

**BUSINESS PROCESS REENGINEERING FOR PERFORMANCE
IMPROVEMENT: A CASE STUDY OF KENYA PETROLEUM
REFINERIES LIMITED**

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**A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILMENT
OF THE REQUIREMENTS FOR THE AWARD OF DEGREE OF
MASTER OF BUSINESS ADMINISTRATION, SCHOOL OF
BUSINESS, UNIVERSITY OF NAIROBI.**

AUGUST, 2012

DECLARATION

This Project is my original work and has not been submitted for a degree in this or any other University

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ACKNOWLEDGEMENTS

This study journey would not have been successful without the invaluable support, understanding, assistance and guidance from workmates, colleagues and family members. I sincerely thank all those individuals for whose encouragement and support made the completion of this study a reality and success. Though I may not be able to list all, I have a strong feeling of mentioning a few names for their special contribution.

First, my special thanks go to my supervisor Mr. Stephen Odock for his special guidance, critique and continued encouragement during the entire period of the study. I also wish to specially thank KPRL for the support in the whole MBA course and all the workmates who spared their valuable time to provide the information I requested from time to time.

Secondly, my special thanks go to my wife Isabella, children; Sharlon, Whitney, Henrietta and Nickson for their understanding, sacrifice and encouragement in my changed life style during the entire MBA study period. This also goes to my entire extended family and friends for their continued encouragement during the entire period too.

DEDICATION

I dedicate this work to my family, wife Isabella, children; Sharlon, Whitney, Henrietta and Nickson and my entire extended family for their enduring patience, love and encouragement and support.

ABSTRACT

This research study sought to find out whether KPRL met its performance improvement objective by implementing BPR in asset management system and the challenges it faced which constrained its improvement.

The findings were based on both secondary and primary data. Secondary data was collected from KPRL records covering six months pre- and post- BPR implementation. This was the data available for post BPR implementation when the research study was started. The consideration was for a single item transaction case with the initiator being a technician level employee and approval up to the supervisor level only. Cost consideration was for the initiator expenses exclusive of all other transaction associated costs.

Primary data was obtained through interview where an interview guide was used to collect data on BPR implementation challenges. Seven informants were targeted to enable data capture for all the sections and categories involved in asset management. They included; one engineering head of department, one engineering supervisor, one mechanical technician, one instrument technician, one electrical technician, one materials clerk and one contracts clerk.

The study found out that by implementing BPR in asset management, KPRL drastically improved its materials approval process time by achieving a ten times reduction resulting in an eleven times reduction in cost too as the two were noted to move in tandem. The cost consideration represented part of the cost saving in the process and the full consideration would result in a much high saving.

The study also found out that BPR implementation comes with a lot of challenges which impacts the improvement achieved. On the part of KPRL out of the many challenges considered, all came out with a significance rating of medium and above with medium representing 57% and above representing 43%. The biggest challenge experienced by KPRL was on communication of the project importance within the organization which was rated high. Generally for any BPR undertaking, reasonable improvement levels can only be achieved when all challenges are managed to the desired level.

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LIST OF ABBREVIATIONS

ATM	-	Automated Teller Machine
BPR	-	Business Process Reengineering
BP	-	British Petroleum
BCS	-	Balanced Scorecard
CCLA	-	Charities, Churches and Local Authorities
DCS	-	Distributed Control System
EABL	-	East African Breweries Limited
EACS	-	East African Community Secretariat
ERC	-	Energy Regulatory Commission
ERP	-	Enterprise Resource Planning
HSE	-	Health Safety Environment
IBM	-	International Business Machines
IEA	-	Institute of Economic Affairs
IFMIS	-	Integrated Financial Management Systems
IS	-	Information Systems
ISM	-	Management Information Systems
IT	-	Information Technology
KCB	-	Kenya Commercial Bank
KPA	-	Kenya Ports Authority
KIPPRA	-	Kenya Institute for Public Policy Research and Analysis
KPLC	-	Kenya Power and Lighting Company
KPRL	-	Kenya Petroleum Refineries Limited

KRA	-	Kenya Revenue Authority
MBA	-	Masters of Business Administration
MOF	-	Ministry of Finance
MS	-	Masters of Science
PIEA	-	Petroleum Institute of East Africa
SPSS	-	Statistical Product and Service Solutions
TQM	-	Total Quality Management
TPM	-	Total Productive Maintenance
UK	-	United Kingdom
USA	-	United States of America

LIST OF SYMBOLS

df	-	Degree of Freedom
F	-	Regression Strength Measure
k	-	Number of Parameters in the Regression
n	-	Number of Observations
R^2	-	Square of a Correlation Coefficient
RSS	-	Residual Sum of Squares
RSS_c	-	Combined Residual Sum of Squares
RSS_R	-	Restricted Residual Sum of Squares
RSS_{UR}	-	Unrestricted Residual Sum of Squares
t	-	Regression Coefficient
\hat{Y}_t	-	Predicted Average Dependable Value
X_t	-	Independent Variable
$\hat{\alpha}_1^2$	-	Regression Error Variance Estimate

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

The business environment in any industry has a lot of challenges resulting from competitive pressure which is growing at an ever faster pace due to growing customer expectation, globalization and technological development. For organizations to remain in business competitively there is need for them to consider performance improvements in their work processes. Macdonald (1995) noted that organizations need to undergo radical changes in the way they work as steady products and services improvement is not sufficient to survive in the business environment.

There are many business performance improvement techniques which have been developed over the years and they include; quality management, process improvement, balanced scorecard, Benchmarking and process reengineering methodologies. Quality management methodologies include; Total Quality Management (TQM), Six Sigma and process improvement methodologies include; the Japanese Kaizen, Lean and Total Productive Maintenance (TPM) among others all focusing on improvement of existing process. Business process reengineering (BPR) focuses on radical changes resulting in complete new processes for dramatic improvements in critical, contemporary measures of performance, such as cost, quality, services and speed thus deviating from the rest of the techniques (Hammer, 1990).

From BPR perspective, the non-value adding processes should be obliterated rather than improved or automated (Hammer, 1990). Attaran (2004) indicated that BPR aims at

substantial gains in organizational performance by 'ground-up' redesign of core business processes and inventing new ones rather than incrementally improving existing processes. According to Valentine and Knights (1998), the radical approach to BPR was pronounced as the only means of salvation for organizations trapped in outmoded and outdated business process and general working ways. In general organizations undertake BPR for various reasons which could be either survival or growth.

1.1.1 Business Process Reengineering

The concept of reengineering traces its origins back to management development as earlier as nineteenth century. It is a management approach aimed at improving businesses by means of elevating efficiency and effectiveness of the processes that exist within and across organizations. Hammer and Champy (1993) defines business process reengineering (BPR) as a management approach that entails a fundamental rethinking and radical redesign of the business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, services and speed. BPR by definition radically departs from other popular business practices which look at incremental improvements like, Total Quality Management, Lean Production, Downsizing, or continuous improvement as it looks at dramatic improvements.

The reengineering purpose is to make all organizational processes best in-class and it focuses more on overall organizational performance improvement rather than on any one element or measure of performance. Tharanga (2010) noted that reengineering allows an organization to achieve a competitive advantage over others in the competing business industry. The benefits resulting from BPR are enormous as it is an organizational process

which is required to align people, processes and technology with organizational strategies in order to achieve the required business integration. The achievement of BPR benefits are considered not easy to achieve but there is substantial evidence that it can be effective (Macdonald, 1995). The question which an organization must address before adopting BPR is if there is a compelling business case for change which will be the centerpiece in defining the project.

BPR implementation requires transformational change thus taking an organization outside its normal process norms or culture. The approach requires organizations to look at their business processes from a clean slate perspective and determine how best they can construct them to improve their business conduct (Hammer & Champy, 1993). Yahya (2002) stated that in reality there are factors which are considered to be critical for successful BPR effort such as the need to conduct effective management change, establishment of systems to ensure that staff from different functions works together and promotion of stakeholder involvement with effective planning and project management.

Information technology is typically used as an enabler in reengineering where new ways of working are developed and the most central is the enterprise resource planning (ERP) software which is almost always implemented during BPR projects (Grover, Teng & Fielder, 1993). ERP systems are configurable information systems packages that integrate information and information based processes within and across functional areas in an organization as well as across organizations as the business environment demands.

BPR concept has grown deeper in developed nations than in developing nations. Deakins and Makgill (1997) found that the presence of BPR practice is more in the USA and

Europe than other regions of the world from the findings on a survey they carried out in the region. The growth of BPR technique in developing nations is on the rise as a result of the metamorphosis they are undergoing because of the ambitious visions of becoming developed. Mengesha and Common (2007) noted that there are many cases of BPR adoption and implementation in public sector of developing economies.

There have been many reengineering cases noted in both public and private organizations in Kenya. In the public sector they include; KRA re-engineered its business processes and modernized technology (KRA, 2009), Ministry of Finance reengineering of Integrated Financial Management Systems (MOF, 2011) and KPLC reengineering of business process cycle (Atebe, 2001). In the private sector they include; banks, KCB reengineered its operating structures and processes for efficiency and productive improvement (African Banker, 2011), manufacturing firms; Wrigley Co. implemented BPR for competitive advantage (Kaptoge, 2008), EABL reengineered its process for growth in efficiencies (Gitagama, 2008), service organizations; Kenya Airways transformed itself from state-owned loss making company into a highly profitable private company through the use of BPR model (KA, 2009).

1.1.2 Kenya Petroleum Refineries Limited

The Kenyan oil industry business is in the mid and downstream end. The midstream business is in crude oil purchases and refining, while downstream business is in the products purchase through to retailing. Prior to 1994, the industry was a regulated sector dominated by the Government participation and thereafter liberalization set in where many players additionally came in.

KPRL conducts its business in the mid-stream refining end and operates a tolling business model (refining crude for marketers at a fee). It is a vital and strategic investment for the country because of the important part it plays in the economy growth as it provides some of the key economical driving components which include; petroleum products for the industry and home use, employment, government revenue through taxes and contribution in setting required industry standard etcetera. It is the only refinery within the country and the East African region.

KPRL was incorporated in Kenya and is based in Mombasa. It started operations in 1963 with four multi-national oil companies namely, Shell, British Petroleum (BP), Caltex and Esso as equal shareholders. In 1971, the Government of Kenya acquired (50%) shareholding while the remaining (50%) was shared equally among the four multi-national oil firms. In 1997, Esso surrendered its shareholding to Shell, BP and Caltex who held the stakes at the Refinery up to 2009 when it was acquired by Essar India Limited. The current ownership is between Essar India Limited (50%) and the Kenya Government (50%) (KPRL, 2012).

Crude oil is purchased from the Middle East where it is shipped by large oil tankers and discharged at Kipevu Oil Jetty along the Kilindini Harbour and then pumped via a pipeline to the refinery at Changamwe for processing. From processing, a wide variety of products are produced and they consist of; liquefied petroleum gas, premium and regular petrol, kerosene, jet fuel, automotive oil, fuel oil and bitumen. The bulk of the finished products are dispatched upcountry via pipeline, road and rail.

As liberalization set in 1994, many players came in and are currently estimated to be 42 oil marketers. Chepkwony (2001) observed that liberalization of Kenyan oil industry has witnessed intense competition among the players and in order to survive, they have to make strategic changes in their internal dimensions.

