation framework (Saunders & Jones, 1992), a conceptual model of ERP implementation (Somers et al., 2000), ERP systems benefits framework by DeLone and McLean (1992). and ERP success model by Gable and colleagues' Gable et al. (2003).

We settled on the integrated frame developed by Princely Ifinedo (2006). His research was guided by a framework that connects ERP systems success measurement, evaluator's perspective, and the impacts of contingency factors. In developing the research framework (Figure 3.1), he took cognizance of other framework indicated above. Need less to say, his framework is among the latest to be developed in this area. The framework is mainly drawn from the model developed by Gable and his colleagues (Gable etal.2003). They identified items that can be used to evaluate the success of the ERP Software as shown below in figure. This includes *System Quality (SQ), Information Quality (IQ), Individual Impact (II) and Organization Impact (OI).* The model provides perhaps the most comprehensive ERP system success measurement approach to date. This model has been validated and considered to be good contribution to knowledge in this area of research. (Princely E I .2006).

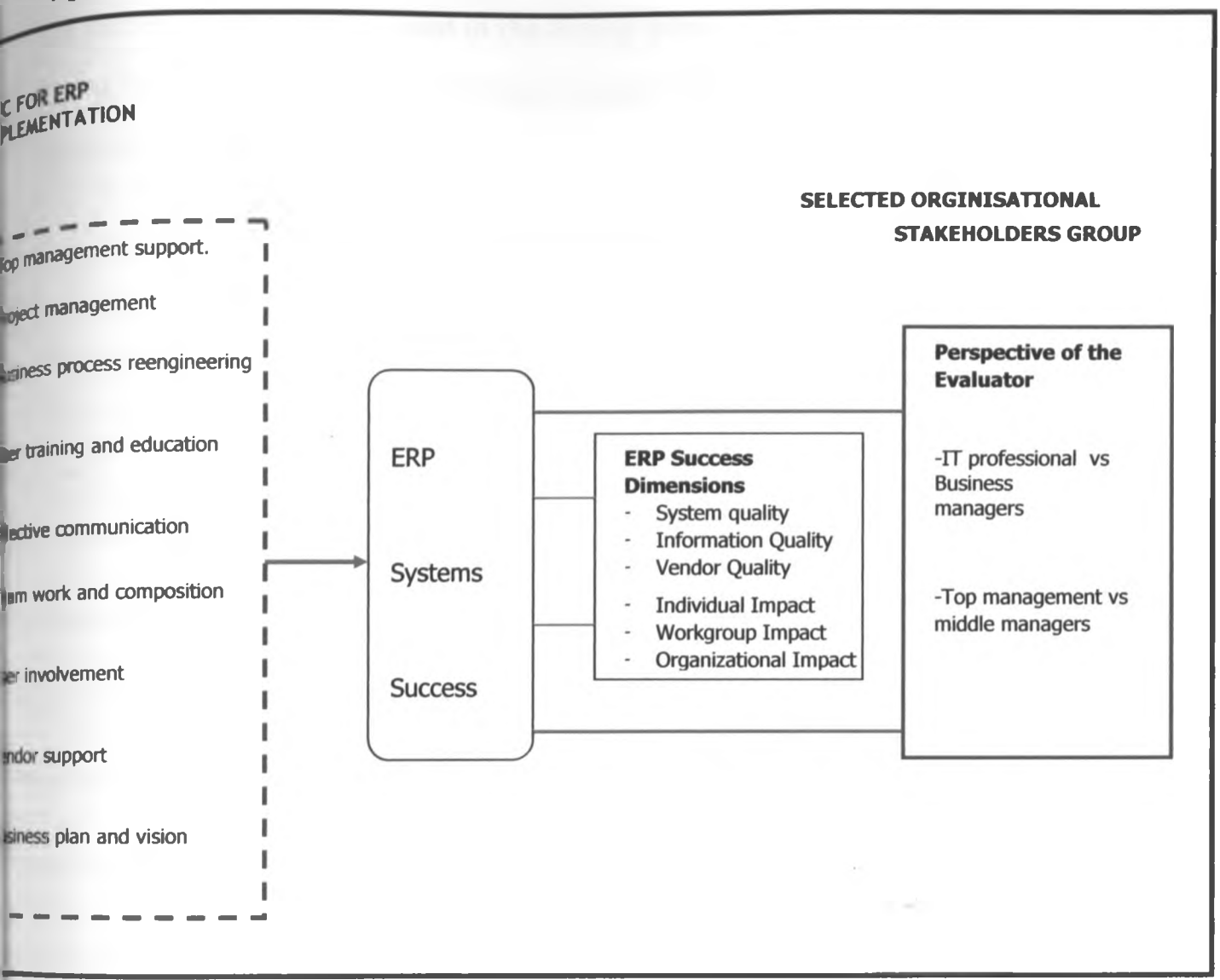
Figure 3.1 integrative frameworks by Ifinedo (2006



3.3 Research Framework used in this study.

The researcher modified integrative framework by Ifinedo (2006) due to the wide scope of his research. To complete the study within prescribed period, the researcher dropped the contingence impact on ERP. Reference to contribution from other researchers such as Kuang, Lau, and Nah (2001) and Holland & Light (1999), does not support direct impact on success of ERP. The figure below illustrates various construct under the refined framework.

Figure 3.2 Framework used in this study



The CSF factors on the left of the framework represent the independent variables which has an impact ERP success. In his framework, Princely Ifinedo (2006) divided the construct into organization and technological variables. However the researcher after consulting several literatures in this area of study listed all key variables without categorization. The dimensions of ERP success and perspective of the evaluator are shown in Figure 3.2 as well. Other researchers such as Myers et al. (1997) and Shang

& Seddon, 2002) have stressed the importance of highlighting the perspective from which the effectiveness or success of acquired IT systems is being presented.

3.4 Definition of variables used in the Frame work

The figure below summarizes the constructs used in the framework.

Figure 3.3 Definition of variables

Top management support.	Refers to the extend top management support directly and indirectly and commits to the continued use, upgrade and progress of ERP.
Project management	Refers to application of knowledge, skills, tools and techniques to project activities to meet project requirements.
Business process reengineering	Refers to fundamental thinking and radical redesign of business processes to fit the software hence reducing degree of customization.
User training and education	Refers to introduction of the ERP concepts to the users, and to providing training to the features of ERP software.
Technological infrastructure	Refers to adequate IT infrastructure, hardware and networking during implementation.
Management of risk	It is the competence to handle unexpected crises and deviation from plans.
Change management	Refer to structured approach to transitioning individuals, teams and organization from current state to future state.
Effective communication	Refer to sharing of information between the project team and communicating to the whole organization the results and goals in each ERP implementation phase.
Team work and composition	Refers to selection of right team members to champion with necessary knowledge, skills, abilities and experiences as well as understanding the company and its business requirements.
User involvement	Refers to psychological engagement of the users with the ERP system by considering their problem and suggestions about the system.
Role of consultants	Refers to strategic relationship and the close fit between the software vendor and the user organization that could be established between the vendor and the company.
Goals and objectives	Describe the continuous fit between the ERP system(which are part of IT infrastructure) and the business goals, IT strategy and the organization structure.
Information Quality	Refers to quality of output produced by a system and the value, usefulness or relative importance attributed to it by the user.

System Quality	Refers to performance characteristics of the system under study such as easy to use and flexibility.
User satisfaction	It is a measure of the net benefits from the system perceived by the information system stakeholders.
Organizational impact	Refers to the effect of Information on Organizational Performance such as cost reduction.
Individual impact	Refers to the effect of Information on the behavior of the recipient such as productivity.

CHAPTER 4 METHODOLOGY

4.0 Introduction

The most important stage for research is to think carefully about the selection of research methodology. The choice of method depends mainly on the nature of the research problem, the variable types, whether data are quantitative or qualitative, with dependent or independent variables, and the relation between them, as well as the researcher's philosophical orientation.

4.1 Research Design

In the light of study objective, the quantitative research paradigm is considered the most suitable approach for the study. It has been successfully been adopted by other researchers in similar research.

This research was conducted using case study approach. The case study is valued as a research method for its capacity to examine a phenomenon in its real-life context (Benbasat et al, 1987, Gable, 1994). A great strength of this method is its facility for retaining and exploiting the "richness of a situation".

Because of the suitability of the case study to deal with poorly structured, lightly researched problem domains, it has been judged as well suited to the exploratory phase of an investigation.

4.2 Population

The population of interest in this study was 151 staff comprising of top, middle and lower level management as shown in the table 4.1 below.

Middle level management staff were selected because they interact with the system daily in execution of the responsibilities. Lower level management though comprising of over 95% of the total staff of G4S, were also included. This category include drivers, radio controllers, tellers, guards and data entry team. We targeted the data entry team because they interact with the system. Though top management were included, directors were excluded in order to exclude biased view.

Table 4.1 **Population**

DEPARTMENT	POPULATION
FINANCE	
CREDIT CONTROL	44
BILLING/TREASURY	31
HUMAN RESOURCES	18
OPERATION	44
IT	8
SALES & MARKETING	6
TOTAL	151

Source – G4s

4.3 Sampling

In computing the sample size, the following formulae developed by Yamane (1967) was used.

$Ns= N/1+N (e)^{2.}$

Where **Ns** is the sample size, **N** is the population size, and **e** is the level of precession. The above formulae based gives sample size of 109. Hence a sample size of 109 selected from the target population as indicated below. Stratified random sampling was adopted.

Table 4.2 Sample

DEPARTMENT	POPULATION	SAMPLES
FINANCE		
CREDIT CONTROL	44	32
BILLING/TREASURY	31	23
HUMAN RESOURCES	18	13
OPERATION	44	32
IT	8	6
SALES & MARKETING	6	4
TOTAL	151	110

4.4 Data collection

In order to understand the research area in detail, the necessary data must be collected (Yin, 2003). There are two types of data, secondary and primary data. Data that has been collected by other researchers for another purpose is called secondary data (Yin, 2003). Primary data is data the researcher collects on his/her own for a specific purpose. When collecting data, the researcher has to choose between using questions approach through questionnaires or personal interview.

Data can also be colleted through observation or from past records. Yin (2003) identified six different sources of evidence that can be sued when collecting data for case studies, namely: documentation, archival records, interviews, direct observation, participant observations and physical artifacts.

Based on the nature of our research, we choose to collect data from both primary and secondary sources; Primary data was collected through questionnaires while secondary data was collected by analyzing written reports relating to ERP.

