

**QUALITY OF RESEARCH AND PERFORMANCE OF
GOVERNMENT RESEARCH INSTITUTES IN KENYA**

BY

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DECLARATION

This research project is my original work and has not been presented for the award of a degree in this university or any other institution of higher learning for examination.

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This research project has been submitted for examination with my approval as the University of Nairobi Supervisor

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DEDICATION

This research project is dedicated to my beloved Claire Nduku and our son Asadel Fadhili for their unending love, support and tolerance through times of absence, and to my parents and siblings for their never ending prayers, encouragement and support.

ABSTRACT

Quality is a complex subject where different quality gurus define it in somewhat different way from each other, leaving no real consensus on definition. This dilemma is transferred to determining quality of research, whereby quality of research is inferred through indicators, rather than being defined. Indicators of quality that have gained practical application are: the establishment and use of a quality management system, independent party evaluation of outputs through peer reviewing and certification, collaboration and partnerships for benchmarking against the best practices by the industry leaders while adding knowledge, and finally the status of facilities and infrastructure. The design adopted for the study was descriptive survey. Data was collected using a questionnaire which consisted of both open and closed ended questions. The data collected was analyzed using descriptive statistics and also an inferential analysis involving a regression was performed. The findings of the study are that there is general awareness of the importance of quality, and that all Institutes have made genuine efforts to control and manage the quality of their research processes and products. Also, that the four indicators of quality were found to be statistically significant and therefore valid indicators to be used for the study. The study recommends that future studies be carried out to establish the other indicators represented by the 24 percentage. Further, that comparative study be made for government research institutes in Kenya and similar institutes in the East African community.

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CHAPTER ONE: INTRODUCTION

1.1 Background of Study

Research is derived from a French word meaning investigate thoroughly. Neuman (2003) describes research as a collection of methods and methodologies that researchers apply systematically to produce scientifically based knowledge about the social world. Research has been used by many interest groups to achieve their various purposes. In the business world, research is used to give firms a competitive edge through new product development and new methods of getting products out to the customers faster than their competitors. In medicine, centers for disease control are actively involved in research for the purpose coming up with vaccines for new threats. In the military, research is conducted continuously for the purpose of enhancing countries ability to defend themselves against external threats. The contribution of research to the economy therefore cannot be understated. Quality of research therefore becomes the key issue that can keep one party one step ahead of the other.

1.1.1 Quality of Research

Research or pursuit of new knowledge has traditionally been divided into two major functions, Pure and Applied research. Today the boundaries between basic and applied research are blurring. The translation of research finding and knowledge into new improved products and services is now seen as an integral part of the research process thus the need to look deeper into quality aspects of research. Quality itself is more complex than it may appear. It seems that every quality guru defines quality in somewhat different way from the other. Crosby (1980) defined it as Conformance to requirements; Juran (2010) defined it as fitness for use; Gitlow et al. (1989) defined it as the extend to which customers or users believe the product or service surpasses

their needs or expectations; Deming (1986) defined it as the predictable degree of uniformity and dependability at low cost and suited to the market. ISO 9000:2005 defines quality as the degree to which a set of inherent characteristics fulfills requirement. There seems to be no real consensus on what the definition of quality is and this dilemma is carried over to the determination of the quality of research, where research quality is inferred rather than defined.

The scientific community and their regulatory bodies will generally view a research as being of high quality if the research process was conducted thoroughly, if it followed the generally accepted methodologies, if the resultant physical products if any, meets regulatory standards and if the research outcomes are revolutionary or add to the general body of knowledge. This view however doesn't put into consideration the satisfaction of the end user who will be the consumer of the product, the assumption being, research is continuous and additional research can always be conducted later to solve any pending issues

The general public and direct customers on the other hand have little interest in the details of how outcomes were arrived at. They will view a research as being of high quality if the resultant outcomes satisfy their needs and expectations i.e. the extent to which the research output has solved the problem it intended to solve and how much practical value has been added to their lives will determine quality.

1.1.2 Organizational Performance

According to Armstrong and Baron (1998), performance is a strategic and integrated approach to increase the effectiveness of companies by improving the performance of the people who work in them and by developing the capacities of teams and individual contributors. In its basic sense, it is the evaluation of actual results against

desired results. Performance management therefore becomes a critical tool to manage business if it is significant in shaping individual behavior that is directed towards achieving strategic aims of the organization. As Mohrman and Mohrman (1995) emphasized, performance management is managing the business.