Processing of crude oil at KPRL has for many years raised criticisms in the oil industry circle where many argue that the high cost of fuel oils is associated with high refining cost at the refinery due to inefficiencies of its operations. PIEA (2011) indicated that one of the causes of high cost of fuel oils were due to KPRL inefficiencies. Also the country's Parliamentary Select Committee on Cost of Living concluded that KPRL was a liability to the tax payer and that it further contributed to the high cost of fuel because of gross inherent inefficiencies (Parliamentary Select Committee on Cost of Living, 2011). The Institute of Economic Affairs noted too that the inefficiencies of KPRL were being reflected in the prices of fuel products (IEA, 2005). With this kind of inefficiency criticisms, the future of KPRL is uncertain and thus requires consideration for survival as well as growth strategies in its operations.

The configuration of KPRL plant is of old type technology considering the year it started its operations (1963). This limits its capacity to refine enough crude oil and high value products to meet the demand (KIPPRA, 2010). Globally there is a steady development in technology across all business environments as a result of information technology development. The business environment in which KPRL is operating in is not left out either and the developments have resulted in more efficient processes thus rendering KPRL uncompetitive in its refining processes. KPRL has had problems in;

communication, refining operations management, financial management, product inventory management, products transfer management, plant access management, asset management etcetera. Over the years KPRL has invested and is investing in a number of performance improvement processes through adoption of BPR.

The adoption of BPR by KPRL started in 1995 when refining operations were reengineered through installation of distributed control system (DCS) from pneumatic control system with the intention of achieving efficiently and economically controlled operations thus resulting in quality products and operational cost reduction. This was attributed to faster deviation controls whenever they arose and the estimated reduction in control times was in the range of over 90%. This has been continuing with the most recent being asset management development which started in 2007 under the banner of Business Systems Improvement and Information Management Strategy where the company made a choice of going for Maximo asset management system owned by IBM. The objective of the system is to support asset and maintenance processes thus ensuring planned maintenances are executed according to the maintenance strategy with the expectation of performance improvement resulting in; better plans, costs reduction and enhanced information availability.

Maximo asset management system supports breakdown maintenance, planned maintenance, preventive maintenance, failure reporting, incident management, procurement, inventory management, among other features. Implementation of the project started in August 2010 and commissioned in April 2011 with the initial key focus being on; asset management, work management, service management, contract

management, materials management and procurement management thus helping in the optimization of maintenance and service initiatives throughout the company. The focus was on approval process measurement for materials and services part through the time taken and estimated cost.

1.2 Research Problem

Organizations are placed in a lot of challenges in their industry because of the dynamism in the business environment worldwide. So the only option for organizations is to look for ways of either survival or gaining competitive edge in their industry. Valentine and Knights (1998) observed that the radical approach to BPR was pronounced as the only means of salvation for organizations trapped in outmoded and outdated business process and general working ways. BPR focuses on processes and it is noted that the production process for an average product accounts for less than 10% of product value in manufacturing and does not even exist in service industry resulting in business processes becoming the major cost factor (Harrington, 1991).

KPRL is the only refinery within the East African region thus considered vital in supporting the region's economic growth (EACS, 2008). It provides up to 50% of all petroleum products required in the country (ERC, 2008). It employs up to 260 persons being own staff and an estimated 300 contractor personnel plus many more indirectly. It has had a number of problems areas with asset management being one of them where none optimization of maintenance and service initiatives resulted from ineffective and inefficient data capture. It has undertaken BPR in asset management system to support the asset and maintenance processes in line with the maintenance strategy. Even with this

undertaking, there are still many more problems which include; plant old age technology, plant inefficient operations, product quality, business model type (currently toll with little flexibility) and power supply stability issues.

Studies have shown that BPR successes are not easy and 70% of the organizations are estimated to fail in achieving the dramatic results anticipated (Hammer & Champy, 1993). But even with this, enormous gains can be realized; Hallmark reduced its product design time by over 200%, Wal-Mart attained a 2% cost advantage over its competitors by reengineering its procurement and distribution processes (Attaran & Wood, 1999). Studies in Kenya; Kaptoge (2008) noted Wrigley Co gained competitive advantage through BPR on its supply chain and enterprise resource management; Gitagama (2008) observed that EABL benefited substantially from BPR through growth in efficiencies leading to improved growth in profitability over the years.

Oil industry studies in Kenyan have focused on operations improvement initiatives and they include; Amolo (2002) focused on benchmarking the order delivery process for continuous improvement where he found out that most oil companies were constrained in achievement of operations objectives; Tuitoek (2007) looked at benchmarking health safety environmental performance measurement practices and found out performance improvement to be a key driver for benchmarking; Nduati (2010) study was on operations improvement practices where he found out that the challenges constraining performance are largely independent of size of the organization. In the industry no specific study has been done on the relationship between performance improvement and BPR implementation. Thus the study aims at filling this gap.

The study seeks to answer the following research questions; has KPRL met its performance improvement objective by implementing BPR in asset management system?

What challenges did KPRL face in the implementation process?

1.3 Objectives of the Study

The objectives of the study were to;

- (i) Establish if performance improvement was achieved through BPR implementation at Kenya Petroleum Refineries Limited in asset management system.
- (ii) Determine the challenges faced by Kenya Petroleum Refineries Limited in implementing BPR.

1.4 Value of the Study

The outcome of the study may be useful in a number of areas. To KPRL, it will help management to understand the usefulness of BPR in performance improvement thus in progressing implementation to other areas for growth of the company. This will also help the government and other organizations with intentions to adopt BPR to understand its applicability in performance improvement. They will also be able to understand the limitations in implementation to be able to work towards successful implementation when doing so.

In academics, the knowledge and information from the study will assist in broadening of the syllabus with respect to performance improvement through application of BPR

technique. This may also be used by other researchers for reference in pursuit of BPR as a performance improvement technique.

In the policy area, the study will offer further guidelines to the formulation of policies for business process reengineering. This can be used by the Government agencies and business organizations in formulating good BPR policies which will be used as supporting guidelines in BPR implementation for organizations in the business industry and government sector.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter presents the literature review highlighting the various improvement approaches and then going down in detail on BPR. The details will be on; processes considered not to be BPR, reasons for adopting BPR, the approaches and methodologies of BPR, the general consolidated basic step in BPR methodology and the benefits and challenges of BPR approach.

2.2 Improvement Approaches

The industrial revolution was the spur for performance improvement initiatives. Since the 1950s, competition between organizations has increased as markets have become increasingly global and there are no signs that this will ease. This increased competition creates an ever greater need for faster improvement methods that can sustain competitiveness. As a result of this, over the years many improvement approaches have been developed and these include; Total Quality Management (TQM), Total Productive Maintenance (TPM), Six Sigma, Lean, Balanced Scorecard (BSC), Benchmarking and Business process reengineering (BPR). The approaches are categorized as either incremental or quantum (radical) in line with the improvement focus (Harrington, 1995).

Total Quality Management (TQM) refers to the broad set of management and control processes designed to focus on an entire organization and all its employees on providing products or services that do the best possible job of satisfying the customer. According to

Sashkin and Kiser (1993), TQM means that the organization's culture is defined by and supports the constant attainment of customer satisfaction through integrated set of tools, techniques and training. This involves continuous improvement of the organizational processes resulting in high quality products and services.

Total Productive Maintenance (TPM) aims at continuously improving productivity through improved availability of the plant. This is a production driven improvement methodology that is designed to optimize equipment reliability and ensure efficient management of plant assets. It is an innovative approach to maintenance that optimizes equipment effectiveness, eliminates breakdowns and promotes autonomous maintenance by operators through day-to-day activities involving total workforce (Bhadury, 2000).

Lean approach focuses on eliminating waste and reducing the time between a customer's order and delivery. By trimming waste, goods manufacturers and service providers can achieve; higher quality and productivity, improved customer interaction and speed (Womack & Jones, 1996). Fuji Cho, Toyota's president defined waste to be anything other than the minimum amount of equipment, materials, parts and workers which are absolutely essential to production. He further identified seven prominent waste types as; overproduction, waiting time, transportation, inventory, processing, motion and product defects.

Balance scorecard approach focuses on translating an organization's strategic objectives into a set of performance indicators distributed among four perspectives; Financial, Customer, Internal Business Processes, and learning and growth. Through the balanced scorecard, an organization monitors both its current performance and its efforts to

improve the processes, motivate and educate employees and enhance information systems. Kaplan and Norton (1996) noted that balanced scorecard is extensively used in business and industry, government and nonprofit organizations worldwide to align business activities to the vision and strategy of the organization.

Benchmarking approach focuses on looking outward (outside a particular organization, industry, region or country) to examine how others achieve their performance levels and to understand the processes they use. This helps to explain “the best practice” processes behind excellent performance. The lessons learnt from benchmarking exercise are then applied to an organization thus facilitating improved performance in key areas of the business environment. Hughes (2003) observed that benchmarking improves performance by continuously identifying and adapting outstanding practices.

Business process reengineering (BPR) approach focuses on redesigning the way work is done to better support the organization’s mission and reduce costs. Reengineering focuses on radical changes resulting in complete new processes for dramatic improvements in critical, contemporary measures of performance; such as cost, quality, services and speed thus deviating from the rest of the approaches (Hammer, 1990).

2.3 Business Process Reengineering

BPR is a performance improvement technique geared towards redesigning work ways to better support the organization’s mission and reduce costs. It aims at substantial gains in multiplicative levels of ten times rather than 10% in organizational performance by ‘ground-up’ redesign of core business processes and inventing new ones rather than

incrementally improving existing processes thus deviating from other improvement techniques (Attaran, 2004). Lee and Chuah (2001) observed that it focuses on the processes and not functions. Davenport (1998) noted that, it is perhaps the most popular business concept since the 1990's.

Many authors have attempted to define BPR where the emphasis in all is on redesigning business processes using a radical IT-enabled approach to organizational change. Davenport and Short (1990) defines BPR as an analysis and design of workflows and processes within an organization. According to Talwar (1993) BPR is rethinking, restructuring and streamlining the business structures, processes, and methods of working, management systems and external relationship through which to create and deliver value. Hammer and Champy (1993) definition is the one which is most quoted. According to them, BPR is a management approach that entails a fundamental rethinking and radical redesign of the business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, services and speed. In summary BPR represents a range of activities concerned with the improvement of processes and combines analysis and modeling of business processes with advanced information technologies.

BPR derives its existence from different disciplines, and the four major areas which can be identified as being subjected to change in BPR are; organization, technology, strategy and people. The process view is used as a common framework for considering these dimensions while business strategy is the primary driver of BPR initiatives and the other dimensions are governed by strategy's encompassing role.

BPR projects are strategic initiatives aimed at making business processes more efficient, effective and flexible hence the process starts with high level assessment of the organization's strategic direction. The quest behind business process transformations is to radically enhance organizations' chances of differentiating themselves and satisfy customer demands while maintaining competitive cost structures and flexibility in the market place. Characteristic of BPR projects differ for the manufacturing and service organizations because of the difference in their business processes where in manufacturing it is product oriented while in service its service oriented and information intensive (Shin & Jemella, 2002).

Chase, Jacobs and Aquilano (2004) noted that reengineering for many years was implemented in a piecemeal fashion in organizations and the production organizations have been in the vanguard without knowing. They have undertaken reengineering by implementing concurrent engineering, lean production, cellular manufacturing, group technology and pull type production system which represents fundamental rethinking of the manufacturing process.

Davidson (1993) stated that successful reengineering efforts ultimately lead to business transformation which may produce new business opportunities. Shin and Jemella (2002) in their case study on Chase Manhattan Bank BPR projects such as e-fund disbursement cards and service charge reengineering resulted in new products and services in addition to producing dramatic increases in revenue and operating savings. BPR has been used for organizational benefits by many researchers. Ascari, Rock and Dutta (1995) applied it at

an organizational level for radical improvement of business functions. Dey (1999) used it for effective implementation of projects.