Data was collected in three phases. First we stated by consulting the relevant literature to identify various factors posed by other researchers in this area of study. Second, interviews were held by selected head of IT and change manager in order to obtain general overview on the system.

Finally by sending out well designed questionnaire linked to the conceptual framework selected for this study. Respondents were required to indicate agreement with statement using a 7 point Likert type scale, where 1=strongly disagree and 7= strongly agree. Since the organization has well distribution network, a questionnaire and a covering letter were handed over to the mailing office for distribution. The questionnaire also had other information such as sex, department, role played in ERP implementation and number of years one had stayed in the organization. Sample of the questionnaire is attached in appendix 1.

4.5 Reliability

Reliability demonstrates the extent to which the operations of a study, such as data collection procedures can be repeated with the same results. Generally a measure is considered reliable if a person's score on the test if given twice will yield similar results (Kombo, 2006). This type of reliability is called a Test – Retest. Thus two similar tests done after a lapse of time should give the same results. However this approach is time consuming.

The other type of reliability is Half-Split. Under this approach, a test is administered once. The results are split into two halves and coefficient of correlation is computed. If the reliability of the test is good, correlation between the two should be high. Cronbach (1949) cautiously declared that the split-half method may give confusing results unless the two half-tests are equivalent. Hence the following assumptions should hold for better results:

- the halves must have almost equal standard deviation
- and they must be alike in content.

Hence the approach is not suitable for this study. It is appropriate to use Cronbach alpha coefficient (α).

Reliability analysis was performed to test whether random measurement errors varied from one question to another. Reliability was measured using Cronbach's alpha internal consistency method. The table below indicates the Cronbach alpha for each dimension.

Each dimension has an alpha above the 7.0 limit recommended by Nunnally (1978), indicating a reasonably high reliability of the research measures.

Table 4.3 Reliability Test

Management level	Measures	Cronbach Alpha
System Quality	8	0.8991
Information Quality	6	0.9654
Vendor Quality	3	0.8913
Individual Impact	5	0.9004
Workgroup Impact	5	0.9532
Organization Impact	7	0.9131
Overall Impact	3	0.8135
Dimension Ranking	7	0.8602
Ranking of CSF	9	0.8131

In order to ensure data validity and reliability an IT director and ERP project manager were given questionnaire prior to emailing it and their comments assisted in improving its quality.

A covering letter was enclosed to assure the respondent the confidentiality of the information to be provided.

4.6 Data analysis Procedures

After the questionnaires are received from the field, they were subjected to thorough process of data cleaning (editing, coding and tabulation) to ensure that the responses are up to required standards. We scrutinized the data and compiled it into relevant subject since in some conversations the topic of our respondents might jump from one subject to another and did not entirely flow forward. In editing we also tried to identify and manage incompleteness, errors, and gaps of the information. Irrelevant information is not included in the presentation of findings.

Our empirical findings are communicated in descriptive ways (Kumar, 1996) as they present perception, knowledge and experience; We tried not to change the content when editing the data. We used SPSS 13.0 analyses the data.

4.7 Factorial validity.

Factorial validity was performed using factor analysis. Factorial analysis is an analytical technique that is used to assess the number of factors and the loading of variables. It allows for the explicit constraints of certain loadings to be zero.

The process for factor analysis is as follows

- Prepare a correlation matrix for all variables. Variables that do not appear to be related to other variables can be identified from this matrix. Coefficient should be greater than 0.3. If few correlation are found above this level , then factor analysis may not be appropriate.
- The number of factors necessary to represent the data and the method for calculating them must be determined. Principal component analysis (PCA) is the most widely used method of extracting factors. In PCA, linier combination of variables is performed. The first principal component is that which accounts for the next largest amount of variance and is uncorrelated with the first and so on. In order to ascertain how well the model fists the data, coefficient called 'factor loadings' that relate variables to identified factors is calculated.
- Factor models are then often rotated to ensure that each factor has non zero loadings for some of the variables. Rotation makes the factor matrix more interpretable.
- Following rotation, scores for each factor can be computed for each case in a sample. These scores are often used in further data analysis.

This research study tested the validity of our data to factor analysis using Kaiser-Meyer-Olkin Method (KMO) of sampling adequacy. KMO indicates whether or not variables can be grouped into a smaller set of underlying factors. High values (Close to 1) generally indicate that a factor analysis may be useful with your data. If values are less than 0.5, the results of the factor analysis will not be useful.

CHAPTER 5

DATA ANALYSIS

5.1 Results

The researcher aimed at collecting a sample of 109 but only managed to get responds from 82. There were certain limitations such lack of knowledge by the respondent and differing interpretation of the questions hence limiting some from submitting the questionnaires within prescribed duration.

The table below shows respondent per category. Feed back from finance was above average. This could be attributed to high level of interaction with ERP. Overall satisfactory responds of 75% was due to constant follow up and the assurance given that the information was to be handled in confidence.

Table 5.1 Respondents

Category	No. targeted	No. responded	% responds
Finance			
Credit Control	32	26	81%
Billing/Treasury	23	17	75%
Human Resources	13	9	69%
Operation	32	24	75%
IT	6	4	73%
Sales & Marketing	4	2	50%
Total	**109**	**82**	**75%**

Source Author 2009

When our data was classified by hierarchy it comprised of 4 (5%), top management, 34 (41%), middle level management and 44 (54%) lower level management .There were 50 (61%) men and 32 (39%) women in our sample.

When classified per education level, 34 (41%) were graduate and 48 (59%) had technical and other vocational training. 41 (50%) participated in the implementation of ERP in G4S, While the other 50% did not participate.

5.2. Ranking of Critical success factors

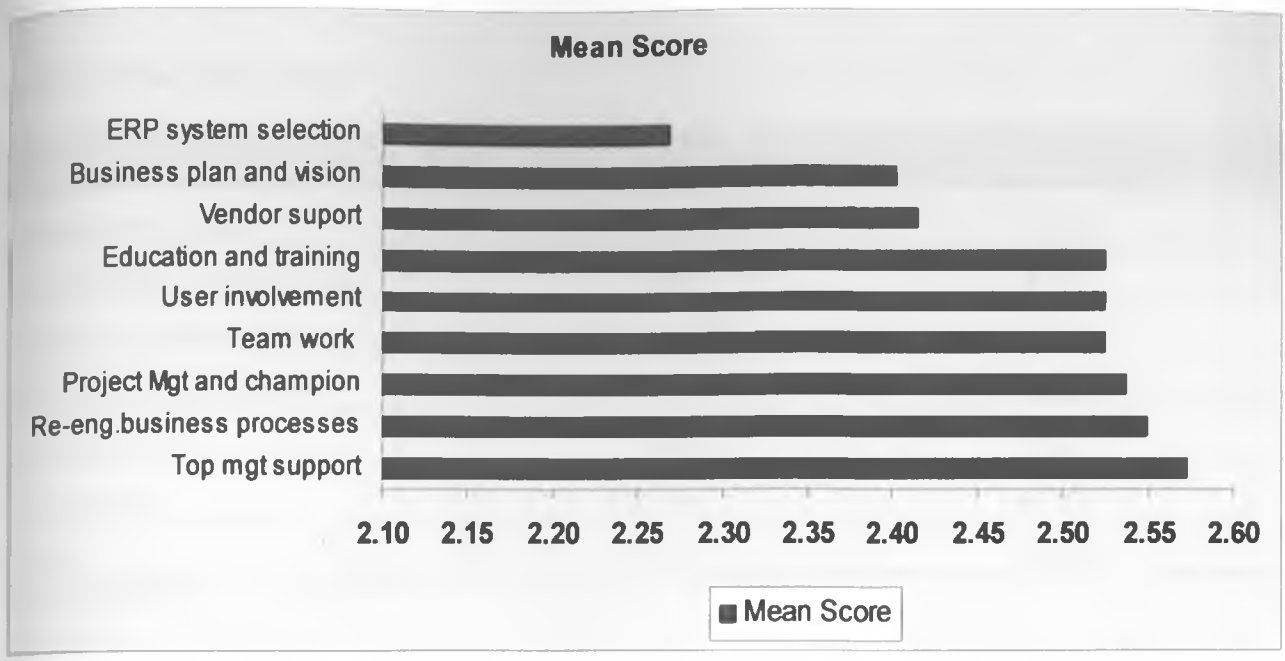
The respondents were asked to rank the critical success factors that the researcher had identified from reference books, journal and other research findings. The table below shows summarized findings.

Table 5.2 Ranking of CSF

Critical Success Factors	Min	Max	Std. Dev	Mean Score
Top management support	1	3	0.567	2.573
Re-engineering business processes	2	3	0.501	2.549
Effective project Mgt and project champion	1	3	0.632	2.537
Team work and composition	1	3	0.671	2.524
User involvement	1	3	0.671	2.524
Education and training	1	3	0.613	2.524
Vendor support	1	3	0.666	2.415
Business plan and vision	1	3	0.664	2.402
ERP system selection	1	3	0.704	2.268

Source Author 2009

Figure 5.1 Ranking of CSF



Top management support was ranked as the most critical factor during ERP implementation with a mean score of 2.573 and a standard deviation of 0.567. Re-engineering of business process was ranked the second with a mean score of 2.549 and a standard deviation of 0.501. Effective project management and project champion was ranked third with a mean score of 2.537 and standard deviation of 0.632, followed by team work and composition. ERP system selection was ranked as the least critical factor during ERP implementation with a mean score of 2.268 and a standard deviation of 0.704.

5.3 Other Factors.

The respondents were also asked to list any other factors that they deemed to be critical not included in the questionnaire. As shown in table 4.3, 67% did not comment. However 11% indicated organization culture were critical factors to considered. 9% of the respondents mentioned the Technological infrastructure as another factor to consider. 6% mentioned the financial stability of the system. This factor was dropped by the researcher because it has been covered under top management support. The need to explain the usefulness of the new system was also suggested but had

adequately been covered under user involvement. 55 respondents did not comment on the additional factors.

Table 5.3 Other critical factors.

Other Critical Success Factors	Frequency	Percent
Organization culture	9.00	10.98
Technological infrastructure	7.00	8.54
Financial stability of org	5.00	6.10
Usefulness of the system	3.00	3.66
Customization	3.00	3.66
No comment	55.00	67.07
Total	82.00	100.00

Source Author 2009

5.4 Ranking of Key dimensions to be used when evaluating post implementation success of ERP system.

The respondents were asked to rank key dimensions considered when evaluating ERP post implementation success the researcher had identified from reference books, journal and other research findings. The table below (5.4) shows summarized findings.