Gibson et al. (1989) defines organizational performance as being the final achievements of an organization and is characterized by the existence of certain targets to be achieved, existence of a period of time in which to achieve the targets and the realization of efficiencies and effectiveness. Organizational performance is thus arguably the ultimate dependent variable of interest for any researcher concerned with any field of management. It is the most significant criterion in evaluating organizations, their actions and performance as reflected by Mach and Sutton (1997) who found that, out of 439 articles in the *Strategic Management Journal*, *The Academy of Management Journal* and *Administrative Science Quarterly* over a period of 3 years, 23 % included some measure of performance as a dependent variable. Good performance refers to the achievement of such objectives as good financial results and profits, quality products, larger market share and survival in the market.

1.1.3 Government Research Institutes in Kenya

The context of this study is government research institutes. There are 6 government research institutes in Kenya namely Kenya medical research institute (KEMRI) established through the Science and Technology (amendment) act of 1979 as the national body responsible for carrying out health research in Kenya. Its mission is to improve human health and quality of life through research, capacity building, innovation and service delivery.

Kenya Marine and Fisheries Research Institute (KMFRI) as per article No. 4 of the Science and Technology Act of 1979, Cap 250 is empowered to carry out research in marine and freshwater fisheries, aquatic biology, aquaculture, environmental chemistry, ecological, geological and hydrological studies as well as chemical and physical oceanography. Its mission is to contribute to management and sustainable exploitation of aquatic resources and thus alleviate poverty, enhance employment, creation of food security through multidisciplinary collaborative research both marine and fresh water aquatic systems.

Kenya Agricultural Research Institute (KARI) was established through Science and Technology Act (Cap 250) in 1979 with the mandate to conduct research in Agriculture and veterinary science. Its mission is to contribute to increased productivity, commercialization and competitiveness of the agricultural sector through generation and promotion of technologies that respond to clients demands and opportunities. Kenya Forestry Research Institute (KEFRI) was established in 1986 under the Science and Technology Act (chapter 250) to carry out research in forestry and allied natural resources. Its mission is to conduct research and provide information and technologies for sustainable development of forestry and allied natural resources for socio-economic development.

Kenya Industrial Research and Development Institute (KIRDI) was established in 1979 under the Ministry of Trade and Industry with the mandate of undertaking multidisciplinary research and development in industrial and allied technologies. Its mission is to undertake industrial research technology and innovation and disseminate findings that will have a positive impact on national development. Kenya Institute of

Public Policy Research and Analysis (KIPPRA) was established in 1997 through a legal notice and currently operating under the KIPPRA bill and KIPPRA Act No 15 to provide quality public advice to the government of Kenya and other stake holders by conducting objective research and through capacity building in order to contribute to the achievement of national development goals. Its mission is to provide quality public policy advice to the government of Kenya and other stakeholders by conducting objective research and through capacity building in order to contribute to the achievement of national development goals.

Private and publicly floated business companies conduct business research for the purpose of keeping them competitive in the market. Their research includes market research, opinion polls, customer satisfaction research as well as research for new product development e.g. Safaricom with Mpesa. Universities, the Non-governmental international institutions e.g. ICIPE and ILRI and the government research institutions e.g. KEMRI on the other hand conduct scientific research and this research is to add to existing knowledge or as a service to the public. They therefore do not do it primarily to make a profit.

1.2 Statement of the Problem

Defining quality has been seen to be problematic with many perceptions of quality being dependent on which angle quality is being observed from. These views are identified by Garvin (1986) as being transcendent approach, product based approach, user based approach, manufacturing based approach and value based approach. Reeves and Bednar (1994) point out that “the definition of quality has yielded inconsistent results, the concept has multiple and often muddled definitions and has been used to describe a wide variety of phenomena. To get a comprehensive

understanding of quality where actual physical products are released to the customer, quality of applied research should therefore be looked at as being both the process of producing the output as well as the perceived impact the resultant output has on the masses. These two views are supported by scientific community and their regulatory bodies on one hand, and the general public and direct customers.

A number of studies have been carried out on quality for example factors affecting quality of customer care in Telecom Kenya (Okibo and Ogwe, 2013), Service Quality and Customer satisfaction (Manani et al. 2013). These studies, though featuring on quality were mainly based on evaluating management processes related to how services were delivered. Little emphasize is placed on evaluating the quality of core functions and outputs of organizations and the research gap in this area is evident. Research, being a core function of government research institutions, falls into this category with limited information.