2.4 Misconceptions of Business Process Reengineering

There are many widespread misconceptions about the nature of reengineering (Hammer & Stanton, 1995). Green and Wayham (1996) noted that BPR is confused with restructuring and reorganization because of their similarity in sound however the processes for each are different in motivations, outcomes and processes.

In restructuring the aim is to reduce business capacity to meet lower demand and poor financial performance by eliminating unprofitable businesses or personnel (Makridakis, 1996). Vollmann and Brazas (1993) observed this to be achieved through downsizing program. In BPR the aim is on changing the way work is done even though this might result in reduction of organization staff which is not the main target as downsizing.

In reorganization the focus is on hierarchical structures of the organization while the underlying business processes do not encounter any major changes (Dickinson, 1997, Green & Wayham, 1996). Reorganization is unlike BPR where there is radical redesign of business processes thus resulting in major changes (Hammer & Champ, 1993).

In automation information technology may be used to automate existing business processes where the sole automation of inefficiently designed business processes often fails (Dickinson, 1997). In this it merely helps to do the wrong things faster. Davenport (1993a) found out that organizations which have embarked on BPR in conjunction with

automation efforts have been able to gain significant benefits from investing in new information technology systems.

TQM is often confused with BPR but the two shares a number of common feature i.e. process principles, need for organization and cultural changes etcetera. TQM is evolutionary and continuous in nature, incremental, of narrow processes focus within departments and is quality focused. BPR is radical, revolutionary and one time approach, of wider scope that crosses multiple functions. BPR focuses on quality, cost and speed (Gulden & Reck, 1992; Wells, O'Connell & Hochman, 1993; Clemmer, 1994).

2.5 Need for Business Process Reengineering

Reengineering purpose is to make all organizational processes best in-class. Jones (1994) noted that the global projected BPR market was \$2.2 billion by 1996 and annual growth rate of 46 percent indicate obviously that BPR has quickly become and remains a very popular approach to organizational improvement. Sidikat and Ayanda (2008) found that BPR became a useful weapon for any corporate organization seeking improvement in their organizational performance and intend to achieve cost leadership strategy in its operating industry and environment. Reengineering process remains an effective tool for organizations striving to operate in the competitive business world and they reengineer in order to achieve breakthrough performance and long term strategy for organization growth.

BPR in organizations is motivated by either external drivers or internal drivers or both. External drivers are related mainly to the increased level of competition, change in

customer needs, IT and regulation changes (Grover, Teng & Fielder, 1993). Internal drivers are mainly related to changes in both organizational strategies and structures. The ever faster growing power of the customers, competitors and today's constantly changing business environment places the steady improvements of products and services to be no longer sufficient for organizations to survive in the global market place. Hammer and Champy (1993); Linden (1993) noted that due to this, many organizations have been forced to recognize the need to move away from focusing on individual tasks and functions to focusing on more communicated, integrated and coordinated ways of work by looking at operations in terms of business processes. BPR has been approached as a tool to dramatically improve organizations business performance and lead them to a competitive position (Schnitt, 1993; Grover, Teng & Fielder, 1993).

Sturdy (2010) observed that there is evidence of major risk and pain associated with organization wide reengineering. Hammer and Champy (1993) estimated that as many as 70% of the organizations fail in achieving the dramatic results anticipated from reengineering but even with this, BPR has a great potential in increasing productivity but this often requires a fundamental organizational change.

There have been arguments that organizations which undertake BPR gets into disruptive business and successful businesses never undertake reengineering. As much as this might be true, it is a reality that in quality management and process improvement techniques, the degree of change, risks and desired performance improvements are much less than those of reengineering exercise. In general, research has shown that there are target

improvements of 5-10% for Kaizen versus 20-30% for TPM all of which focus on process improvements while reengineering is 50-80% (Grover & Kettinger, 1998).

Taylor (1995) suggested that managers use process reengineering methods to discover the best processes for performing work and that processes are to be reengineered to optimize productivity. Managers have been prompted to explore BPR philosophy because of the well documented BPR success stories, however the resulting landslide of companies who have initiated their own process improvement efforts with little success have made it apparent that a successful outcome to BPR may be exceptional rather than the rule (Marchand & Stanford, 1995).

There are a number of successful cases of BPR in organizations which may have prompted managers to explore the philosophy as noted from the literature. They include; Dey (2001) on reengineering materials management at Indian refinery improved the materials management system resulting in reduced inventory cost by more than 30% and improved profitability by 15% within a period of two years. Hallmark, a USA company reduced its design time by over 200% by reengineering its product design operations (Attaran & Wood, 1999). CCLA, a UK funds management organization reengineered its office operations from paper to a more efficient paperless and resulted in saving money and positioning itself for growth (Harmon, 2010). IBM reengineered in 1992 through redesigning its delivery process with focus centered at the customer and eliminated normal delivery delays by two months (Janson, 1992).

2.6 Business Process Reengineering Approaches and Methodologies

Several approaches and methodologies have been introduced by a number of authors (Yu & Wright, 1997; Kettinger, Teng and Guha, (1997); Davenport & Short, 1990; Petrozzo & Stepper, 1994; Barrett, 1994; Harrison & Pratt, 1993; Furey, 1993). The methodologies developed are distinct from each other as emphasis varies from one BPR project to another. The approaches are viewed based on the different focuses that BPR efforts may emphasize.

There are various forms of BPR and the three identified ones are; process improvement, evolutionary and revolutionary (Lu & Yeh, 1998). The process improvement uses a conservative approach to make incremental changes to existing systems. Evolutionary moves towards a potentially radical change but still through incremental steps as in the previous approach. However, revolutionary is a clean slate approach which uses one time process innovation to achieve radical business improvement. The original concept of BPR was one of revolutionary while the first two forms are basically a variant of TQM.

Reengineering is considered highly situational and creative with two BPR distinct approaches as found from the literature. Hammer and Champy (1993) originally prescribed methodology is a top-down approach focus where BPR team focuses on determining how strategic objectives of the organization can be met without having the existing processes constraining its thinking. In 1991, Harrington's methodology outlined a more incremental change which is a bottom-up approach focusing on changing the as-is processes by identifying opportunities for improving it to meet strategic objectives. In normal practice, mixed approach is adopted as this would consider high-level changes

without being cluttered by details of current process. It is important to note that an initial BPR study may lead to recommendation for a number of more detailed projects on improving sub processes requiring relatively small changes.

BPR approach is fundamentally different from other process improvement approaches as it involves creating new systems and structures rather than fixing those that are currently in place. While there are some similarities in how firms approach reengineering and rather than following what would be called the universal approaches of reengineering, each organization should tailor its BPR efforts to satisfy its unique organizational conditions. Kettinger, Teng and Guha (1997) noted that organization's BPR projects require different approaches depending on their characteristics and capabilities.

2.7 Basic Steps of Business Process Reengineering Methodologies

From the several approaches and methodologies introduced by many authors, many structure-based steps have been proposed for BPR implementation however most have common elements and view BPR efforts as a top-down implementation project (Earl & Khan, 1994; Hammer & Champy, 1993). The proposed steps range from three to seven. Kettinger, Teng and Guha (1997) developed a comprehensive step activity framework consisting of six basic steps each containing a number of activities following a literature review of BPR methodologies, techniques and tools. The steps of his framework are; envision, initiate, diagnose, reconstruct and evaluate. This step activity framework is valuable in viewing a BPR project as a set of integrated and co-ordinated tasks to alter different organizational subsystems through business process change.

Envision involves the development of executive consensus. The task force which includes senior executives and individuals knowledgeable about the organization's processes is mandated to target a business process which should be considered for improvement based on a review of the business strategy and IT opportunities with the hope of improving the organization's overall performance (Kettinger, Teng & Guha, 1997).

Kettinger, Teng and Guha (1997) noted that initiation involves encompassing of the assignment for a reengineering project team which includes; performance goals setting, project planning, and stakeholder/employee notification and buy-in. This is frequently achieved through developing a business case for reengineering via benchmarking, identifying the customer needs and cost benefit analysis.

Kettinger, Teng and Guha (1997) observed that diagnosing involves the documentation of the existing process and its sub-processes in terms of process attributes such as; activities, resources, communication, roles, information systems and cost. When process requirements are identified and customer values are assigned, root causes for problems surface and non-value adding activities are identified. This is considered the key step for identification of performance improvement opportunities and obstacles.

Kettinger, Teng and Guha (1997) showed that redesign involves the development and redesigning of new process. This will be accomplished by devising design alternatives through brainstorming and creativity techniques. The new design should meet strategic objectives and fit with the human resource and information system architectures.

Documentation and prototype of the new process is typically conducted and a design of information systems to support the new process is completed.

Kettinger, Teng and Guha (1997) stated that reconstruction involves consideration of the management change techniques which provide reasonable assurance of smooth migration to the new process responsibilities and human resource roles. Here the IT platform and systems are implemented and the users go through the training and transition.

According to Kettinger, Teng and Guha (1997), evaluation involves the monitoring requirement for the process in determining if the targeted goals are met and this often involves linkage to total quality program developed for the project.

2.8 Benefits of Business Process Reengineering

BPR is an approach that focuses on redesigning the way work is to be done to better support the organization's mission and reduces cost. Redesigning focuses on the whole process in order to achieve the greatest possible benefits to the overall organizational performance rather than on any one particular element or measure of performance. According to Harrington (1991) production process for an average product accounts for less than 10% of the product value only, meaning that the process accounts for the balance 90% and in BPR the focus is in the process improvement and not specific elements of the process. Attaran (2004) indicated that BPR aims at substantial gains in organizational performance by 'ground-up' redesign of core business processes and inventing new ones rather than incrementally improving existing processes.

BPR is an organizational process which is required to align people, processes and technology with organizational strategies in order to achieve the required business integration where the benefits are enormous. It takes a business in its current state and forms an organizational and operational blueprint in order to redirect skills, policies, information or data, cultural values, organizational skills and processing as well as incentives towards making targeted improvements to the business (Hammer & Champy, 1993).

Groover, Joeng, Keitinger, and Jeng (1995) observed that the value of BPR to an organization can be seen at both process such as time reduction and cost. Ozcelik (2009) observed that this can also be seen at the overall organizational performance such as productivity, profitability and market advantage levels. The advantage achievement can only be possible when it is implemented successfully. Research has shown that around eighty percent of the organizations that implement BPR are satisfied with the results achieved (O'Neill & Sohal, 1999).

Ozcelik (2009) noted that improvements magnitude order achieved that go beyond process level benefits and impacting on overall organizational performance does not only depend on BPR per se. This also involves creating a set of BPR complementary skills, systems and technologies which are necessary to institutionalize and reinforce the redesigned business processes post BPR implementation. Most organizations that have undertaken BPR have improved their business performance and an organization that has embraced BPR and developed an original idea is likely to be the leader in their industry rather than the follower.

BPR projects are extremely pervasive and they effect a substantial modification of all organization's processes and relationships. They may result in new business priorities based on value and customer requirements with concentration on process as a means of improving products, services and profitability, new approaches to organizing and motivating people inside and outside the organization, new approaches to the use of technology in developing, producing and delivering goods and services etc (Hammer & Champy, 1993).