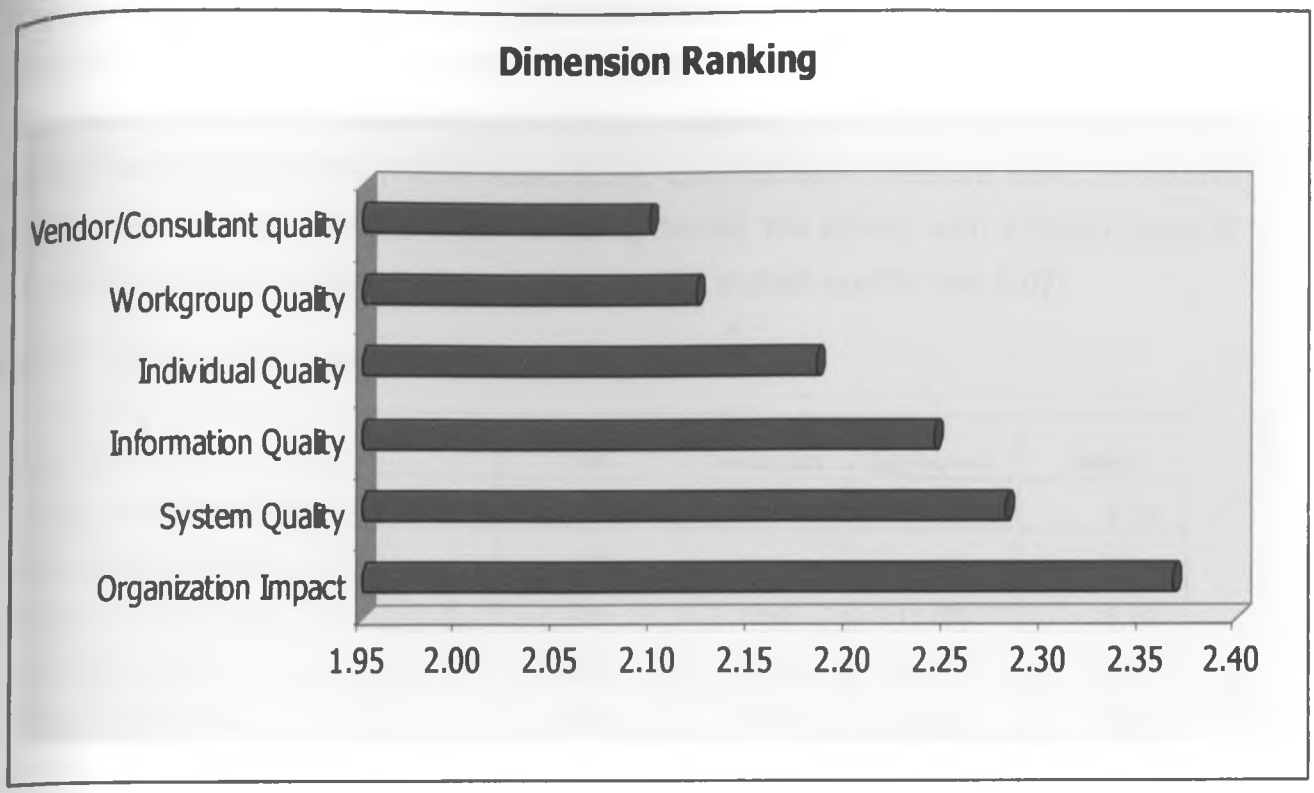
Table 5.4 Ranking of various dimensions.

DIMENSION RANKING

ITEM	Sum	Std. Deviation	Mean
Organization Impact	194	0.75	2.37
System Quality	187	0.71	2.28
Information Quality	184	0.78	2.24
Individual Impact	179	0.65	2.18
Workgroup Impact	174	0.66	2.12
Vendor/Consultant support.	172	0.68	2.10

Source Author 2009

Figure 5.2 Ranking of various dimensions



Source Author 2009

It is evident from table 5.4. System Quality (SQ) and Organizational Impact (OI) appear to predict "success" more than do any other dimensions. Organization impact was ranked as the first dimension to consider when evaluating post implementation success of ERP software with a mean of 2.27 and a standard deviation of 0.75.

It was followed closely with system quality with a mean of 2.28 and a standard deviation of 0.71. Information quality was ranked 3rd with a mean of 2.24 and standard deviation of 0.78. In the forth position was individual impact.

Workgroup impact was ranked in the 5th position. Vendor/consultant support was ranked in the last position with a mean of 2.10 and standard deviation of 0.68. Hence, these two dimensions may not be among the topmost concerns for firms when assessing the success of their software.

5.4.1 System quality measures.

Respondents were asked using a 7 point likert scale to give score for each of the 8 measures under system quality, where 1=strongly disagree and 7= strongly agree. The table below (4.5) shows summarized findings. Majority of the respondent believe that the ERP has accurate data (mean score 5.39). Easy to learn measure took the second position with a mean score of 5.24. Flexibility scored the lowest with a mean score of 4.7. Overall mean score for all the measures under system quality was 5.07.

Table 5.5 System quality measures

Measure	Sum	Std. Deviation	Skewness	Mean
Ramco has accurate data	442	1.39	(1.46)	5.39
Ramco is easy to learn	430	1.49	(1.29)	5.24
Ramco is easy to use	426	1.54	(1.08)	5.20
Ramco is reliable	424	1.55	(0.99)	5.17
Ramco is efficient	416	1.55	(1.24)	5.07
Ramco meets users' requirements	403	1.62	(0.90)	4.91
Ramco allows for customization	398	1.64	(0.88)	4.85
Ramco is flexible	385	1.75	(0.78)	4.70
AVG				**5.07**

Source Author 2009

5.4.2 Information Quality measures.

Respondents were asked using a 7 point likert scale to give score for each of the 6 measures under Information Quality, where 1=strongly disagree and 7= strongly agree. The table below (5.6) shows summarized findings. Majority of the respondent believe that information on Ramco is important (Mean score 5.11). They also believe information on Ramco is usable and relevant with a mean score of 5.09 and 4.94 respectively.

Table 5.6 Information quality measures

Measure	Sum	Std. Deviation	Mean
The information on Ramco is important	419	1.99	5.11
The information on Ramco is usable	417	1.96	5.09
The information on Relevant is relevant	405	1.88	4.94
The information on our Ramco is available	392	1.98	4.78
Ramco has timely information	388	1.89	4.73
The information on Ramco is accurate	370	1.98	4.51
Avg			**4.86**

Source Author 2009l

5.4.3 Workgroup impact Measures.

Table 5.7 Workgroup impact measures

Measure	Sum	Std. Deviation	Mean
Ramco helps to improve workers' participation in the org.	370	1.79	4.51
Ramco improves organizational-wide communication	386	1.90	4.71
Ramco improves inter-departmental coordination	390	1.85	4.76
Ramco create a sense of responsibility	391	1.72	4.77
Ramco improves the efficiency of sub-units in org	384	1.86	4.68
AVG			**4.69**

Source Author 2009

The table below (4.7) shows summarized findings. Majority of the respondent believe that Ramco has enhanced sense of responsibility in the organization (Mean score 4.77).They also believe the ERP has enhanced inter-departmental coordination and organization wide communication with a mean score of 4.76 and 4.71 respectively. Overall mean score for all the measures was 4.69

5.4.4 Organization impact Measures

Table 5.8 Organization impact

Measure	Sum	Std. Deviation	Mean
Ramco supports decision making in the org.	441	1.44	5.38
Ramco improves overall productivity	436	1.39	5.32
Ramco facilitates business process change	427	1.37	5.21
Ramco improves work-groups productivity	424	1.51	5.17
Ramco provides us with competitive advantage	415	1.54	5.06
Ramco increases customer service / satisfaction	396	1.67	4.83
Ramco reduces organizational costs	391	1.81	4.77
AVG			5.10

Source Author 2009

The table above (4.8) shows summarized findings. Majority of the respondent believe that ERP has enhanced decision making in the organization (Mean score 5.38). They also perceive that it improved overall productivity and facilitate business process change with a mean score of 5.32 and 5.21 respectively. Overall mean score for all the measures was 5.10

5.4.5 Individual impact Measures

The table below (4.9) indicates summarized findings. Majority of the respondent believe that ERP has enhanced higher decision making at an individual level (Mean score 5.09). They also perceive that it saves time in executing individual tasks and improving also individual productivity with a mean score of 4.95 and 4.96 respectively. Overall mean score for all the measures was 4.8.

Table 5.9 Individual impact

Measure	Sum	Std. Deviation	Mean
Ramco enhances individual creativity	337	1.68	4.11
Ramco improves individual productivity	407	1.68	4.96
Ramco is beneficial for individual's tasks	402	1.67	4.90
Ramco enhances higher-quality of decision making	417	1.60	5.09
Ramco saves time for individual tasks/duties	406	1.67	4.95
AVG			**4.80**

Source Author 2009

5.4.6 Measures under Vendor Quality

The table below (5.10) indicates summarized findings. Majority of the respondent believe the ERP vendor is credible and trustworthy (Mean score 4.79). They also perceive the vendor provides adequate technical support and quality training with a mean score of 4.66 and 4.57 respectively.

Overall mean score for all the measures was 4.67. Engagement of poor quality ERP systems providers "can become a negative influence or even a curse which [drags] the entire company into a spiral of ineffectiveness" (Yu, 2005, p.117). Markus and Tanis (2000) note that when the quality of the providers (vendors and consultants) have not been perceived to be high for the adopting organization, dire consequences have resulted (in severe cases, the firm may have suffered serious operational performance leading to loss of business and bankruptcy.