Positive attempts have been made to ascertain quality of academic research as indicated by the study done by Magutu et al. (2010) on the quality management practices in Kenyan Education Institutions. The European Union's expert group on assessment of university education in 2010 identified indicators of quality as number of research publications, percentage of publications in top ranked high impact journals, number of citations and referring in prestigious publications, number of keynote addresses at national or international conferences, international visiting research appointments, number of external research income, number of individual competitive grants won, employability of PHD graduates, number of patents an

international property rights, postgraduate research load, number of collaborations and partnerships, and research infrastructure and facilities.

The international non-governmental research institutions in Kenya like ICIPE also conduct extensive research work, but just like Government research institutes, the quality of their research is inferred and mainly remains ambiguous, subject to different interpretations. Relevant documented evidence is currently lacking on studies having been carried out to ascertain the quality of research in non academic circles, which leads this study to the research questions:

Which indicators are used for determining the quality of research in government research institutes? And what is the relationship of these indicators of quality to the institutes' performance?

1.3 Research Objectives

1. To establish the use of quality indicators to determine quality of research in government research institutes in Kenya
2. To establish the relationship between these indicators and the institutes' performance.

1.4 Value of Study

Governments need research among other things, for policy and planning, efficiency and investor confidence, to determine national competitiveness and development of research strategy. On the other hand, government is the number one employer and number one consumer of goods in Kenya. Its sources of income are mainly from taxing its residents and borrowing. In return it's institutions offer services to the public at subsidized or no cost. This leaves a catch 22 situation where public institutes

need to provide quality without the added motivation of direct benefit through profits, and a public that demands for quality without directly paying for it. This study thus looks at establishing some comprehensive and generic quality indicators that can be used for evaluating quality across these organizations thereby benefiting both the institutes and the public. It will further enable the management of these public institutions to critically evaluate them on whether they are impacting lives or not as their services are paid for by the public. This study will encourage other studies to venture into the field of critically evaluating the quality of core offerings by companies and not just how companies interact with customers, which has been the key emphasis of current studies. This will add to the limited body of knowledge in this area as no amount of good service will offset a deficient product.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of literature pertinent to the study as observed by various researchers and scholars. It seeks to anchor and develop the theoretical underpinnings of the study to actual literature on theory and practice

2.1.1 The Concept of Quality

Juran (2010) identifies 5 aspects of product quality as quality of design meaning the product should be designed as per consumer needs and high quality of standards, quality of conformance meaning that the finished product must conform to the specifications in the product design, reliability meaning that the product is dependable and does not easily break down, safety meaning that the product should not be harmful to the consumer in any way, and proper storage meaning that the product should be packed and stored properly to maintain the quality until the stated expiry date.

Customers also form service expectations from past experiences, word of mouth and advertisement and then compare the perceived service they receive with that expected service. If the former falls short of the latter, they become dissatisfied

Parasuraman et al (1988) highlights in their SERVQUAL model, 10 determinants that can lead to the appearance of a quality gap in services. These are reliability, responsiveness, competence, access, courtesy, communication, credibility, security, understanding the customer and tangibles. These were later reduced to 5 in their RATER model in 1990. These are reliability, which is ability to perform promised service dependably and accurately, Assurance which is knowledge and courtesy of

employees and their ability to convey trust, Tangibles which is appearance of physical facilities, equipment, personnel and communication, Empathy which is provision of caring, individualized attention to customers, and responsiveness which is willingness to help customers.

Garvin (1986) points out 5 approaches to defining quality. Transcendent approach advances that quality cannot be defined precisely, rather it is learnt through experience. He relates this to Plato's discussion of beauty that, like other terms philosophers consider "logically primitive", quality can be understood only after one is exposed to a succession of objects that display its characteristic. Product based approach advances that quality is a precise and measurable variable where differences in quality reflect differences in the quantity of some ingredient or attribute possessed by it. Meaning, quality is an inherent characteristic of a product and higher quality is obtained at higher cost. User based approach advances that products that best satisfy consumers' needs and preferences are those they will regard as having the best quality. Manufacturing based approach advances that quality is conformance to requirement. A product deviating from specification is likely to be poorly made and unreliable, thus providing less satisfaction to the customer Value based approach advances that a quality product is one that provides performance at an acceptable price or conformance at an acceptable cost. Weinberg (1992) states that value is the quality of something to someone. It begins with requirements which state the value required to be delivered to the person. Joyce and Woods (1996) summarize it by saying that value is not created by activities in isolation but by activities working together, thus creating a value chain.

The variation in definitions brings out the dilemma that today's managers' face in balancing the various departmental interests when determining quality for their organizations. Obviously relying on a single definition becomes a source of conflict.

A process based approach has therefore become the most inclusive and most used. First the characteristics that connote quality are identified through market research (user based approach to quality). They are then translated into identifiable product attributes (product based approach), finally the manufacturing process ensures products are made precisely to these specifications at the least cost (manufacturing and value based approach).