Davidson (1993) found that successful reengineering efforts ultimately lead to business transformation resulting in new products, services and customer services in the form of improved information flow which may produce new business opportunities. Shin and Jemella (2002) in their case study on Chase Manhattan Bank BPR projects (e-fund disbursement cards and services charge); they noted that the effort resulted in new products and services in addition to the dramatic increase in revenue and operating savings.

Hammer (1990) noted that in organization where the application of BPR is being done it is considered as process oriented where all processes are identified and given specific names. In this each individual is aware of the particular process in which he or she is involved and complete process measurement such as monitoring and control is performed. The awareness created here brings in a greater sense of responsibility for individuals thus resulting in proper management and control of all business processes thus leading to; improved efficiency in personnel utilization, cost reduction, increased motivation level etcetera. When BPR is implemented in an organization, it results in

increased flexibility and adaptability for change within the organization thus creating a better environment for people to work leading to employee satisfaction.

According to Hammer (1990), reengineering is basically done to achieve a number of benefits within an organization and this includes; cost reduction, increase in quality, improvement in speed and services. BPR enables an organization to become competitive in its business industry. There are a number of success stories noted from the literature studies.

Hallmark traditionally had its new products reaching the market in up to two years. The process involved more than 20 hands-offs and was very inefficient due to long wait in someone's basket. It decided to reengineer its product design operations with the goal of completing a design in less than one year. The company reduced its design time by 200% with the introduction of more than 23,000 new card lines each year (Wellins & Murphy, 1995).

Wal-Mart's traditional procurement and distribution function of mass merchandisers had too much cost built into it. The process was reengineered where information was extended to its suppliers from its internal IT systems therefore eliminating the traditional method of merchandisers resulting in processes improvement. This resulted in attainment of a 2% cost advantage over its competitors which was considered a tremendous competitive advantage as market margins were about 6% (Furey & Diorio, 1994).

Kaptoge (2008) did a study on Wrigley Co. with the objectives of finding out whether the company succeeded in BPR implementation by improving its competitiveness and

determining the key factors that may have led to the success or failure of BPR implementation. The findings were that BPR implementation on the supply chain and enterprise resource management resulted in process management improvement resulting in achievement of competitive advantage.

Gitagama's (2008) study on EABL had the objective of finding out the relationship between BPR and organizational performance, whether it was symmetrical, reciprocal or asymmetrical. The findings indicated that EABL substantially benefited from reengineering through growth in efficiencies leading to improved growth as measured by profitability over the years. The relationship was thus revealed to be symmetrical.

Dey (2001) studied the Indian refinery with the objective of finding out how reengineering of the materials management function through implementation of the integrated materials management system would improve operations the function. The findings indicated that the organization was to attain a reduction in inventory cost by more than 30 percent and improve profitability by 15 percent within a period of two years resulting from performance improvement in its materials management system.

2.9 Implementation Challenges of Business Process Reengineering

Embarking on BPR is no easy task as it is considered a painful process because the whole set of values and beliefs in an organization are being challenged (Champy, 1995). Hammer and Champy (1993) estimated that as many as 70% of the organizations fail in achieving the dramatic results anticipated from reengineering. Despite this high failure rate, some organizations achieved the anticipated benefits through BPR implementation.

Zairi (1997) noted that implementation process was considered complex and to achieve the anticipated benefits, the process must be scrutinized into proper details. The benefits do not necessarily come in due time thus meaning that BPR projects must be carefully monitored throughout its life cycle.

At each step of BPR change process (design, implementation and operational/roll out) problems related to sponsorship, scope, organizational culture, leadership, skills, human resources and management can arise. The risks include; insufficient management commitment, scope unrelated to strategic vision, inadequate consideration of human resource issues, fear of change etc. For effective and beneficial BPR implementation in an organization, the risks must be managed (Al-Mashari & Zairi, 1999).

Dale (1994) observed that BPR is radical where implementation requires transformational changes in the organization's processes, technology, job roles and culture. Significant change to even one of these areas requires resources, money and leadership. Changing them simultaneously is an extra ordinary task requiring top management support. Executive leadership will create an environment for change to take place and without this, implementation efforts can be strongly resisted and ineffective (Attaran & Woods, 1999).

According to Dale (1994), BPR takes organizations outside their current "rules of the game". The rule either explicit or implied include superficial manifestations or status buried deep within people beliefs thus confronting the beliefs and values of the organization, complex and prejudice interests of employee in particular senior management will lead to resistance resulting in failure of the BPR project.

The scope of change required in BPR can be overwhelming which is considered properly the single biggest fault of it. BPR asks organizations to do so much and too quickly. It requires organizations to convert their employees to this new brand of thinking, retrain them, design and implement entirely the new ways of performing internal functions while continuing to operate their core business (Hammer & Stanton, 1995).

Effective communication is needed throughout the change process at all levels and for all audiences even with those not involved directly in the project which is necessary in marketing the BPR program (Carr & Johansson, 1995). This is required to take place frequently and in both directions between those in charge of the change initiatives and those affected by them. Davenport (1993a) indicated that communication need to be open, honest and clear especially when discussing sensitive issues related to change such as personnel reduction.

For any change being made anywhere, this comes with new challenges which require the affect people to be trained for effective implementation. BPR also introduces new ways of working thus requiring employees to be trained to meet the new challenges. This requires increased organization's budget which is critical to the success of BPR project (Attaran & Wood, 1999)

Organization's culture is the determining factor in successful BPR implementation since it influences the organization's ability to adapt to change (Bruss & Roos, 1993; Rohm, 1993). The existing culture in the organization contains beliefs and values that are often no longer appropriate or useful in the reengineered environment. The organization must therefore understand and conform to the new values, management process and

communication styles that are created by newly redesigned processes so that a culture which upholds the change is established effectively.

The implemented change demand is inherently too difficult, which is one of the major criticisms in BPR. It is expected that functional managers and process owners work together in a close of which most high-level executives find uncomfortable (Hammer & Stanton, 1995). Since human behavior is so hard to change this increases the chances of BPR project failure. Hammer estimates that 80% of an organization will resist process centering at the beginning of BPR project.

The other major BPR criticism is the euphemism for downsizing. Ehrbar (1993) on an article in the Wall Street journal focused on a large negative side effect of BPR layoffs. In BPR the aim is on changing the way work is done through eliminating work and not people or jobs but this might result in reduction of organization staff which will be seen as downsizing. By the mid-1990's, BPR had gained the reputation of being a nice way of downsizing. Considering this, resistance from staff in supporting the reengineering process will definitely be there thus posing a challenge to the BPR project.

Al-Mashari and Zairi (1999) noted that BPR brings about different jobs therefore reward system need to be changed to recognize these new changes. According to Hammer and Champy (1993), the existing reward system may be obsolete. The challenge therefore is for ensuring that the changes made are fair and equitable to promote harmony among employees as well as support BPR efforts this includes changing job titles.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the methodology of the study and it comprises: research design, data collection instrument and data analysis. The study was conducted in an objective, systematic manner of gathering information so as to attain the research objectives.

3.2 Research Design

A case study approach was adopted to evaluate the relationship between BPR implementation and performance improvement in asset management at KPRL. Facts on the challenges faced in the implementation were determined too. Barkley (2006) noted that case study methodology was commonly used in “evaluation” of business and government programs with the goal of identifying potential explanations for their successes or failures. Robinson (2002) defined case study as “a strategy which involves an empirical investigation of a particular contemporary phenomenon within its real life context using multiple source of evidence”. Zainal (2007) stated that a case study was a valuable method of research with distinctive characteristics that make it ideal for many types of investigations and enables examination of data at a micro level. This was done through determination of cycle time and the associated cost in the requisitioning and approval process for both materials and services.

3.3 Data Collection

Both secondary and primary data were used. Secondary data was obtained from the available documents both in hard and soft copies within the organization using the collection form (Appendix II). The data covered a period of six months prior (October 2010-March 2011) and post (April 2011-September 2011) BPR implementation.

Primary data was obtained through interview where an interview guide (Appendix I) was used to collect data on BPR implementation challenges. Yin (2003) argues that interviews allow for focused direction on case study topic. Seven informants were targeted to enable data capture of all the sections and categories involved in asset management. They include; one engineering head of department, one engineering supervisor, one mechanical technician, one instrument technician, one electrical technician, one materials clerk and one contracts clerk. The study aim was to make a generalization on the challenges faced in BPR implementation process.

3.4 Data Analysis and Presentation

The secondary data collected was presented using tables and charts and structural break was used for analysis. Monthly transaction average approval time and cost for materials and services were presented using charts and tested for structural break to confirm whether indeed a structural change had occurred between pre- and post- BPR implementation represented by October 2010 - March 2011 and April 2011 - September 2011 respectively. The presence of a structural break between the two sub periods could suggest impact of BPR on KPRL materials and services approval performance

improvement. Chow test for structural change analysis was used under the null hypothesis that there was no structural change between pre- and post- BPR implementation and the regressions for the two periods were statistically the same. Statistical Product and Service Solutions (SPSS) was used as a tool of analysis and presentation.

Primary data collected was first edited for accuracy, consistency and completeness for ease of interpretation. The data was then analyzed using content analysis. This was to determine facts on the challenges faced in BPR implementation. Klenke (2008) defined content analysis as a methodological measurement applied to text and its certain concept. This was useful in getting areas of consensus and disagreement from various interviews. Content analysis is a technique for making inferences by systematically and objectively identifying specific characteristics of messages (Krippendorff, 2004).

CHAPTER FOUR: DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

In this chapter, secondary data obtained from KPRL records was presented using tables and charts and analyzed using structural break analysis to determine whether there has been an improvement in time and cost performance. Data collected from the records was for transactions having a single entry in the requisition and of normal priority requirement. The process considered here was for identification, approval and waiting through to collection of an item by the initiator. Approval considered was up to the supervisor level requirement only. Primary data obtained from interview covering seven informants was analyzed to determine the challenges faced by KPRL in BPR implementation.

4.2 KPRL Performance Improvement in Asset Management

In data analysis, the consideration was on average time and cost per transaction for the period October 2010 to September 2011 which was represented as months 1 to 12 respectively. Cost considered was only for the initiator requiring an item to be able to work. The monthly average transaction time and cost was generated from consideration of six (6) transactions per month where individual transaction time was collected from the records while cost was calculated using initiator hourly payment rate per transaction and an average was taken for each.

4.2.1 Monthly Average Transaction Time

The monthly average transaction time represented the time taken in identification of the item required, raising of the requisition, circulation of the requisition for approval and closing of the transaction (collection of the item). The monthly average transaction time for months 1 to 12 is given in table 4.1 (a) and table 4.1 (b) representing pre- and post-BPR periods respectively.

Monthly Average Transaction Time

Table 4.1 (a): Pre - BPR

Month	1	2	3	4	5	6
Average time/ transaction (hours.)	9.00	18.00	15.00	10.50	12.00	13.50

Table 4.1 (b): Post - BPR

Month	7	8	9	10	11	12
Average time/ transaction (hours.)	1.09	1.68	0.83	1.48	0.97	0.94

Source: KPRL records

This data is represented graphically as follows.