Table 5.10 Vendor quality

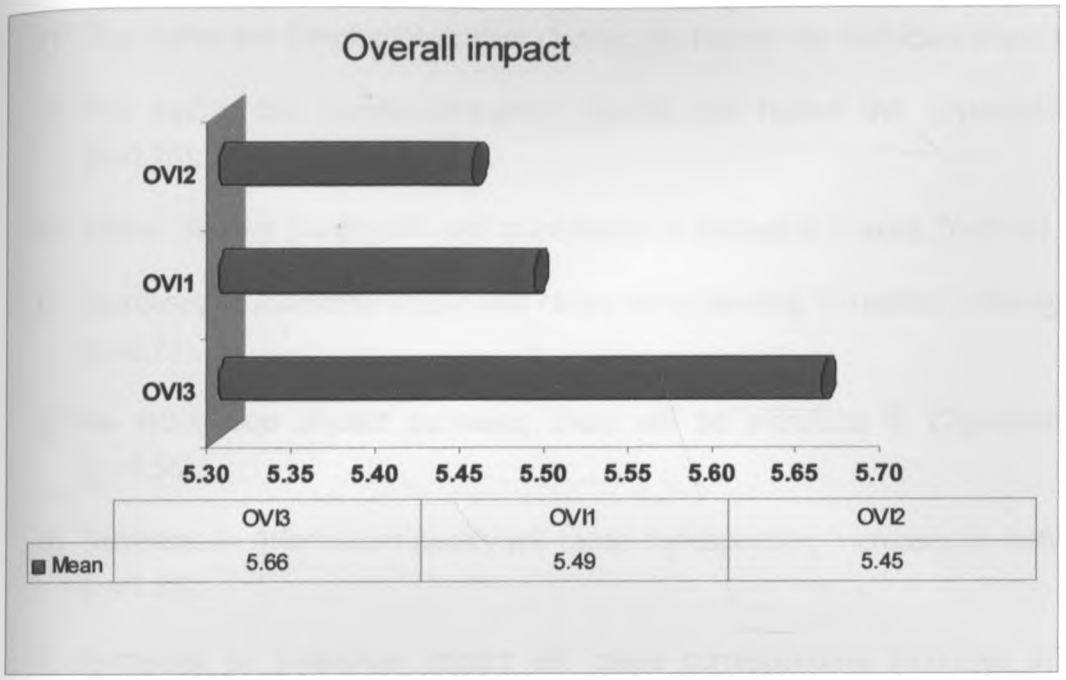
Measure	Sum	Std. Deviation	Mean
Ramco vendor is credible and trustworthy	393	1.40	4.79
Ramco vendor provides adequate technical support	382	1.32	4.66
Ramco vendor is experienced and provides quality training.	375	1.47	4.57
Avg			**4.67**

Source Author 2009

5.5 Overall Impact

The figure below (5.3) indicates summarized findings. Majority of the respondent believe that ERP impact on the organization has been positive vendor (Mean score 5.66). They also perceive ERP impact on the department/workgroup and on the individual has been positive with a mean score of 5.49 and 5.45 respectively.

Figure 5.3 Overall impact



VI- Overall, the impact of our ERP on **me** has been positive
V2- Overall, the impact of our ERP on **my workgroup (Department)** has been positive
V3-Overall, the impact of our ERP on **my org** has been positive

5.6 Interrelationships between the dimensions of ERP success

The researcher computed the correlation between the ERP dimensions as per the framework. The objective was to confirm if the relationship exists and the nature of relationship.

The table below (5.11) summarizes the results. All the relationship between the variables under considerations was positive .The result confirms the following hypothesis.

a) Increased *Vendor/Consultant Quality* will lead to higher perception of *System Quality* (r=0.30).

b) The higher the *Vendor/Consultant Quality*, the higher the *Information Quality* of the acquired system. (r=0.49).

c) The higher the *Vendor/Consultant Quality*, the higher the *individual Impact*. (r=0.38).

d) The higher the *Vendor/Consultant Quality*, the higher the *Organizational Impact*. (r=0.76).

e) Higher *System Quality* will lead to increases in *Individual Impact*. (r=0.48).

f) Increases in *Individual Impact* will cause corresponding increases in *Workgroup Impact*. (r=0.73).

g) As *Workgroup Impact increases*, there will be increases in *Organizational Impact*. (r=0.56).

h) Increases in *information quality* will cause corresponding increases in *individual Impact*. (r=0.54).

i) Increases in *Individual Impact* will cause corresponding increases in *organization Impact*. (r=0.56).

Table 5.11 Correlation between dimensions

Pearson Correlation coefficient						
	SQ	IQ	VQ	II	WI	OI
SQ		0.64	0.30	0.48	0.43	0.55
IQ	0.64		0.49	0.54	0.50	0.76
VQ	0.30	0.49		0.38	0.25	0.44
II	0.48	0.54	0.38		0.73	0.50
WI	0.43	0.50	0.25	0.73		0.56
OI	0.55	0.76	0.44	0.50	0.56	

Source Author 2009

Q _System Quality **VQ** _Vendor Quality **IQ** _Information Quality
II _Individual Impact **WI** _Workgroup Impact **OI** _Organization Impact

Our data did not support the hypothesized paths between *Vendor/Consultant Quality* and *Workgroup Impact* (H4). All the relationships were positive. Increase in one dimension has an impact on the other dimension. The researcher noted a very strong relation between *workgroup impact* and *individual impact* (0.73). If implemented ERP system has an impact on each member of the organization, it is imperative the whole organization will be impacted.

The researcher also noted a strong relationship between information quality and the organization impact (0.76). In fact this relationship was the strongest among all variables under research.

5.7 Organization stakeholder groups views on ERP success.

In finding answers to the final research question, the table below represents the results different key organizational stakeholder groups in G4S when classified by occupation types. The groups included Finance, Human resource (HR), operation and ICT. As indicated below Finance, HR, Operation ranked highly the organization impact as a key dimension with a mean score of 2.42, 2.11, and 2.33. ICT Ranked System quality as a key dimension with a mean score of 3.00 with no deviation in views. It is worthy noting

that Finance, operation ranked systems quality as the second dimension with a mean score of 2.35, 2.11 and 2.17 respectively. ICT ranked organization impact as the second dimension in ranking.

Table 5.12 Organisation stakeholders ranking

DEPT		DR1	DR2	DR3	DR4	DR5	DR6
Finance	Mean	2.35	2.28	2.12	2.30	2.26	2.42
	Std. Deviation	0.69	0.77	0.63	0.64	0.62	0.73
HR	Mean	2.11	1.89	1.89	1.78	1.89	2.11
	Std. Deviation	0.60	0.93	0.93	0.67	0.60	0.78
Operation	Mean	2.17	2.17	2.04	2.13	2.04	2.33
	Std. Deviation	0.76	0.76	0.69	0.68	0.69	0.82
ICT	Mean	3.00	2.50	2.75	2.25	1.75	2.75
	Std. Deviation	-	1.00	0.50	0.50	0.96	0.50

DR1 _System Quality **DR3** _Vendor Quality **DR2** _Information Quality
DR4 _Individual Impact **DR5** _Workgroup Impact **DR6** _Organization Impact

5.8 Do different levels of management view ERP system success measures differently?

The table below summarizes our findings relating to above question. Top management rated information quality highly with a mean of 2.75 followed closely by organization impact with a mean score of 2.60. Middle level and lower level management placed emphasis on organization impact with a mean score of 2.21 and 2.48 respectively. The second dimension in raking was system quality. Middle level management ranked it second with a mean score of 2.21 while lower level ranked the same dimension with a mean score of 2.32.

Table 5.12 Views from different levels of management

LEVEL		DR1	DR2	DR3	DR4	DR5	DR6
Top Mgnt	Mean	2.50	2.75	2.40	2.25	2.00	2.60
	Std. Dev	0.58	0.50	0.58	0.96	0.82	1.00
Middle level mgnt	Mean	2.21	2.18	2.12	2.15	2.06	2.21
	Std. Dev	0.73	0.76	0.64	0.66	0.65	0.73
Lower level mgnt	Mean	2.32	2.25	2.05	2.20	2.18	2.48
	Std. Dev	0.71	0.81	0.71	0.63	0.66	0.73
Total	Mean	2.28	2.24	2.10	2.18	2.12	2.37
	Std. Dev	0.71	0.78	0.68	0.65	0.66	0.75

DR1 _System Quality **DR3** _Vendor Quality **DR2** _Information Quality
DR4 _Individual Impact **DR5** _Workgroup Impact **DR6** _Organization Impact

5.9. Factor analysis

The main objective of carrying out this analysis was to confirm if measures identified in our literature review properly classified in their respective dimensions. 34 measures were subjected to principal components analysis (PCA) using SPSS. Prior to performing PCA, the suitability of data for factor analysis was assessed.

Inspection of the correlation matrix revealed the presence of many coefficients of 0.3 and above. Kaiser-Meyer Oklin was 0.78, exceeding the recommended value of 0.6 (Kaiser, 1974) and Barletts Test of Sphericity (Bartlett, 1954) reached statistical significance, supporting the factorability of the correlation matrix.

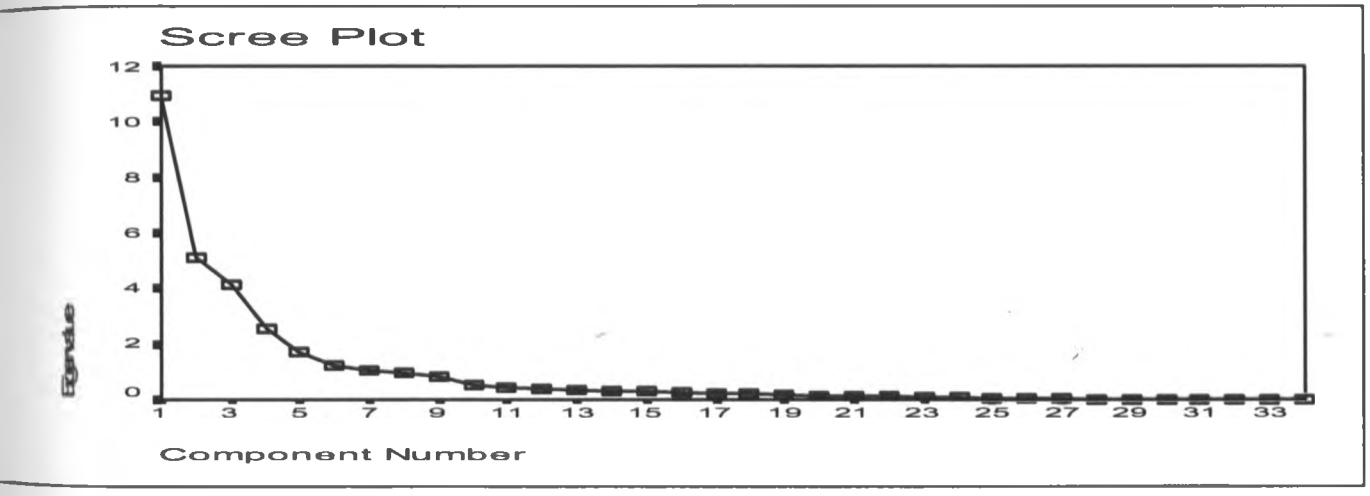
Table 5.13 KMO Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**0.787**
Bartlett's Test of Sphericity	Approx. Chi-Square	**2913**
	df	**561**
	Sig.	**0.000**

PCA analysis revealed the presence of 7 components with eigenvalues exceeding 1, explaining 79.6% of the total variance as indicated in appendix 5. An inspection of the screen plot revealed a clear break after the 6th component as indicated in figure 5.4. At this point the curve changes direction and becomes horizontal. Catell's (1996) recommends that all factors above the elbow or before break in the plot as the factors contribute to the explanation of variance in the data set. He the researcher decided to retain 6 components for further investigation.