2.1.2 Quality of Research: A Global Perspective

The quality of research and research outcomes in the world today is continuously improving due to emerging challenges of the 21st century. Challenges occur in different areas necessitating research, but with this specialization come increased understanding of specific field under study and thus improvement of quality of outcomes. Some emerging trends in research include experimental development, also called research and technology development. This is specific research carried out by a department of an organization for the purpose of developing new products, processes and services. This has been brought about by globalization and the internet revolution, which has exposed firms to increased competition and hence the need to remain relevant.

Countries are also recognizing that natural disasters like tsunamis, computer cyber attacks as well as new disease strains like SARS or H1N1 are a risk to national fabric as much as physical terrorist attacks and therefore a need for early warning and containment capacity that can only be achieved through supporting their relevant

research institutes. Nowhere has this been felt as much as in the Asian continent. In Asia for example, the national applied research laboratories (NAR Labs) of Taiwan, a government institute, has identified 3 major research domains for increased financial support and quality emphasis. These are: information and communication technology, Biomedical technology, and integrated disaster prediction and warning system.

In the United States of America, the bulk of federal government funding for research goes to medical and biomedical research like cancer research institutes, artificial intelligence and ICT development research, military defense research and alternative energy research. The USA just like the rest of the world, has realized that current sources of energy especially fossil fuels are finite so many government are directing their funding to research on alternative sources of energy.

2.2 Indicators of Research Quality

2.2.1 Quality Management Systems

An indicator of good quality research is the existence of a quality management system (QMS). United Kingdom department of trade and industry defines a QMS as a set of coordinated activities to direct and control an organization in order to continually improve the effectiveness and efficiency of its performance, by defining processes which will result in production of quality products and services rather than in detecting defective products or services after they have been produced. A QMS ensures customer requirements are actually being captured and translated into products they require, and has a mechanism for continuously improving the system and dealing with any product that does not conform to customer expectations. According to Juran (2010) Product quality means incorporating features that have

capacity to meet customer needs and wants and giving customers satisfaction by making products free from deficiencies or defects A QMS also sets standards for service provision to customers that will influence their perception of performance of the institution.

Quality management presents a strategic option and an integrated management philosophy for organizations, which allows them to reach their objectives efficiently and effectively, and to achieve competitive advantage (Goldberg and Cole, 2002) Some examples of QMS that can be used are ISO 9000, Total Quality Management (TQM), Continuous Quality Improvement (CQI) and Six Sigma

The most important task is to implement a consistent and reliable quality system. Everything else is based on that, and further development is based on the reliability and integrity of the basic quality system in place.

2.2.2 Third Party Approvals

Quality is assumed to be assured when an independent authority confirms it. In research, this third party will approve the process of research and/ or approve the final product. The process is assured if the research is peer reviewed, the quality can be evaluated using information provided i.e. definition of key variables and concepts, description of population and process of selecting study subjects, and finally if there is minimal threat to the study's internal, external and construct validity.

The product is assured by certification by a third body. In Kenya, one active participant is Kenya Plant Health Inspectorate Service (KEPHIS) which is mandated to certify new plant varieties from breeders right from conception to final release of the varieties.

2.2.3 Partnerships and Collaborative Ventures

Partnerships and collaborative ventures provide opportunities to benchmark against best practices and can lead to informal or formal professional learning opportunities. Informal professional learning occurs through communication and reflection between professionals (McWayne et al. 2008). Engaging in mutual reflection on one another's practices assists professionals refine their knowledge about their subject area. According to Professor Stanley Waudo, partnerships are part of his University's quest to benchmark itself against the best in the world thus giving them the opportunity to be mentored and elevated to the level of the world's best universities (The Daily Nation, Friday July 25, 2014)

For collaborations to be successful there must be both organizational and individual support. Organizational support requires leadership that affirms and encourages partnerships and that provide professionals with resources and time to pursue collaborative opportunities as a central component of their roles. Research joint ventures have become increasingly popular (Cologhirou et al., 2003) and constitute the dominant form of research co-operation today (Hagedoom, 2002)

2.2.4 Facilities and Infrastructure

Facilities and infrastructure play a crucial role in influencing the perception of quality and the actual quality of outputs. Parasuraman et al (1988) in their RATER model of 1990 identified reliability, assurance, empathy, responsiveness, and "tangibles" characterized by the appearance of physical facilities, equipment, personnel and communication, as determinants that can lead to the appearance of a quality gap.