Figure 4.1: Monthly Average Transaction Time

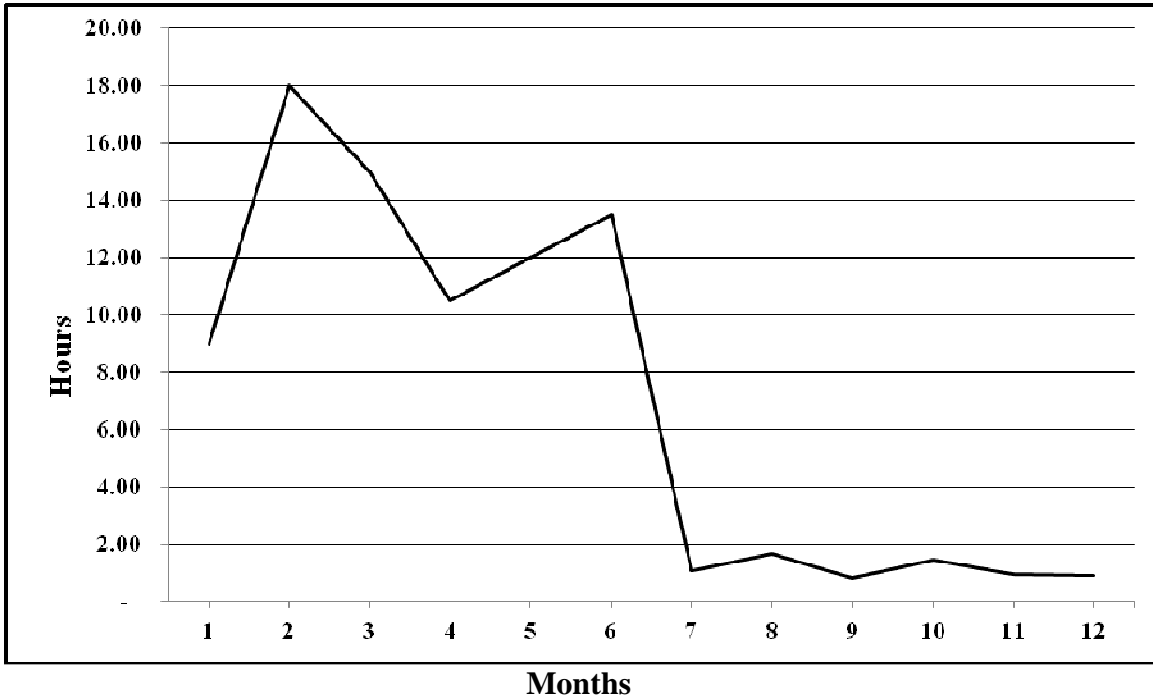


Figure 4.1 shows the monthly average transaction time to be swinging between 9 hours and 18 hours per transaction for months 1 to 6 representing the pre-BPR period. For months 7 to 12, the swinging range dropped drastically to between 0.8 hours and 1.7 hours per transaction representing the post-BPR period.

The change in swing on monthly average transaction time from a high of 18 hours and 1.7 hours to a low of 9 hours and 0.8 hours for pre- and post- BPR period respectively indicates an achieved decrease in time of approximately ten times as a result of BPR implementation on asset management.

4.2.2 Monthly Average Transaction Cost

The monthly average transaction cost represent the direct initiator cost incurred in identification of the item required, raising of the requisition and waiting for approval

through to collection of the item. The cost considered was for a technician level grade initiator only exclusive of all other transaction associated costs. The monthly average transaction cost for months 1 to 12 is given in table 4.2 (a) and table 4.2 (b) for pre- and post- BPR periods respectively.

Monthly Average Transaction Cost

Table 4.2 (a): Pre - BPR

Month	1	2	3	4	5	6
Average Cost/ transaction (Kenya Shillings)	4,383	9,330	7,963	5,114	6,370	6,998

Table 4.2 (b): Post - BPR

Month	7	8	9	10	11	12
Average Cost/ transaction (Kenya Shillings)	603	849	374	672	505	438

Source: KPRL records

This data is represented graphically as follows.

Figure 4.2: Monthly Average Transaction Cost

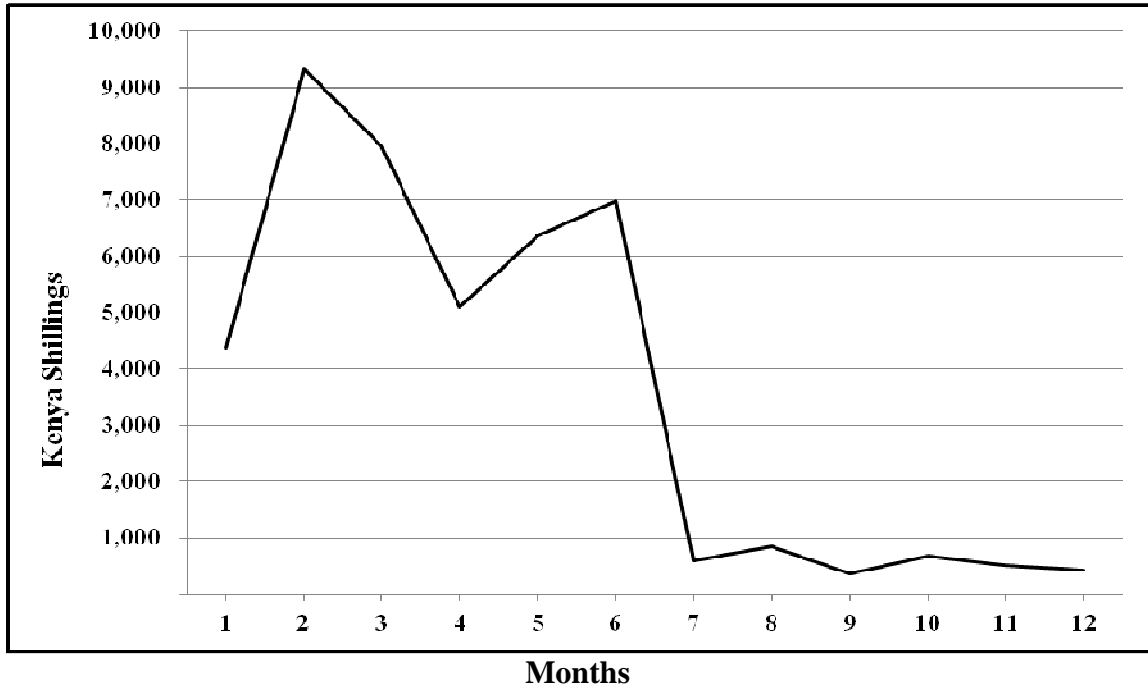


Figure 4.2 shows the monthly average transaction cost to be swinging between Ksh 4000 and Ksh 10000 per transaction for months 1 to 6 representing the pre-BPR period. For months 7 to12, the swinging range dropped drastically to between Ksh 350 and Ksh 850 per transaction representing the post- BPR period.

The change in swing on monthly average transaction cost from a high of Ksh 10000 and Ksh 850 to a low of Ksh 4000 and Ksh 350 for pre- and post- BPR period respectively indicates an achieved decrease in cost of approximately eleven times as a result of BPR implementation on asset management.

The time and cost per transaction as indicated on figure 4.1 and figure 4.2 represents a good indicator of performance improvement measure as they indicate to be moving in tandem. Both cases were taken into consideration indicating the time and cost improvement resulting from BPR implementation.

4.3 Structural Break Analysis

In order to determine whether cost and time improvement was significant, structural break was done on time and cost data. This was to test for structural break on materials approval performance improvement in time and cost, the monthly average transaction time and cost were used for the period months 1 to 12. The data was split into two sub-period of six months each: months 1 to 6 and months 7 to 12 to get two separate regression models each for time and cost. The assumption was that implementation of BPR in month 7 (April 2011) might have resulted into a structural change in monthly average transaction time and cost and hence it would be misleading to represent the pre- and post- BPR periods using a single regression model.

Chow's test for structural change analysis was used under the null hypothesis that there was no structural change in months 1 to 12 and thus it is justified to use a single regression model to fit all the data. Residual sum of squares for all observations was defined as RSS_C with degree of freedom, $df = (n_1 + n_2 - k)$ where n_1 represents number of observations pre-BPR implementation, n_2 represents number of observations post-BPR implementation and k represents number of parameters in the regression, the restricted residual sum of squares as RSS_R and the unrestricted residual sum of squares as RSS_{UR} . Then equated as: $RSS_R = RSS_C$ and $RSS_{UR} = RSS_1 + RSS_2$ with $df = (n_1 + n_2 - 2k)$.

If indeed there was no structural break, and that the regression models of pre- and post BPR are essentially the same, then RSS_R and RSS_{UR} should not be statically different. A formal test is performed by calculating the F- statistics

$$F = \frac{(\text{RSS}_R - \text{RSS}_{UR})/k}{(\text{RSS}_{UR}) / (n_1 + n_2 - 2k)} \approx F_{[k, (n_1 + n_2 - 2k)]}$$

4.3.1 Time Consideration

The null hypothesis represents a case of no structural change on monthly average transaction time for months 1 to 12 and thus having a single regression model justified for use on the complete data. The alternative hypothesis represents a structural change case on monthly average transaction time for months 1 to 6 and months 7 to 12 with each having a separate regression model. All the working is illustrated as follows.

For the period between months 1 and 12:

Equation 1: Transaction time for months 1 to 12

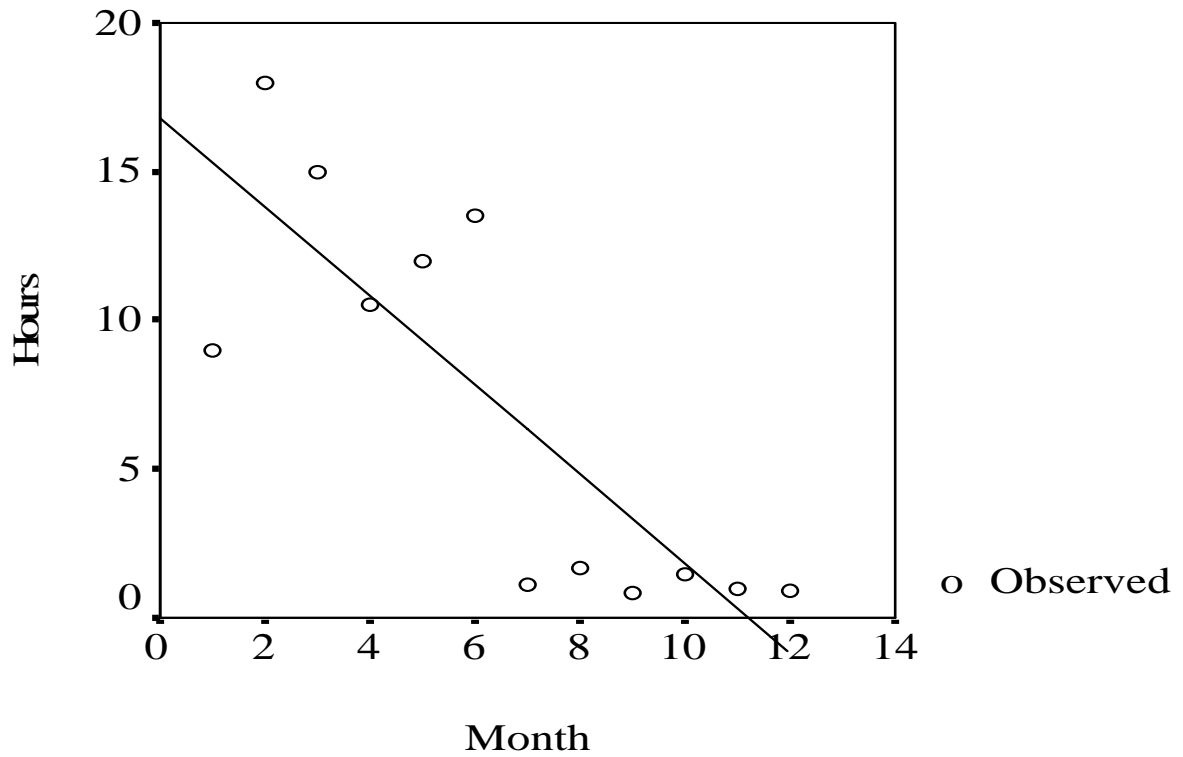
$$\hat{Y}_t = 16.816 - 1.498X_t$$

$$t = (6.995) \quad (-4.584)$$

$$R^2 = 0.678 \quad \text{RSS}_c = 152.587 \quad df = 10$$

Figure 4.3 shows the scatter gram for the above regression model.