To aid in the interpretation of these six components, Varimaz rotation was performed using SPSS. The output is shown in *appendix 6*. Save learning (SQ 2) that is located in component 1 and 6, all other measures are aligned appropriately in all the six components. This confirms that our categorization of 34 measures was valid.

Figure 5.4 Screen plot



5.9.1 Factor analysis on Critical Success Factors.

Exploratory factor analysis (EFA) was performed to empirically test the nine Critical Success Factors included in this study using the principle component method. As indicated below, Kaiser-Meyer Oklin was 0.8, exceeding the recommended value of 0.6 (Kaiser, 1974) and Barletts Test of Sphericity (Bartlett, 1954) reached statistical

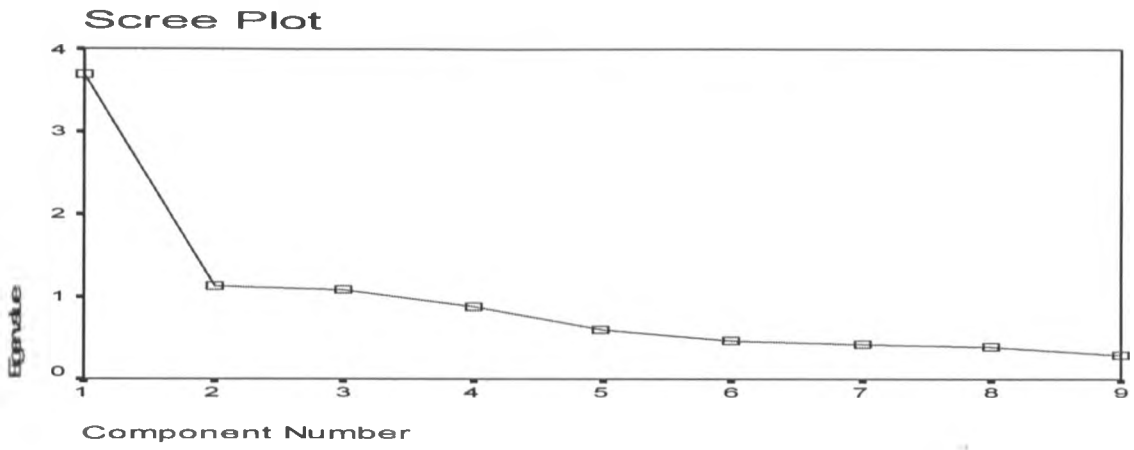
significance, supporting the factorability of the correlation matrix. Hence all constructs were retained for further analysis.

Table 5.15

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.80
Bartlett's Test of Sphericity	Approx. Chi-Square	219.67
	df	36.00
	Sig.	0.00

An inspection of the screen plot revealed a clear break after the first component as indicated in figure 5.4. Hence no further tests were done to categorize the factors. All factors were retained in the study.



CHAPTER 6 DISCUSSION AND CONCLUSION

6.1 Discussion of main Findings

This chapter present a discussion on empirical evidence gathered from data analysis in chapter 5.

6.2. Ranking of Critical success factors

Top management support (score 2.573)

Most of all respondents agree that top management support is very important. This finding is in tandem with other research in this area such as Li Fang and Sylvia Patricia (2005), Davenport (1998), and Sumner (1999). In their research, top management was ranked as the most important factor to consider. In any ERP implementation, repositioning the company and transforming the business practices must receive approval from top management (Bingi et al., 1999). And a good commitment from top management is essential to support the implementation progress.

The implementation plan also must be communicated from top to down to show the attention from the top management. Management must be involved in every step of the ERP implementation and committed with its own involvement & willingness to allocate valuable resources to the implementation effort (Gibson, Holland & Light, 1999). In this way, the progress of the project can be monitored and directed. Top management needs to identify the project as a top priority publicly and explicitly, to set up the suitable and competent project team, to share the role of new systems and structures through the whole organization. One of the issues in top management support (Razi & Tarn, 2003) is strongly emphasized by Per Hansson, consultant of Sogeti. He acknowledges that budget is very important as the support of the activities and in choosing the software. Top management must act as a coach, keeping his staff motivated and in harmony

Re-engineering business processes (score 2.549)

This factor was ranked as the second important factor in ERP Implementation. It had the lowest standard deviation as indicated in 4.2 (0.501), implying that there is a general consensus that the factor is critical. Companies need to identify their current business structure and business processes associated with their existing IT systems in the beginning of ERP project and relate this to the business processes contained within ERP system.

To gain full benefit of ERP systems, it is imperative that business processes are aligned with the ERP systems, since both reengineering literature and the ERP implementing literature have proven that the ERP itself can not improve the firm's performance unless the firm reengineers the business process per ERP systems.

Researchers have found a strong correlation between the attention paid to business process improvement and the likelihood of ERP success (Muscatello et al., 2003; Millman, 2004).

Effective project Mgt and project champion (score 2.537)

Effective project management & champion is another factor that being approved as the top priority in ERP implementation by most of the respondents. Project team supplies the ERP project with good team composition and sufficient team skills. And change management creates new working relationships and information sharing among departments, assumes additional responsibilities, and increases the user involvement based on the requirements of ERP implementation.

ERP applications lock the operating principles and processes of the adopting organization into software systems. It is paramount for the project team to nail down the project requirements and have them documented and signed by the senior management and users. Olsen et al. (2005) found that it is necessary for the team to inform organizational employees of how the system can help them do their jobs better. They also found that all retained employees are going to find their jobs changed. People are naturally resistant to change and it is very difficult to implement a system within an organization without some cooperation

Remus (2006) noted that project champion is one of the most important factors in the ERP implementation.

Team work and composition, user involvement and training (Score 2.524).

All the three factors were rated equally though with slightly different standard deviation. User trainings and involvement creates confidence among the staff hence preventing resistance to change. ERP skills have been in acute shortage because of the high demand for people with good understanding of and the radical process changes brought about by ERP implementation have made providing sufficient and timely training to project persons and users a critical requirement in ERP implementation (Davenport, 2000).

Rectification of training deficiencies can be accomplished in three ways: reassignment, outsourcing or replacement of staff, hiring of new personnel with substantial knowledge in ERP systems, or training of managers and key employees.

Two key areas of user involvement include definition of the company ERP system needs and participation in the actual implementation. Incase of G4S, the project committee was not headed by IT manager but by management accountant. Thus implementation was user driven.

ERP system selection (Score 2.268).

Was ranked as the least important factor in ERP implementation. Irrespective of ERP selected, if other factors are not put into perspective, success is not assured. The selection of a suitable ERP system is a challenging and time consuming process. Wei and Wang (2004) stated that there is no one single ERP package that could provide all the functionalities required for the business. For G4S selection of ERP was a challenging task. No ERP was available to meet user requirement from the three divisions. They had to rely on G4S IT Company based in India to source for the software. Even after

sourcing major customizations were done to ensure the software fit the initial requirements.

6.3. Discussion on other factors suggested by respondents

Organization culture.

As indicated in table 5.3, 9 respondent mention organization culture as a critical factor. Organizational culture is the common set of assumptions, beliefs, and values that has developed within the organization to cope with the external and internal environment and which is passed on to new members to guide their actions within these environments. The underlying organizational values which are the core of a firm's culture include:

- Trust & respect individuals
- Focus on a high level of achievement and contribution
- Conduct business with integrity.
- Achieve common objectives through team work
- Encourage flexibility and innovation.

Other researchers such as Li Fang and Sylvia Patricia (2005) listed organization culture as a critical factor. Being a strategic solution, ERP systems will change the way people used to work, rather than operational levels, such as using a new computer program. The innovative open organizational culture will facilitate the user participation throughout the whole implementation process.

Technological infrastructure.

As indicated in table 4.3, 7 respondents mentioned technological infrastructure as factor to consider. Researchers such as Al-Mashari (2002) argued that adequate IT infrastructure, hardware and networking are crucial for an ERP system's success. It is clear that ERP implementation involves a complex transition from legacy information systems and business processes to an integrated IT infra-structure and common business process throughout the organization. Hardware selection is driven by the firm's choice of an ERP software package.

Customization.

The above factor was also mentioned as indicated in table 4.3. Customizing is an integral part of ERP solutions. The rate of customization is directly proportional to ERP success. Customization tends to pose a challenge due to time and the funds allocated. The challenge of a successful management lies in balancing them and making both ends meet. Customization affects the organization in an on-going fashion through increased maintenance costs, increased complexity, and less flexibility of the system.

Numerous studies of the critical success factors for ERP implementation success conclude that the preferable way to implement ERP software is sans software modification (Nah & Zuckweiler, 2003). However, for reasons of misalignment and strategic alignment, customizations of enterprise systems are necessary. One estimate is that 20% of the processes in an organization cannot be modeled in an ERP system without customization (Scott and Kaindl,2002).

6.4 Ranking of Key dimensions to be used when evaluating post implementation success of ERP system.

In reference to table 5.4, Organization impact was ranked as the first dimension to consider when evaluating post implementation success of ERP software. Other researchers such as Princely Ifinedo (2006) argue that the relatively high mean score on the Organizational Impact dimension is perhaps a reflection of the capability of ERP to provide tangible benefits for adopting organizations. Thus, it may be safe to say that this dimension could serve as the best indicator of ERP success for firms adopting such software.

It was followed closely with system quality with a mean of 2.28. This could be interpreted as indicating that firms adopting such software would more readily evaluate the quality and features of their software vis-à-vis its success than they do for the other remaining four dimensions of success

Information quality was ranked 3rd. A plausible explanation might be that users are not satisfied with the quality of information in ERP systems. In fact, Sammon et al. (2003)

have raised concerns regarding the informational quality of ERP systems in general and the misleading roles that the vendors of such systems play when promoting the capabilities of their software.