A modern lab having well calibrated, routinely maintained and latest equipment has the capability of producing more accurate results within a short period of time as compared to one with old equipment.

2.3 Quality of Research and Performance

Quality management and by extension quality of research, has been closely linked to performance with many performances management strategies being used as quality management strategies. The overall performance i.e. efficiency and effectiveness of a research can be greatly enhanced by having strategic quality management, which proposes that the realization of product does not only represent the total quality control of a product offering, Fraigenbaum (1961) but also the application of management principles to each and every aspect of the business (Crosby, 1980; Deming,1986)

Some examples of organizational improvement models that cut across the quality divide include bench marking which uses standard measurement in service or industry for comparison to other organizations' best practices in order to gain perspectives on organizational performance. Continuous improvement is a method focused on improving customer satisfaction for better organizational performance, but by improving internal processes quality of service is enhanced. Continuous improvement is often perceived as a quality management initiative. ISO 9000 is an internationally recognized standard of quality and includes guidelines to accomplish the ISO standard for improved organizational performance. This proves that increasing the quality of research product offerings as well as internal processes of research institutes will have a direct positive impact on the institutes overall performance in the market.

2.4 Performance Management

Performance is actual results versus desired results. Any discrepancy where actual is less than desired constitutes a performance improvement zone. Performance improvement is thus any effort targeted at closing this gap. Abrey Daniels (1970)

described performance as a scientifically based, data oriented management system for managing both behavior and result.

Performance management can focus on performance of organizations, departments, employees or even processes to build a product or service, and many more. Performance management involves 3 stages of planning where goals and objectives are established, coaching where a manager intervenes to give feedback and adjust performance and appraisal where individual performance is documented and feedback is given.

Some prominent performance improvement models in use are business process reengineering, culture change, knowledge management, outcome based evaluation and balanced score card. Balanced score card is arguably the most popular in use and it evaluates a firms financial performance, customer knowledge, internal processes, and the firms ability to learn and grow.

2.5 Summary

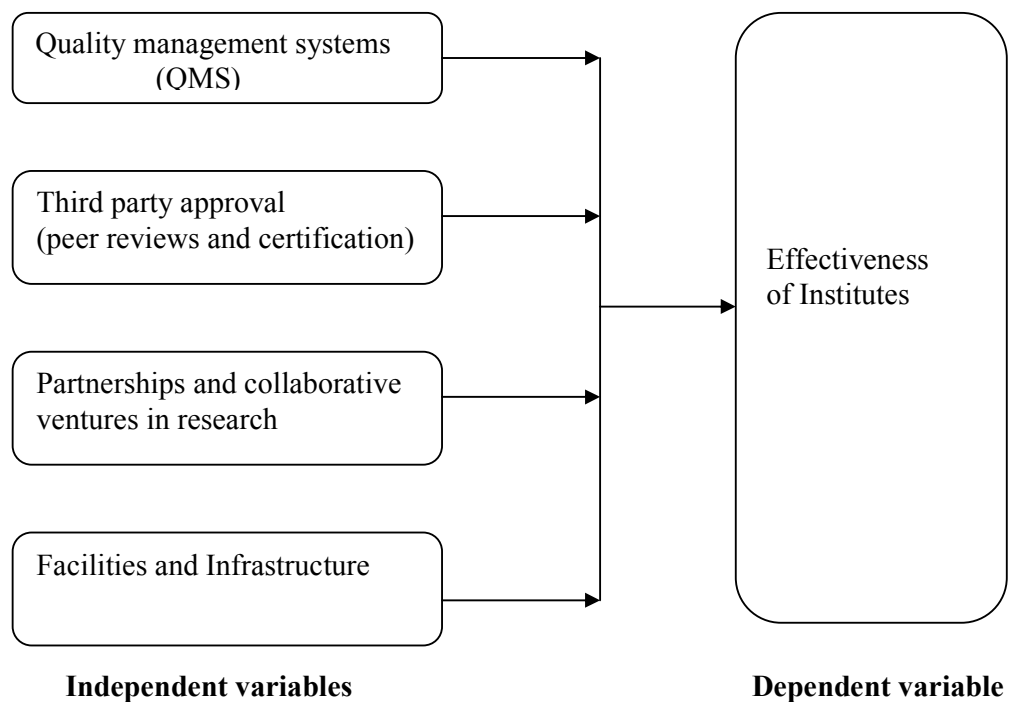
It has been seen in this chapter that the definition of quality remains problematic to date and no definition can adequately be used on its own. Quality products have been summarized by Garvin and Juran as those products that satisfy the needs of customers safely. Service quality has also been summarized by Parasuraman into the RATER model of 5 key determinants. Having borrowed from quality, determination of quality of research is equally as problematic with belief in some quarters that quality of scientific research is uneven and not in tandem with issues of the day.