Figure 4.3: Transaction time for months 1 to 12



For the period between months 1 and 6:

Equation 2: Transaction time for months 1 to 6

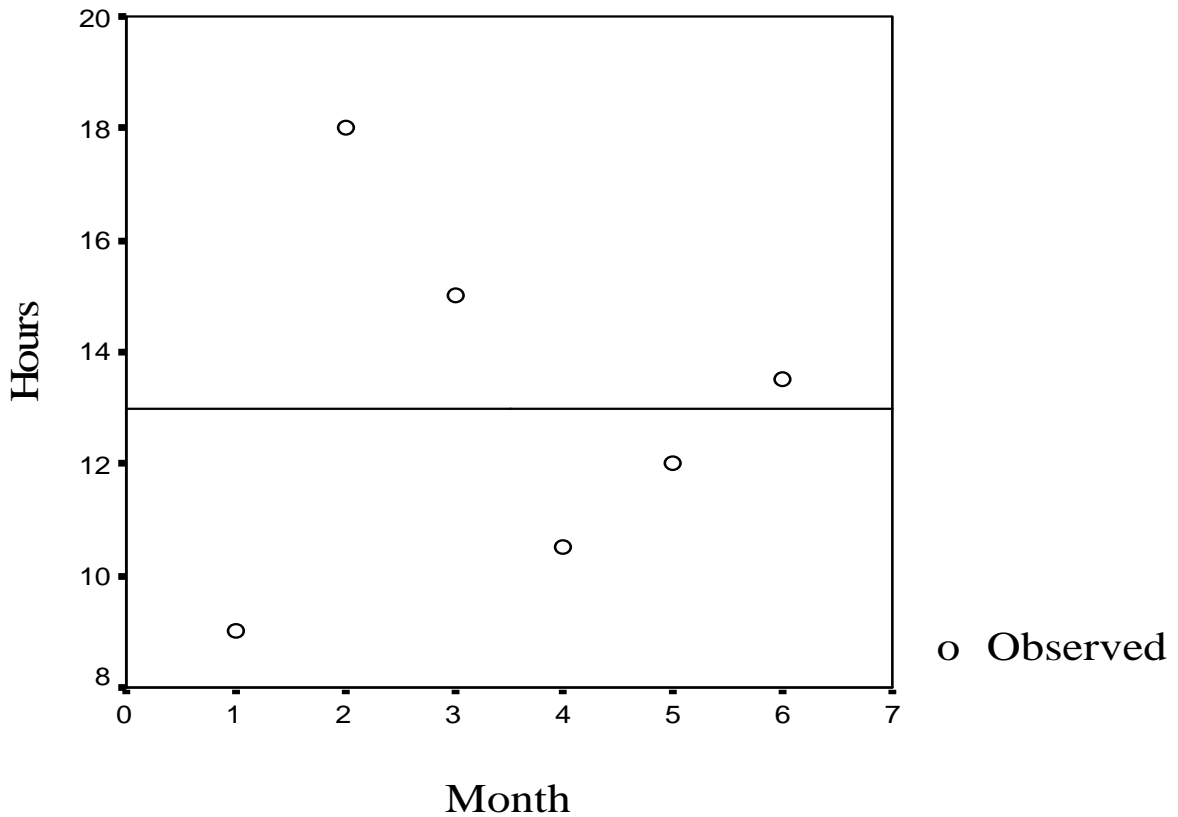
$$\hat{Y}_t = 13 + 0 X_t$$

$$t = (-3.854) \quad (0.000)$$

$$R^2 = 0.000 \quad RSS_c = 52.500 \quad df = 4$$

Figure 4.4 shows the scatter gram for the above regression model.

Figure 4.4: Transaction time for months 1 to 6



For the period between months 7 and 12:

Equation 3: Transaction time for months 7 to 12

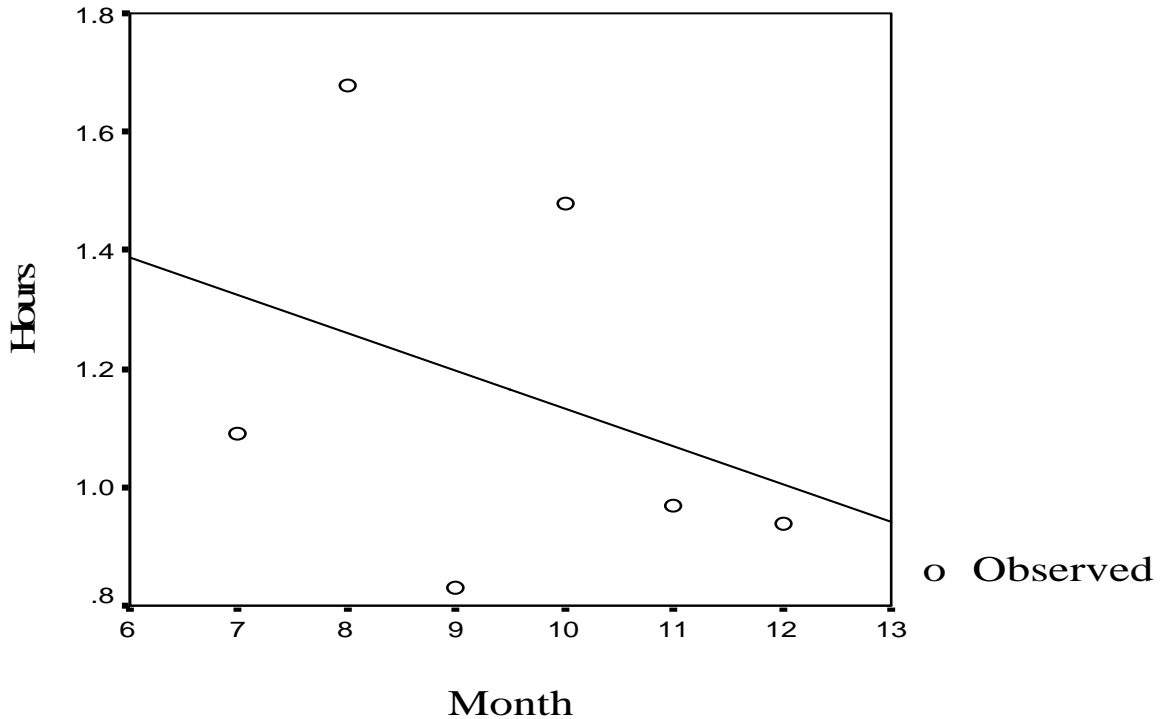
$$\hat{Y}_t = 1.77 - 0.064X_t$$

$$t = (2.170) \quad (-0.754)$$

$$R^2 = 0.124 \quad RSS_c = 0.500 \quad df = 4$$

Figure 4.5 shows the scatter gram for the above regression model.

Figure 4.5: Transaction Time for months 7 to 12



The computed value of F is obtained as follows.

Equation 4: F-computed value against F-critical value

$$F = \frac{(RSS_R - RSS_{UR})/k}{(RSS_{UR}) / (n_1 + n_2 - 2k)} \approx F_{[k, (n_1 + n_2 - 2k)]}$$

$$RSS_{UR} = 52.500 + 0.500 = 53.000$$

$$F = \frac{(152.587 - 53.000)/2}{(53.000)/8} = 7.516$$

The computed value of F was 7.516 while the critical value of $F_{(2/8)}$ with 2 and 8 degrees of freedom at 95% level of significance from F-tables is 4.459. Since the computed F value exceeded the critical F value, the null hypothesis of parameter stability was rejected and the conclusion was that the regression models of sub- periods months 1 to 6 and months 7 to 12 were different. Hence the researcher concluded that a structural change in regard to approval transaction time had indeed occurred as a result of BPR

implementation and the change is negative as indicated in equations 2 and 3. This means that there has been a significant reduction in transaction time.

To justify the use of Chow test for structural break, the fundamental assumption underlying the Chow test was examined under the null hypothesis that the error variances of the two sub periods were the same. These error variances are estimated from the RSS given in the regression models as follows:

Equation 5: Error variance estimate for pre – BPR period

$$\hat{\alpha}^2_1 = \frac{RSS_1}{n_1 - 2} = \frac{52.500}{6 - 2} = 13.125$$

Equation 6: Error variance estimate for post – BPR period

$$\hat{\alpha}^2_2 = \frac{RSS_2}{n_2 - 2} = \frac{0.500}{6 - 2} = 0.125$$

Equation 7: Two sub-periods estimate for variances against F-critical value

$$\frac{(\hat{\alpha}^2_1 / \alpha^2_1)}{(\hat{\alpha}^2_2 / \alpha^2_2)} \approx F_{(n1-k), (n2-k)}$$

Equation 8: F-computed value of variances

$$\frac{\hat{\alpha}^2_1}{\hat{\alpha}^2_2} = \frac{13.125}{0.125} = 105.00$$

The computed F value was 105.00 and the critical F value with 4 and 4 degrees of freedom in the numerator and denominator respectively is 6.39. Since the computed F value was greater than the critical value, the researcher rejected the null hypothesis and concluded that the two sub- periods variance are statistically different, hence it was inappropriate to use the chow test in examining structural change for monthly average transaction time.

4.3.2 Cost Consideration

The null hypothesis represents a case of no structural change on monthly average transaction cost for months 1 to 12 and thus having a single regression model justified for use on the complete data. The alternative hypothesis represents a structural change case on monthly average transaction cost for months 1 to 6 and months 7 to 12 thus each having a separate regression model. All the working is illustrated as follows.