In the forth position was individual impact. Princely Ifinedo (2006) argues that ERP adoptions tend to be focused more on achieving effectiveness for the organization than for improving individual impacts.

By ranking Workgroup impact 5th position and Vendor/consultant support in the last position, it imply that these two dimensions may not be among the topmost concerns for firms when assessing the success of their software.

6.4.1 System quality

System quality as indicated in our review refers to performance characteristics of the system. From our literature review (Myers et al. 1997, Gable et al 2003 and Ifinedo 2006), we identified 8 measures that can be adopted in evaluating system quality dimension and include the following:

a) *Data accuracy*
b) *Easy of learning*
c) *Easy of use.*
d) *Reliability*
e) *Efficiency*
f) *Users' requirements*
g) *Customization/Integration*
h) *Flexibility.*

Empirical evidence obtained from G4S (Table 5.5) indicates that data accuracy and the extent to which it is easy to learn the new system are regarded highly by users. Hence if the data in the system is accurate and it is easy for the users to learn the system, the dimension of system quality will be rated highly.

6.4.2 Information quality

Information quality refers to quality of output produced by a system and the value, usefulness or relative importance attributed to it by the user. From our literature review (Myers et al. 1997 Gable et al 2003 and Ifinedo 2006), we identified 6 measures that can be adopted in evaluating information quality dimension of an ERP and include the following:

a) *Importance*
b) *Usability*
c) *Relevance*
d) *Availability*
e) *Timeliness*
f) *Content accuracy*

Empirical evidence obtained from G4S (Table 5.6) indicates that the importance and usability are among the key measures to consider. Hence if the information from the ERP is important, it can be used accurately and relevant for decision making, dimension of information quality will be rated highly.

6.4.3 Workgroup impact.

From our literature review (Myers et al. 1997), we identified different measures that can be adopted in evaluating workgroup impact dimension of an ERP and include the following:

a) *Improvement in workers' participation in the org.*
b) *Improvement in organizational-wide communication*
c) *Improves inter-departmental coordination*
d) *Enhancement and creation of sense of responsibility*
e) *Improvement in the efficiency of sub-units in org*

Empirical evidence obtained from G4S (Table 5.7) indicates that the extend to which ERP improves workers participation in the organization and improvement in organization-wide communication are among the key measures to include in the above dimension.

6.4.4 Organization impact

Refers to the effect of Information on Organizational Performance such as cost reduction. From our literature review (Myers et al. 1997, Gable et al 2003 and Ifinedo 2006)) we identified 8 measures that can be adopted in evaluating system quality dimension and include the following:

a) *Supports decision making.*
b) *Overall productivity*
c) *Facilitation of business process change*
d) *Improvement work-groups productivity*
e) *Competitive advantage*
f) *Improvement in customer service / satisfaction*
g) *Organizational costs*

Empirical evidence obtained from G4S (Table 5.7) indicates that, the extend to which information from ERP support decision making and improvement in overall productivity in an organization are among the key measures to consider.

6.4.5 Individual impact

Individual impact as indicated in our framework refers to the effect of Information on the Behavior of the Recipient such as productivity. From our literature review we identified 4 measures that can be adopted in evaluating system quality dimension and include the following:

a) *Individual creativity*
b) *Individual productivity*
c) *Beneficial for individual's tasks*
d) *Higher-quality of decision making*

Empirical evidence obtained form G4S (Table 5.9) indicates the extend to which ERP enhances higher-quality of decision making, the benefit in execution of individual tasks and overall individual productive as among the key measures to consider under the above dimension.

6.4.6 Vendor quality

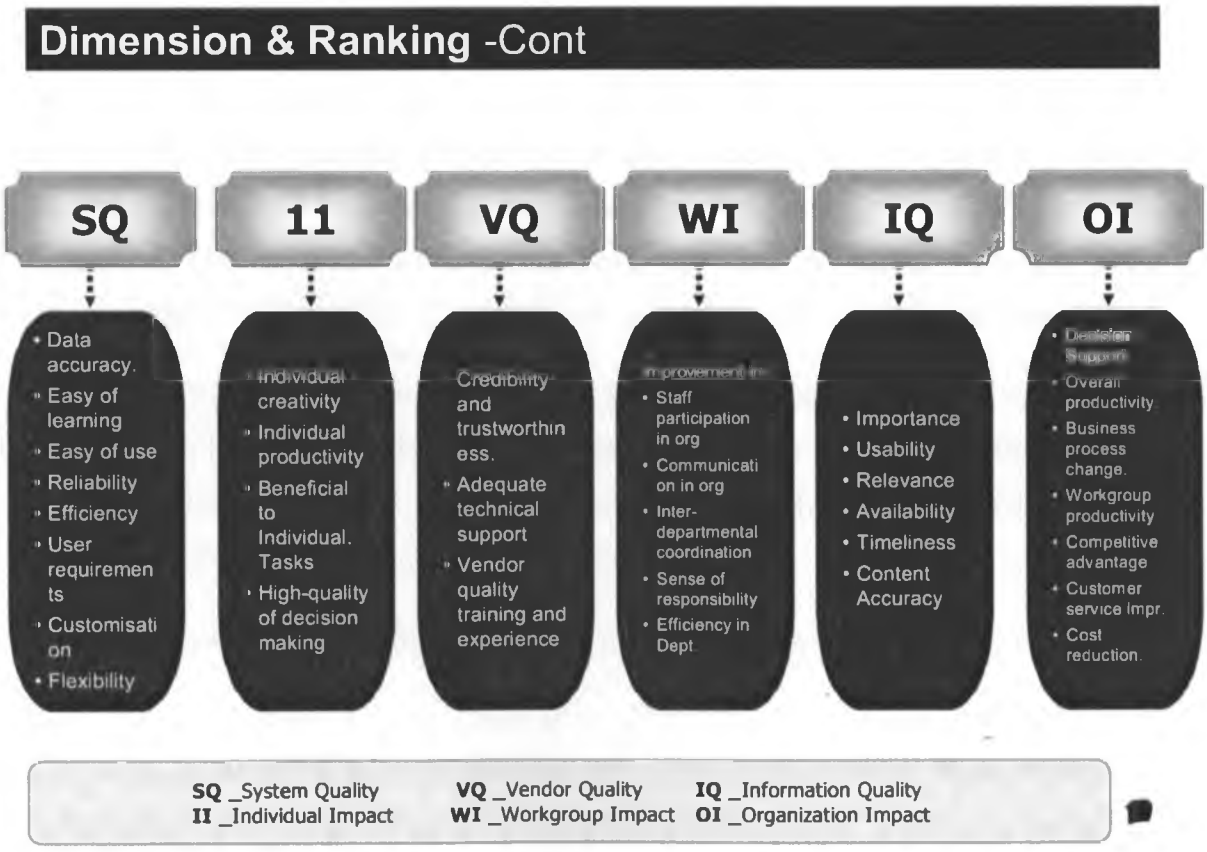
Under this dimension we identified 3 measures after reviewing contribution from ifinedo (2006) as indicted below.

a) Credibility and trustworthiness
b) Adequate technical support
c) Vendor is experience and quality training.

Empirical evidence obtained from G4S (Table 5.10) demonstrates credibility and trustworthiness of the vendor is a major measure to include under vendor quality dimension.

The figure below summarizes the dimensions and the measures discussed above

Figure 6.1 Dimensions



6.5.1 Assessment ERP systems success by different stakeholders groups in the organization

In reference to paragraph 5.7.0, our findings were that ICT views on ERP measurement success dimension are different from other stakeholders. While other department views organization impact as a key dimension, for ICT, it is the system quality. This finding is at variance with viewpoints by Ifinedo (2006c) who indicated business managers and their IT professionals hold comparable views (with respect to the prioritization and evaluation of measures) of ERP success. However the result was in agreement with what appears in literature.

The results from Sedera et al. (2002; 2004) showed that IT staff evaluated and prioritized *System Quality* more than Users (Strategic and Management) did and the latter evaluated and prioritized measures and the dimensions of *Organizational Impact* more than the IT staff did. Both share similar views regarding the informational quality of ERP systems.

The divergence in views is attributed to cultural differences. A study by Schein (1992) found that top management (business managers) and the IT community belong to two Separate subcultures. According to Van der Heijden (2000) in his research, he noted that this gap [differences between IT and business professionals] is often fostered by "hard" elements (power and control structures), but also by rituals, routines, stories, myths, and symbols that set the IT department apart from the other departments.'

Differing viewpoints between the two organizational stakeholder groups could also be attributable to the presence of differing agendas or goals for the organization regarding IT issues (e.g. Schein 1992), organizational politicking (and Myers 2004) and to different perceptions of value (Saunders and Jones 1992).

6.5.2 Do different levels of management view ERP system success measures differently?

In reference to paragraph 5.8.0, our findings were that views on ERP measurement success dimension differ depending on the level of management. Top management regard highly information quality perhaps because they rely heavily on information in

strategic management. Hence the information must be readily available, accurate, usable and reliable. Lower level and middle management placed emphasis on origination impact followed by system quality.

These finding are in tandem with other research in literature suggesting that organizational members occupying different organizational positions may hold differing views on organizational issues. Wilkes and Dickson (1987) studied the perceptions of three organization stakeholders (top-level management, IS managers, and internal auditors) regarding the assessment of an IS organization. They found the perceptions of the three groups differed markedly. With regard to ERP success evaluations, Sedera et al.(2004) found that top-level managers (Strategic level) placed greater emphasis on *Organizational Impact* than mid-level management cohorts did.

However the above findings are at variance with research conducted by Ifinedo (2006b). Their result showed that no significant statistical differences exist between the two groups on how they prioritize and evaluate the measures and dimensions of ERP success.