Research in government research institutes is focused on providing solutions, therefore is continuously displaying both product and service characteristics, which supports the argument that quality of research should be assessed as both the process

of producing the product (service) as well as the resultant outcome and its attributes (product). Research quality is now judged as being both the scientific process of coming out with research outcomes as well as the impact the outcomes have on the masses. The effect of this is what will be used to evaluate the performance of research institutes and the effectiveness they display in delivering their mandate to the public

2.5 Conceptual Framework

Figure 2.1 Schematic diagram showing variable relationships



Source: Researcher 2014

From figure 2.1 above it is clear that the performance of research institutes will be greatly influenced by the Institutes' collective interventions to manage quality by the use of the four independent variables identified.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

The purpose of this study is to establish how government research institutions determine and manage quality of research. This chapter provides a roadmap on how this is to be achieved. Included in this chapter are research design, data collection and data analysis

3.2 Research Design

This study has employed the survey design. It uses this design because the design enables the researcher to collect in-depth information on the population being studied. According to Kothari (2004), surveys are conducted in case of descriptive research studies, which may either be a census or sample survey. Surveys are concerned with describing, recording and interpreting conditions that either exist or existed.

3.3 Target Population

The target population for this study consisted of all 6 government research institutions in Kenya. The respondents were officers in charge of quality development and implementation, and middle operation level researchers in the institutions.

3.4 Data Collection

Collection of data was done using self administered questionnaires (Appendix II). The questionnaire had both structured and unstructured questions and was used to collect primary data. Structured questions had a list of possibilities from which respondents selected best answers suiting their position. Unstructured questions allowed the respondent freedom of response, allowing the researcher to gauge the feelings and attitudes of the respondent (Field, 2011)

The questionnaire had six parts; Part A covered the respondents' general information, part B covered management processes, part C covered third party approvals, part D covered partnerships and collaborations, part E covered facilities and infrastructure and part F covered the influence of quality indicators on performance of the institutes.

3.5 Data Analysis

Data analysis is the whole process which starts immediately after data collection and ends at point of interpretation and processing (Kothari 2004)

Once questionnaires were received, they were checked for completeness and consistency, then collated, organized, summarized and described.

Data collected was analyzed using descriptive statistics (measures of central tendency and measures of variations) to achieve objective number one and regression analysis for objective number two.

Inferential statistics was used to enable inference about the population based on the results obtained from the samples. The respondents were categorized into 4 groups depending on the number of years worked at the institutes i.e. 1-3, 4-7, 8-11 and above 12years

The regression equation assumed the following form:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \alpha$$

Where:

Y - Organizational performance

β_0 - Constant

X_1 - Quality management systems

- X₂ - 3rd party approval by peer reviews and certifications
- X₃ - Partnerships and Collaborative ventures in research
- X₄ - Facilities and Infrastructure in place to facilitate research

CHAPTER FOUR: DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

This chapter discusses the interpretation and presentation of findings obtained from the field. The purpose of the study was to establish the quality of research and its effect on performance of government research institutes in Kenya.

The study targeted all the 6 government research institutes and a total of 55 respondents from which 41 filled and returned the questionnaires making a response rate of 75%. This was considered satisfactory for the analysis.

4.2 Demographic and Respondents Profile

The general information considered in this study include name of respondent, department, job title and number of years worked at their institute. This information was considered important as it influences the perception of quality by the respondent.

4.2.1 Number of Years Worked at Institute

This section aimed to establish from the respondents the number of years worked at their institute and the results are presented in Table 4.1

Table 4.1: Number of Years Worked at the Institute

Variable		Frequency	Percentage
Number of years worked	Below 3 years	3	7.3%
	4 – 7 years	13	31.7%
	8 – 11 years	14	34.1%
	Above 12 years	11	26.8%

Source: Researcher 2014

The results in table 4.1 indicate that a large number of the respondents have worked at their institutes for more than 4 years, the majority falling between 8 – 11 years.

There were a low number of respondents who have worked below 3 years (7.3%) and those who have worked above 12 years (26.8%). The figures of those below 3 years could be due to government freeze on employment while those above 12 years could be lethargic reaction developed over a long period of time due to participating in many similar or diverse surveys.

This means that studies conducted exclusively within either of these two groups may not give an accurate picture as the low numbers may not adequately represent the scientific population and their sentiments.