For the period between months 1 and 12:

Equation 9: Transaction cost for months 1 to 12

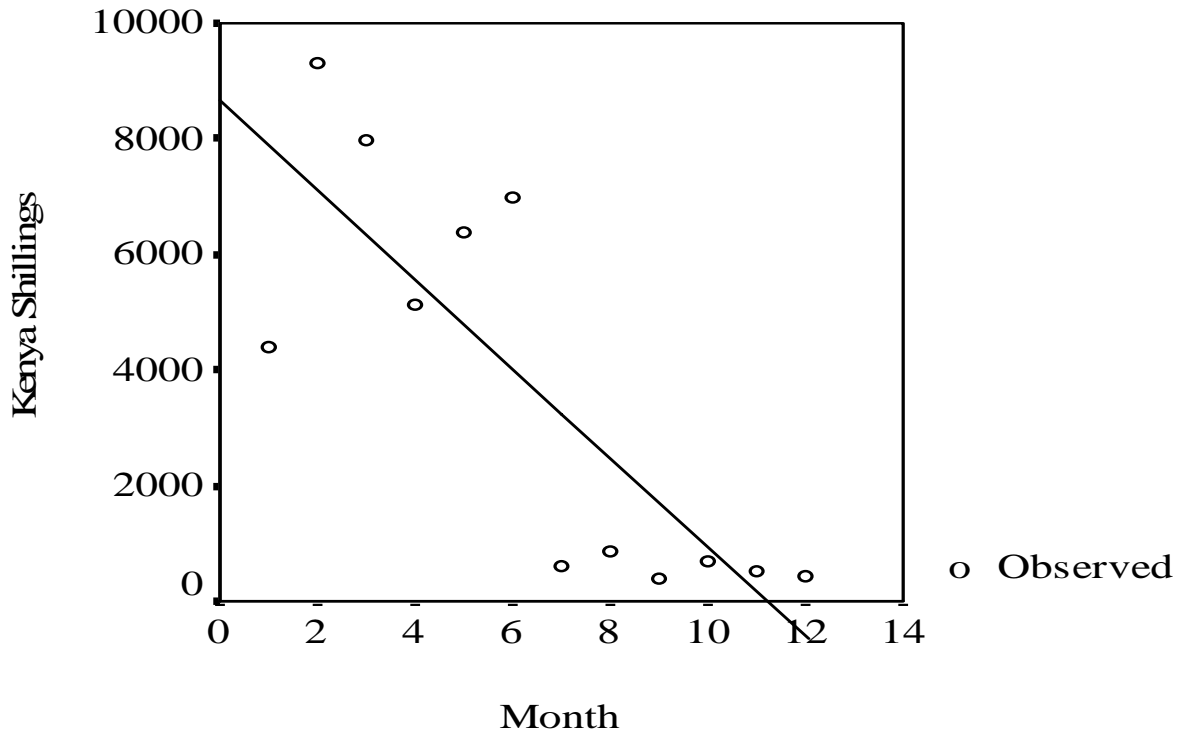
$$\hat{Y}_t = 8644.955 - 771.031X_t$$

$$t = (6.691) \quad (-4.392)$$

$$R^2 = 0.659 \quad RSS_c = 44075528 \quad df = 10$$

Figure 4.6 shows the scatter gram for the above regression model.

Figure 4.6: Transaction cost for months 1 to 12



For the period between months 1 and 6:

Equation 10: Transaction Cost for months 1 to 6

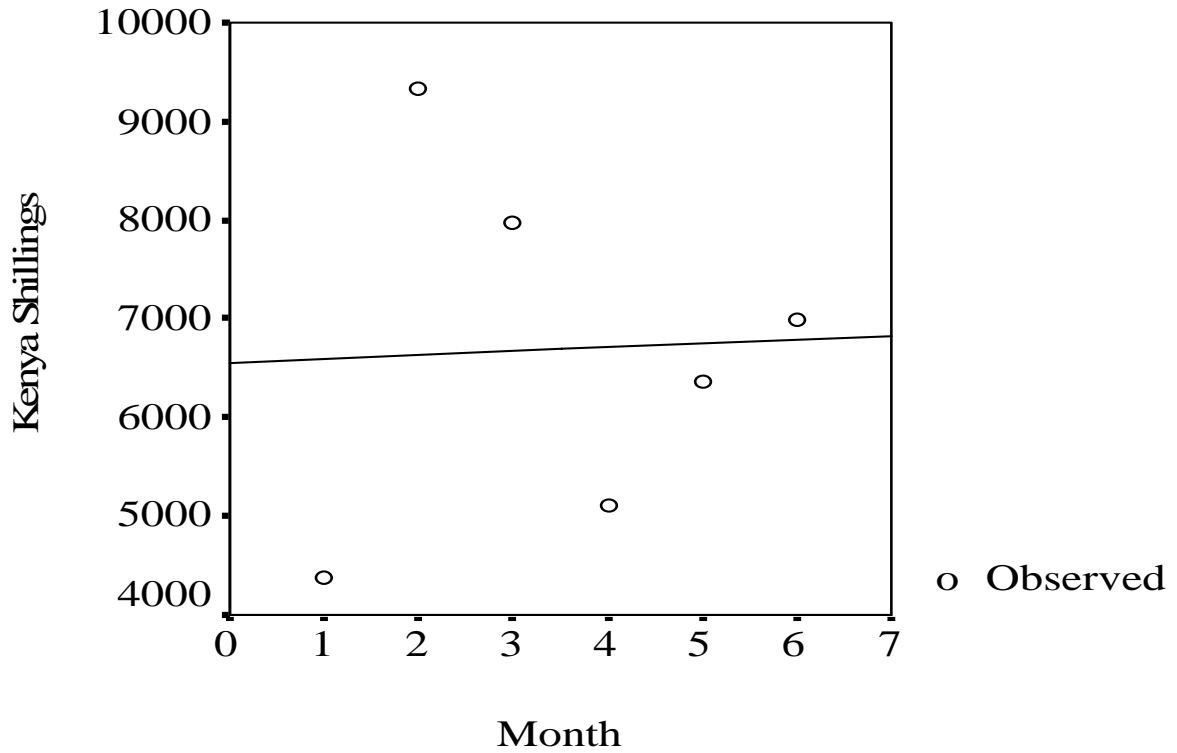
$$\hat{Y}_t = 6558.4 + 38.457X_t$$

$$t = (3.462) \quad (0.079)$$

$$R^2 = 0.002 \quad RSS_c = 16567482 \quad df = 4$$

Figure 4.7 shows the scatter gram for the above regression.

Figure 4.7: Transaction cost for months 1 to 6



For the period between months 7 and 12

Equation 11: Transaction cost for months 7 to 12

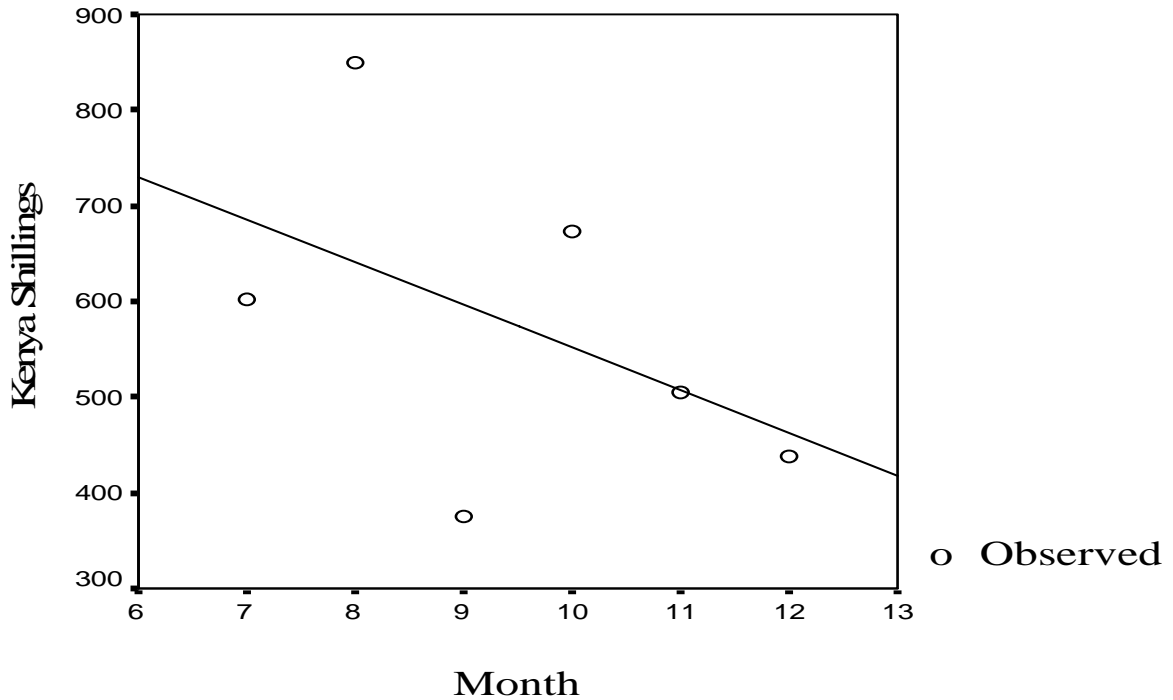
$$\hat{Y}_t = 996.657 - 44.543X_t$$

$$t = (2.552) \quad (-1.101)$$

$$R^2 = 0.233 \quad RSS_c = 114604.3 \quad df = 4$$

Figure 4.8 shows the scatter gram for the above regression model.

Figure 4.8: Transaction cost for months 7 to 12



The computed value of F is obtained as follows.

Equation 12: F-computed value against F-critical value

$$F = \frac{(RSS_R - RSS_{UR})/k}{(RSS_{UR}) / (n_1 + n_2 - 2k)} \approx F_{[k, (n_1 + n_2 - 2k)]}$$

$$RSS_{UR} = 16567482 + 114604.3 = 16682086.3$$

$$F = \frac{(44075528 - 16682086.3)/2}{(16682086.3)/8} = 6.568$$

The computed value of F was 6.568 while the critical value of $F_{(2/8)}$ with 2 and 8 degrees of freedom at 95% level of significance from F-tables is 4.459. Since the computed F value exceeded the critical F value, the null hypothesis of parameter stability was rejected and the conclusion was that the regression models of sub- periods months 1 to 6 and months 7 to 12 were different. Hence the researcher concluded that a structural change in regard to approval transaction cost had indeed occurred as a result of BPR

implementation and the change is negative as indicated in equations 10 and 11. This means that there has been a significant reduction in transaction cost.

To justify the use of Chow test for structural break, the fundamental assumption underlying the Chow test was examined under the null hypothesis that the error variances of the two sub periods were the same. These error variances are estimated from the RSS given in the regression models as follows:

Equation 13: Error variance estimate for pre – BPR period

$$\hat{\alpha}_1^2 = \frac{RSS_1}{n_1 - 2} = \frac{16567482}{6 - 2} = 4141870.5$$

Equation 14: Error variance estimate for post – BPR period

$$\hat{\alpha}_2^2 = \frac{RSS_2}{n_2 - 2} = \frac{114604.3}{6 - 2} = 28651.075$$

Equation 15: Two sub-periods estimate for variances against F-critical value

$$\frac{(\hat{\alpha}_1^2 / \alpha_1^2)}{(\hat{\alpha}_2^2 / \alpha_2^2)} \approx F_{(n1-k), (n2-k)}$$

Equation 16: F-computed value of variances

$$\frac{\hat{\alpha}_1^2}{\hat{\alpha}_2^2} = \frac{4141870.5}{28651.075} = 144.56$$

The computed F value was 144.56 and the critical F value with 4 and 4 degrees of freedom in the numerator and denominator respectively is 6.39. Since the computed F value was greater than the critical value, the researcher rejected the null hypothesis and concluded that the two sub- periods variance are statistically different, hence it was inappropriate to use the chow test in examining structural change for monthly average transaction cost.

4.4 BPR Implementation Challenges Experienced by KPRL

The informant responses to the challenges experienced were rated on a Likert scale with; 0 - no challenge, 1- low, 2- medium, 3- high and 4- very high challenge respectively. These were the BPR implementation challenges which impacted on the level of performance improvement achieved. For each of the challenge considered, a mean was obtained from the informants' responses. This is presented in table 4.3.