For top management information is a paramount ingredient in all three phases of strategic management that is diagnosis, formulation and implementation. Managers are look for information that enables them to make effective and efficient decisions. The value of information is the difference between project value with the information and project value without information minus the cost of obtaining that information

6.6 Relationships between Dimension

The figure below summarizes the findings in paragraph 5.6. The findings were in tandem with research finding by Ifinedo (2006C). Specifically, the finding contributes to knowledge by showing that when the quality of the providers (i.e., vendors and consultants) is high, it is likely that the users of the systems will appreciate and rate highly the system and its output. The findings of this study establishing a positive relationship between the quality of the vendor/consultant and the effect of ERP on the individual is consistent with other studies (Ifinedo 2006c, Gefen, 2004; Sedera et al., 2003b). The positive relationship between *System Quality* and Individual *Impact* from

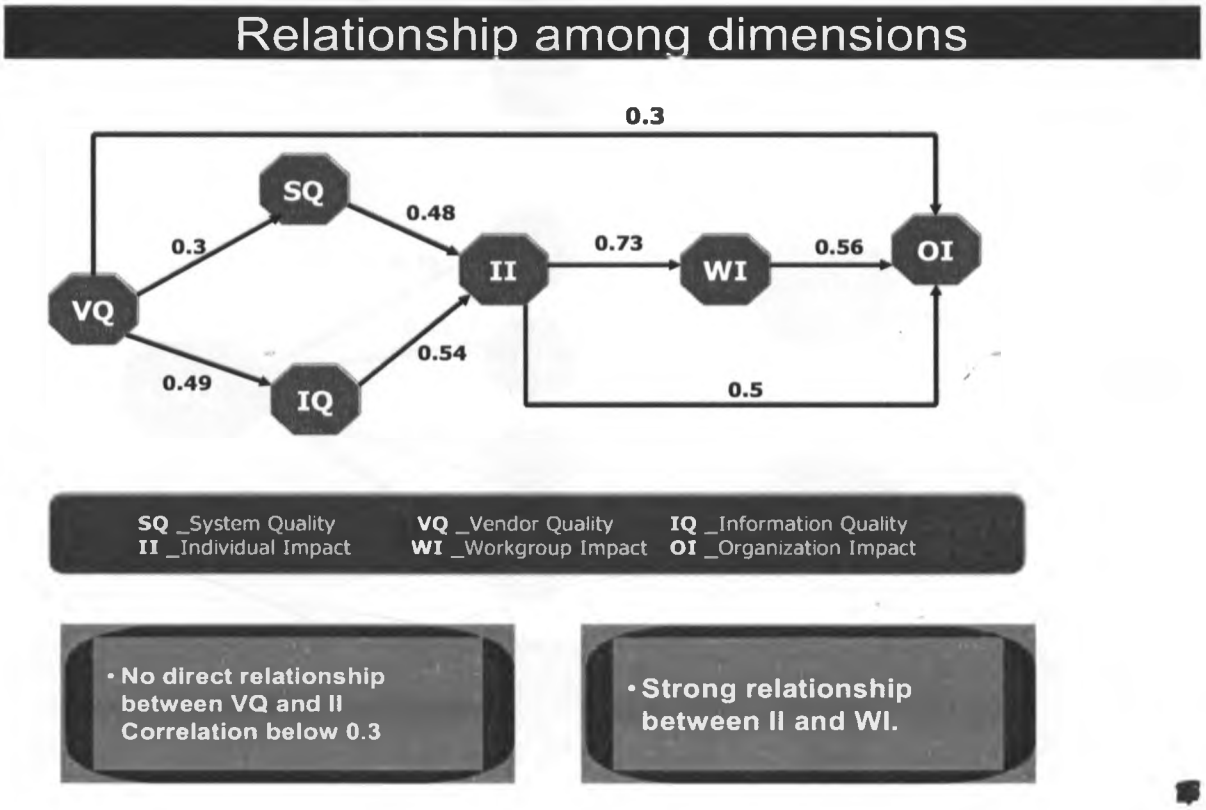
our findings is consistent with other studies (Ifinedo 2006c Seddon & Kiew, 1994, Rai et al., 2002).This might be suggesting that such a relationship holds for a wide range of IS. As we had indicated data did not support the hypothesized direct paths between *Vendor/Consultant Quality* and *Workgroup Impact* (H4). However vendor quality has an impact on individuals and since they belong to a department/group, workgroups are

indirectly impact

ed. It is imperative for the management encourage worthwhile interactions between the systems providers and organizational members (i.e., individuals) using the software.

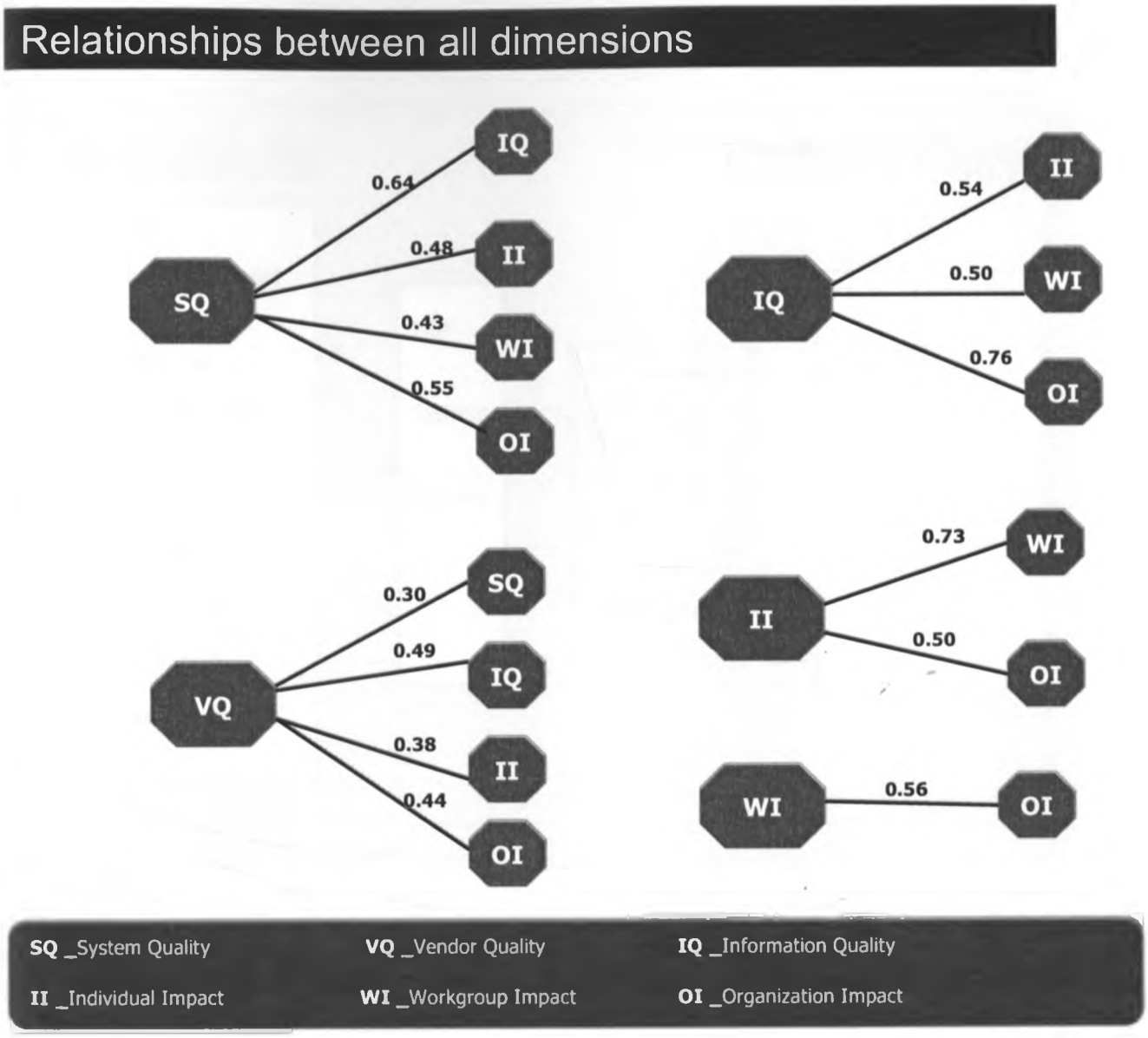
The figure below (6.2) summarizes the relationships as per our initial hypothesis.

Figure 6.2 Relationship between dimensions



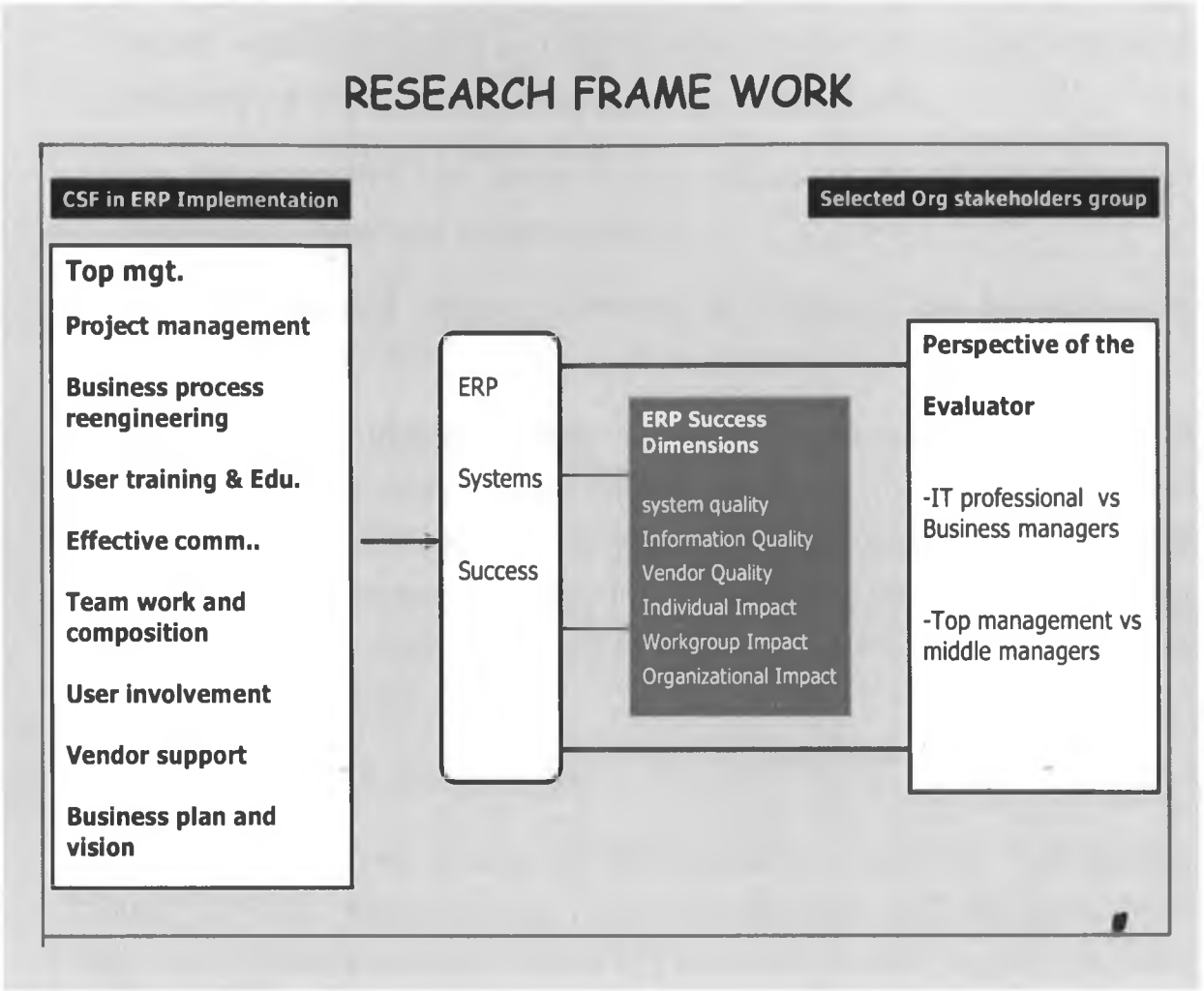
Our data also confirmed positive relations exist between other dimensions not included in our hypothesis. The Figure below (6.3) summarizes the degree of relationship between all dimensions under our study.