4.3 Performance of Quality Management System

Questions in this section aimed to establish the internal attempts made by the institutes in managing the quality of their research processes as well as evaluating the performance of the management systems in place. Summary results are presented in the table 4.2 and Table 4.3:

Table 4.2: Management Processes

Variable		Frequency	Percentage
Quality Management system	Existence of QMS	41	100%
Documented research procedure	Exists	41	100%
Originator of documented research	Myself	4	9.76%
	My department	8	19.51%

procedure	Top management	20	48.78%
	Other	9	21.95%
Documented research procedure	Used by all research departments of institute	39	95.12%
	Not used by all research departments in the institute	1	2.44%

Source: Researcher 2014

From Table 4.2 above, it is observed that positive attempts have been made by all the institutes to establish a quality management system (100%) and this has been led by top management (48.78%). Documentation of systems and processes allows for standardization and institutionalization (95.12%) and therefore better management of the same.

This supports the argument that the existence of a quality management system plays a key role in the overall management of quality.

Table 4.3: Performance of QMS

Performance of quality management system	Mean	Standard Deviation
1. Emphasis on customer focused outputs	3.8293	0.6671
2. Implementation of customer feedback	3.9268	0.6079
3. Quick rectification of customer complaints	3.8049	0.7490
4. Learning from mistakes	3.7317	0.4486
5. Implementing suggested improvements	3.6098	0.6276
6. Removing inter departmental bottlenecks	3.5854	0.4988
7. Efficiency in procurement	3.4146	0.4988

8. Evaluating research proposals	3.8780	0.5097
9. Monitoring research	4.1463	0.6149
10. Evaluating outcomes of research	4.1707	0.5433
11. Impact assessment of research	3.5854	0.6315
12. Availing funds for research	3.7073	0.6018

Source: Researcher 2014

Table 4.3 above indicates the respondents rating of the performance of the institute's quality management system. The average rating of the quality management systems in place is high at 3.7825 or 76% approval rating.

This means that the quality management systems in place in the institutes were actually seen to be effective in managing the quality of outputs by the institutes. Therefore, not only is this variable relevant to the study, but it is also judged on its own to be performing well.

4.4 Performance of Third Party Approval

Questions in this section aimed to establish controls put in place to monitor research being conducted as well as evaluating the approval rating of the final research outcomes. Summary results are presented in the Table 4.4 and Table 4.5 below:

Table 4.4: Control Measures in Research

Variable		Frequency	Percentage
Process of research	Checked by external body	29	70.73%
	Not checked by external body	12	29.27%
Area of research	Proposed by myself	0	0.00%

study	Proposed by institute	14	34.15%
	Proposed by department/ section	10	24.39%
	Proposed by other	17	41.46%
	Formally approved	41	100.00%
Outcomes of research	Certified by 3 rd party before release	39	95.12%
	Not certified by 3 rd party before release	1	2.44%

Source: Researcher 2014

From Table 4.4 above it is observed that the area of research study by majority of respondents is proposed by “Other” (17%) i.e. the institute in collaboration with the government, or the scientists in collaboration with donor agencies facilitated by the institutes. This is closely followed by proposal by the institutes (14%) which influence the thematic area of research.. However all of these areas of study have to be formally approved and monitored by the institutes (100%). The research is generally counterchecked by external parties (70%)

This supports the argument by the study that when an external or 3rd party checks one’s products and processes, one is most likely to make a conscious effort to ensure the outputs are of acceptable quality, therefore validating the inclusion of this variable in the study.

Table 4.5: Third Party Performance Review

Performance of third party approval	Mean	Standard Deviation
1. Research is peer reviewed	3.7805	0.7250
2. Research steps are certified by external body	3.4634	0.7449
3. Outcomes of research are certified by external body	4.0732	0.8772
4. Research outcomes are patented	3.6585	0.8547
5. Research is presented in national scientific forums	4.0244	0.6515
6. Research is presented in international scientific forums	3.7805	0.5706

Source: Researcher 2014

Table 4.5 indicates the respondents rating of the performance of the institute's final research outcomes in the face of external scrutiny. The overage rating for these research outcomes is high at 3.7967 or 76% approval rating

This means that exposure to third party scrutiny was seen to be effective in managing the quality of outputs by the institutes. Therefore, not only is this variable relevant to the study, but it is was also seen to be effective in its own standing.