Table 4.3: BPR Implementation Challenges Experienced by KPRL

	Challenge Area	Mean Rating
1	Communication on the importance of the project in the organization.	3.8
2	Dealing with project implementations timelines	3.3
3	Commitment of top management to the project.	3.2
4	Provision of sufficient and successful training for the end users.	3.2
5	Ensuring proper support level of operational problems with the system.	3.0
6	The sufficiency in system commission testing.	3.0
7	Provision of sufficient and successful training for the project team members.	2.8
8	Suitability of Information Technology infrastructure for the project.	2.7
9	Resources suitability for the project.	2.6
10	Resources adequacy for the project.	2.6
11	Reviewing the existing approval process to eliminate the non-value adding steps.	2.6
12	Resistance to system adoption within the organization	2.6
13	Ensuring data quality, reliability and integrity from the system.	2.3
14	Ensuring that the system met the user's needs/ expectation.	2.1

Sources: Primary data

From table 4.3, Communication of project importance within the organization was rated as the biggest challenge which KPRL experienced with a score of 3.8 followed by dealing with project implementations timelines with a score of 3.3. The third challenge in significance rating was both top management commitment to the project and the provision of sufficient and successful training for the end users with a score of 3.2. The fourth challenge in significance rating was both in ensuring proper support levels for the operational problems with the system and in sufficient system testing with a score of 3.0. The least experienced challenge was in ensuring that the system met the user's needs/ expectation with a score of 2.1 thus meaning that expectations were averagely met. In general from all the challenges considered none was of zero and low rating as all rated medium and above. Medium represented 57% while high and above represented 43%.

In consideration of other implementation challenges, the findings were that they focused more on data integrity issues in the system as it dominated informant responses. The process issues were dominant too which in most cases was considered a hindrance to the degree of improvement level. Also some issues raised were to do with communication of the project importance and training of the system users.

The degree level on each challenge experienced from organization to organization varied as it was dependent on organization's capability in handling BPR implementation process. Kaptoge (2008) on Wrigley Company study observed that the key among the drivers for success in BPR implementation was the compelling case for change which was managed properly and lead to the gain in competitive advantage achieved. Mireri (2010) study on KPA factors impacting BPR implementation found out that change

management, top management and organization structure negatively impacted on the BPR implementation.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

This research study sought to find out whether KPRL met its performance improvement objective by implementing BPR in asset management system and the challenges it faced in the process of implementing BPR in asset management.

The findings were based on both secondary and primary data. Secondary data was collected from KPRL records covering six months pre- and post- BPR implementation. This was the data available for post BPR implementation when the research was started. The consideration was for a single item transaction case with the initiator being a technician level employee and approval level up to the supervisor level only. Cost consideration was for the initiator expenses incurred exclusive of all other transaction costs. Primary data was collected from seven informants through an interview. The informants covered were; one engineering head of department, one engineering supervisor, one mechanical technician, one instrument technician, one electrical technician, one materials clerk and one contracts clerk all involved in the asset management focused part.

The findings indicated that there was a drastic improvement in time for the approval process. From the data collected, it was noted that the swinging range of the average monthly transaction time was 18 hours to 9 hours and 1.7 hours to 0.8 hours for pre-and post- BPR implementation respectively. In this, the decrease in monthly average

transaction time achieved was approximately ten times as a result of BPR implementation on asset management.

For the cost, the trend was noted to be the same as time. The findings indicated the swinging range of the monthly average transaction cost was Ksh 10000 to Ksh 4000 and Ksh 850 to Ksh 350 for pre- and post- BPR implementation respectively. In this, the decrease in monthly average transaction cost achieved was approximately eleven times as a result of BPR implementation on asset management.

The study showed that there was a structural change in both monthly average transaction time and cost for pre- and post- BPR periods. This was determined through Chows' test for structural change under the null hypothesis of no structural change which was rejected. This meant that the two sub- periods pre- and post- BPR were different with each having different regression models.

The study also showed that most of the BPR implementation challenges were challenges too on KPRL implementation case. The rating for all the challenges was on medium and above where medium represented 57% and high and above represented 43%. In descending order rating consideration, communication of project importance within the organization was rated as the biggest challenge which KPRL faced followed by dealing with project implementations timelines. Top management commitment to the project and the provision of sufficient and successful training for the end users were third. The least challenge in rating was in ensuring that the system met the user's needs/ expectations.

5.2 Conclusions

BPR is a performance improvement technique geared towards redesigning work ways to better support the organization's mission and reduce costs. It has been approached as a tool to dramatically improve organizations business performance and lead them to a competitive position (Schnitt, 1993; Grover, Teng & Fielder, 1993). It aims at substantial gains in multiplicative levels of ten times rather than 10% in organizational performance (Attaran, 2004). It focuses on the processes and not functions (Lee & Chuah, 2001). Groover, Joeng, Keitinger, and Jeng (1995) observed that the value of BPR to an organization can be seen at both process such as time reduction and cost and advantage achievement can only be possible when it is implemented successfully.

Hallmark reduced its design time by over 200% through reengineering its product design operations (Attaran & Wood, 1999). IBM eliminated normal delivery delays by two months through redesigning its delivery process resulting from reengineering (Janson, 1992). Wrigley Company gained competitive advantage through BPR on its supply chain and enterprise resource management (Kaptoge, 2008). EABL benefited substantially from BPR through growth in efficiencies leading to improved growth in profitability over the years (Gitagama, 2008).

The study concluded that by implementing BPR in asset management, KPRL drastically improved its materials approval process time by achieving a ten times reduction thus resulting in an eleven times cost reduction too as the two were noted to move in tandem. In cost, this represented part of the cost saving in the process and the full consideration would be much high.

The study found out that KPRL experienced all BPR implementation challenges at different rating levels. The rating for all the challenges was on medium and above with medium representing 57% and high and above representing 43%. This indicates that the challenges impacted the improvement level achieved through BPR implementation at KPRL thus requiring a high degree of management for each. Communication of project importance within the organization was rated as the biggest challenge which KPRL experienced.

The challenge findings were observed to be in line with other studies where organizations experienced various highly rated challenges. Kaptoge (2008) on Wrigley Company BPR implementation study found out that the key among the drivers for success was the compelling case for change. Mireri (2010) study on KPA factors impacting BPR implementation found out that change management, top management and organization structure impacted negatively on BPR implementation.

5.3 Recommendations

The competitive pressure due to faster pace of growing customer expectation, globalization and technological development have placed organizations to continuously operate in challenging business environment. For organizations to remain in business competitively there is need for them to consider performance improvements in their work processes. The steady products and services improvement is not sufficient to survive in the business environment. The radical approach to BPR was pronounced as the only means of salvation for organizations trapped in outmoded and outdated business process and general working ways (Valentine & Knights, 1998).

Many organizations as noted from the literature studies reengineered some of their processes and achieved drastic gains in both time and cost. On the part of KPRL, reengineering the asset management clearly resulted in time and cost benefits on the part of approval process considered and this was a clear indication on the overall gain to be achieved from the whole process. In this consideration, KPRL should continuously consider adopting BPR on process areas impacting its business performance operations in order to position itself competitively in the business industry as well as to progress with its business growth.

BPR implementation comes with a lot of challenges which impacts the improvement achieved. For substantial benefits from BPR implementation to an organization, the challenges must be managed properly. On the part of KPRL out of the many challenges considered, all came out with a significance rating of medium and above. The biggest challenge experienced by KPRL was on communication of the project importance within the organization which was high rated. In general, BPR implementation challenges impact heavily on the level of improvement to be achieved in any undertaking. Reasonable improvement levels can only be achieved when all challenges are managed to the desired level.

For KPRL to achieve the required improvement level in any BPR undertaking, all factors that cause success and failure of BPR efforts as noted from the challenges experienced and relevant literature review must be analyzed. This will take into consideration the organizations' various capabilities. Then proper management measures are to be developed and implemented for achievement of reasonable improvement levels.

5.4 Limitations of the Study

The transactions data collected was for a number of personnel of same grade level within the organization. It was assumed that their productivity level was to be same while this in reality could not be correct. This thus gave an estimated position and not the very exact position if all transactions were handled by the same person and working under the same conditions.

Transactions considered were for a single item but with the limitation of not being the same item for all transactions. The assumption was that the process required for any single item was the same in all cases. This thus gave an estimated activity time for each transaction. The pre- BPR period depended on best estimated position considering that the recorded times were not detailed enough for each activity but represented by only dates. The estimated transaction process time position thus impacted on determination of the proper improvement level. Despite all the above, the researcher took utmost precautions for the very objective findings from the research.

5.5 Suggestions for Further Research

This research study focuses on the use of BPR for performance improvement in the case of KPRL. The concept of BPR is however applicable across the private and public organizations as a whole and in processes as well within organizations. This is also applicable in both service and manufacturing organizations.

Further research can be done on a number of areas which the study did not cover in depth as the study was limited to the implemented phase and available data then, these include:

Detailed study on the overall impact of BPR implementation in asset management on the KPRL business performance; The study on whether BPR implementation strategy adopted by KPRL was the best. Also further research on BPR as an improvement technique could be carried out on various organizations within and outside the industry and in both private and public sector.

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APPENDIX I: INTERVIEW GUIDE

This research aims at establishing factual views on the challenges faced by KPRL in BPR implementation process on asset management.

PART A- General Details

Part A; consists of questions aimed at capturing the general information about the employee

- 1) Job position.....

- 2) Involvement in materials and service requisitioning/approval process part of asset management within the organization? (Y/N)

PART B- Implementation Challenge Questions Areas

Part B; consists of question areas aimed at establishing the challenges experienced by KPRL in BPR implementation process. In a scale of 0 to 4, please indicate the extent to which you consider the following items as challenges experienced. Indicate with a tick in the appropriate box where; 0 - not a challenge, 1- low, 2- medium, 3- high and 4- very high challenge.

Item No.	Challenge details	Challenge rating				
		0	1	2	3	4
1	Commitment of top management to the project.					
2	Communication on the importance of the project in the organization.					
3	Resources suitability for the project.					
4	Resources adequacy for the project.					
5	Provision of sufficient and successful training for the project team members.					
6	Provision of sufficient and successful training for the end users.					
7	Reviewing the existing approval process to eliminate the non-value adding steps.					
8	Dealing with project implementations timelines					
9	Suitability of Information Technology infrastructure for the project.					
10	Ensuring proper support level of operational problems with the system.					
11	Ensuring data quality, reliability and integrity from the system.					
12	Resistance to system adoption within the organization					
13	Ensuring that the system met the user's needs/ expectation.					
14	The sufficiency of system commission testing.					

15. Indicate any other challenge areas not considered and the significance rating.

APPENDIX II: SECONDARY DATA COLLECTION FORM

PART A (Prior BPR implementation)

This will cover six month prior BPR implementation (October 2011 to March 2012) and for each month, six entries will be considered of a single item only.

I) Materials/Services

a) Time Consideration

Item No.	Transaction details	Transaction					
		1	2	3	4	5	6
1	Identification of the spares required & Preparation of the requisition form (time)						
2	Circulation of the form for approval (time)						
3	Signing & collection of the items (time)						
4	Total time per transaction						

b) Cost Consideration

Item No.	Transaction details	Transaction					
		1	2	3	4	5	6
1	Identification of the spares required & Preparation of the requisition form (cost)						
2	Circulation of the form for approval (cost)						
3	Signing & collection of the items (cost)						
4	Total cost per transaction						

PART B (Post BPR implementation)

This will cover six month prior BPR implementation (April to September 2012) and for each month, six entries will be considered of a single item only.

I) Materials/Services

a) Time Consideration

Item No.	Transaction details	Transaction					
		1	2	3	4	5	6
1	Identification of the spares required & Preparation of the requisition form (time)						
2	Circulation of the form for approval (time)						
3	Signing & collection of the items (time)						
4	Total time per transaction						

b) Cost Consideration

Item No.	Transaction details	Transaction					
		1	2	3	4	5	6
1	Identification of the spares required & Preparation of the requisition form (cost)						
2	Circulation of the form for approval (cost)						
3	Signing & collection of the items (cost)						
4	Total cost per transaction						