Figure 6.3 Relationship between all dimensions



The figure below (6.3) summarizes the research framework used in this study. The researcher added three more critical factors suggested by the respondents namely organization culture, customization and technological infrastructure.

Figure 6.4 Research Framework



6.7. Conclusion

Our research confirmed the following:

6.7.1 Success measurement

- Where practitioners lack knowledge about what issues to watch out for when evaluating the success of their ERP software management can use the dimensions of *System Quality, information quality, vendor quality ,individual impact, workgroup impact and Organizational Impact* of acquired systems in assessing the effectiveness or success of such technologies
- The dimension that can server as the best surrogate of ERP success is *organization impact* and *system quality*.
- Based on empirical evidence gathered 24, measures can be adopted in evaluating ERP success.
- As observed by ifidedo (2006a), another practical way to use our ERP systems success measurement model would be to use the "Quality" constructs and their measures to assess situations with the ERP software during the early periods preceding acquisition and to use the "Impact" items for latter periods when the impact of ERP to the workgroups and the entire organization are to be assessed.

6.7.2 Critical Factors in ERP implementation

- Key factors to consider in order of their criticality include Top management support, business re-engineering, project management and champion,, team work, user involvement, user training and education, vendor support, business plan and vision and ERP selection.
- Other critical factors take into consideration include organization culture, technological infrastructure and customization.
- ERP implementation is a strategic step of repositioning the organization and transforming business processes. Hence top management support is critical in

enhancing the overall success of the software. Therefore, to increase the prospects of having a successful ERP acquisition in which the expectations of individuals, workgroups or departments, and the entire organization are adequately met, top managers must show commitment and support for their ERP projects both at the implementation and post-implementation phases.

6.7.3 Assessment by stakeholders

- Organizational members occupying different organizational positions may hold differing views on organizational issues. While top management regards highly information quality, lower level and middle management placed emphasis on organization impact followed by system quality.
- ICT member's views on ERP measurement success dimension are at variance with other stakeholders. While other department views organization impact as a key dimension, for ICT, it is the system quality.

6.7.4 Relationship between Dimensions

- Save for the workgroup, relationship exist between vendor quality and other dimension. Hence for management of firms wishing to adopt ERP systems must ensure that highly rated providers are engaged. When the services of such external entities are engaged, it is likely that the benefits of the software in the adopting firm will be higher.
- It imperative for management to encourage worthwhile interactions between the systems providers and organizational members (i.e., individuals) using the software, because the findings of this study suggest that such contacts might augur well for individuals using the systems.
- Management should also ensure that organizational members using the software have access to relevant training in the adopted system. When this is made

possible, the effects of the ERP software on the performance and productivity of the individual using it will increase.

6.8. Limitation

"Every research is flawed." Ifinedo (2006) accordingly, we admit that this study has its limitations; we highlight the major ones as follows:

- We used subjective and perceptual measures in this study. It is likely that objective measures of ERP success like profit and productivity measures might yield a result different from ours.
- It is also possible completing the questionnaire in English was a challenge to some of the respondent depending on the level of education. In addition some of the terms used in Information technology can be a challenge to those who have specialized in other areas such as human resources.
- For the respondents who were in branches, it is difficult to ascertain whether the person to whom we addressed the questionnaire is the one that actually filled out the questionnaire. Sometimes questionnaires may actually be filled by different person. (Saunders et al., 2000). For example, senior management may ask their subordinates to fill out such questionnaire on their behalf.
- Although our sample size of 82 is statistically sufficient for analysis, a larger sample size might produce better insights. Nevertheless, our sample size compares favorably with other ERP studies done by other researchers (e.g. Ifinedo (2006).
- The views expressed in this study relate only to organization in private sector, opinions in the public sector may differ.

6.9. Recommendation

The researcher identified several areas that will require further research in order to deepen the understanding on issues relating to ERP implementation. On critical success factors the researcher recommends future case studies that will identify various measures to be used in evaluating each critical success factor. In our research the respondents suggested addition factors i.e. organization culture, customization and technological infrastructure. The researcher recommends future studies to be conducted including these factors, rank them, in order to determine if top management support still rank as the most critical factor.

We also recommend a case study to be conducted in firms from public sector in order to confirm if our results still hold in this sector. Further more it will be vital for future studies to seek and identify why ICT staff perception system quality as the most critical dimension in evaluating ERP system.

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APPENDIX 1

The questionnaire used for the main survey

Instructions: Fill-in the space provided. Please tick (/) or mark (x) on every question; do not omit any.

SECTION - A

1) Your Gender: ( ) Male ( ) Female

Your Age bracket:

( ) <30 ( ) 31 – 40 ( ) 41 – 50 ( ) 51 – 60

Your Educational level:

( ) University graduate ( ) Vocational/Technical/ Others

2) What is your job title? _____

3) What is your position in the organization?

( ) Top management ( ) Middle Management

( ) lower level management

4) How long have you been working in the organization: _____

5) Did you participate in the implementation of Ramco ? ( ) Yes ( ) No

6) If Yes, What was your role during the ERP acquisition process, (if any)?

_____

_____

SECTION - B

7) To what extent do you agree or disagree with the statements provided below.

*(**A**= strongly disagree, **B**= Disagree, **C**= somewhat disagree, **D**=Neutral, **E**=somewhat agree, **F**=Agree, **G**=strongly agree)*

DIMENSION- SYSTEM QUALITY	**A**	**B**	**C**	**D**	**E**	**F**	**G**
Ramco has accurate data	1	2	3	4	5	6	7
Ramco is easy to use	1	2	3	4	5	6	7
Ramco is flexible	1	2	3	4	5	6	7
Ramco is easy to learn	1	2	3	4	5	6	7
Ramco is reliable	1	2	3	4	5	6	7
Ramco is efficient	1	2	3	4	5	6	7
Ramco allows for customization	1	2	3	4	5	6	7
Ramco meets users' requirements	1	2	3	4	5	6	7

DIMENSION- INFORMATION QUALITY							
Ramco has timely information	1	2	3	4	5	6	7
The information on Ramco is accurate	1	2	3	4	5	6	7
The information on Ramco is important	1	2	3	4	5	6	7
The information on Ramco is relevant	1	2	3	4	5	6	7
The information on Ramco is usable	1	2	3	4	5	6	7
The information on our Ramco is available	1	2	3	4	5	6	7

DIMENSION- VENDOR /CONSULTANT SUPPORT							
Ramco vendor provides adequate technical support	1	2	3	4	5	6	7
Ramco vendor is credible and trustworthy	1	2	3	4	5	6	7
Ramco vendor is experienced and provides quality training.	1	2	3	4	5	6	7

DIMENSION- INDIVIDUAL IMPACT							
Ramco enhances individual creativity	1	2	3	4	5	6	7
Ramco improves individual productivity	1	2	3	4	5	6	7
Ramco is beneficial for individual's tasks	1	2	3	4	5	6	7
Ramco enhances higher-quality of decision making	1	2	3	4	5	6	7
Ramco saves time for individual tasks/duties	1	2	3	4	5	6	7

DIMENSION- WORKGROUP IMPACT

Ramco helps to improve workers' participation in the org.	1	2	3	4	5	6	7
Ramco improves organizational-wide communication	1	2	3	4	5	6	7
Ramco improves inter-departmental coordination	1	2	3	4	5	6	7
Ramco create a sense of responsibility	1	2	3	4	5	6	7
Ramco improves the efficiency of sub-units in org	1	2	3	4	5	6	7

DIMENSION- ORGANISATIONAL IMPACT

Ramco improves work-groups productivity	1	2	3	4	5	6	7
Ramco reduces organizational costs	1	2	3	4	5	6	7
Ramco improves overall productivity	1	2	3	4	5	6	7
Ramco provides us with competitive advantage	1	2	3	4	5	6	7
Ramco increases customer service / satisfaction	1	2	3	4	5	6	7
Ramco facilitates business process change	1	2	3	4	5	6	7
Ramco supports decision making in the org.	1	2	3	4	5	6	7

Overall, the impact of our ERP on **me** has been positive	1	2	3	4	5	6	7
Overall, the impact of our ERP on **my workgroup**							
(department) has been positive	1	2	3	4	5	6	7
Overall, the impact of our ERP on **my org** has been positive	1	2	3	4	5	6	7

8) According to our research from reference books and journals, we identified various dimensions to be considered when evaluating post implementation success of an ERP system. Please rank according to their importance in ERP post implementation success assessment.

C = Highly critical **B** = Critical **A** = Not critical

DIMENSION	A	B	C
System Quality	1	2	3
Information Quality	1	2	3
Vendor/Consultant quality	1	2	3
Individual Quality	1	2	3
Workgroup Quality	1	2	3
Orginisation Impact	1	2	3

SECTION - C

9) According to our research from reference books and journals, we identified some critical success factors (CSF) in ERP implementation. Please rank according to their importance in contributing to the success of Ramco by completing the table below.

C = strongly determine the success

B = determine the success

A = Not necessary determine success

CSF	A	B	C
Top management support	1	2	3
Business plan and vision	1	2	3
Team work and composition	1	2	3
Effective project management and project champion	1	2	3
ERP system selection	1	2	3
User involvement	1	2	3
Education and training	1	2	3
Vendor support	1	2	3
Re-engineering business process	1	2	3

10- State any other factors excluded from the above table that contributes to successful implementation of Ramco.

_____

_____

_____