4.5 Performance of Partnerships and Collaborations

Questions in this section aimed to establish the willingness by the institutes and their members to collaborate and partner with like-minded research organizations as well as evaluating the performance of their collaborative research ventures. Summary results can be seen in the Table 4.6 and Table 4.7

Table 4.6: Involvement in Collaborative Ventures

Variable		Frequency	Percentage
Collaborations and partnerships in the last 2 years	I have been involved	36	87.80%
	I have not been involved in any	5	12.20%
	Were initiated by myself	7	17.07%
	Were initiated by the institute	23	56.10%
	Were initiated by other	7	17.07%
Collaborations and partnerships	Are actively promoted by the institute	41	100.00%

Source: Researcher 2014

From Table 4.6, it can be observed that the majority of the respondents have been involved in some partnership or collaborative venture in research within the last 2 years (87%). It is also observed that the institutes are actively involved in encouraging and promoting collaborations and partnerships.

This means that the institutes have acknowledged the importance of engaging in partnerships and collaborations while undertaking their work and therefore supports the argument by the study that partnerships and collaborative ventures play a key role in overall management of quality at the institutes.

Table 4.7: Performance of Partnerships & Collaborations

Performance of partnerships and collaborations	Mean	Standard Deviation
1. Changed the way an aspect of research was being done	3.4634	0.5522
2. Added knowledge that was not previously known	3.7317	0.6334

3. Resulted in a research grant	3.5610	0.6726
4. Resulted in improvement of equipment and facilities	3.7073	0.4606
5. Resulted in an education scholarship	3.1951	0.4012

Source: Researcher 2014

Table 4.7 above indicates the respondents rating of the performance of the institute's partnerships and collaborations. The average rating for partnerships and collaborations is high at 3.5317 or 71% approval rating.

This means that engaging in partnerships and collaborative ventures is seen to be effective in managing the quality of outputs and that not only is this variable relevant to the study, but it is also judged on its own to be performing well. A major benefit accrued is access to funding which could not have been realised had the institutes not engaged in this partnerships and collaborations.

4.6 Performance of Facilities and Infrastructure

In this section, the questions aimed to establish the status of the facilities and infrastructure in place for conducting research in the research institutes. Summary results are seen in the table below

Table 4.8: Facilities and Infrastructure

Performance of facilities and infrastructure	Mean	Standard Deviation
1. Quality of research equipment	3.8293	0.8337
2. Quality of research Laboratories	3.6341	0.7667
3. Suitability of offices and office space	4	0.8062

5. Calibration of equipment	3.439	0.6344
6. Maintenance of equipment	3.6585	0.5296
7. Maintenance of facilities	3.95121	0.3123

Source: Researcher 2014

Table 4.8 indicates the respondents rating of the institute’s facilities and infrastructure. The overall rating for facilities and infrastructure is generally high at 3.752 or 75% approval rating. This means that the facilities and infrastructure in place in the institutes were actually judged to be superior and playing a key role in accuracy and quality of outputs from the institutes. Therefore, not only is this variable relevant to the study, but it is also judged on its own to be performing well.

4.7 Differences in Quality Opinions

From the preceding sections, it is observed that the most significant quality indicators are existence of a quality management system (76%) and 3rd party approvals (76%) which were both given the same score by the respondents. They are closely followed by Facilities and infrastructure at 75% and finally Partnerships and collaborative ventures at 71%.

The study also wished to find out if there were any significant differences in perceptions of quality influenced by the number of years worked. The results of this investigation are presented in the Table 4.9.

Table 4.9: Quality comparisons by years worked

Number of years worked	Mean	Standard deviation	Quality of research (Rated by indicators) (%)
Below 3 years	3.7459	0.2509	74.9%
Between 4 and 7 years	3.5372	0.1266	70.7%
Between 8 and 11 years	3.7347	0.0899	74.7%
Above 12 years	3.8765	0.155	77.5%

Source: Researcher 2014

From Table 4.9 above, there is marginal difference in the perception of quality by the 4 groups of respondents. The respondents above 12 years returned the best scores probably due to being in leadership roles and having better access to resources and established research networks. They are closely followed by those of below 3 years probability due to relative newness to the organizations, so they may not yet have discovered things that do not work, and if they have, they are still at their most optimistic phase being loyal to their new organization.

The most pessimistic group is those of years between 4 and 7, probably because members of this group have overcome the euphoria of being newly employed and are probably now encountering bottlenecks and situations that impede their work, and therefore are more likely to give a modest score.

In general however the quality of research in government research institutions is scored highly (above 70%)

4.8 Quality of Research and Performance

The second objective of the study was to establish the relationship between indicators of quality of research and performance of the research institutes. The effect of quality of research on performance was investigated from the resultant data obtained from the respondents using regression analysis. Summary results of the regression are presented in Table 4.10 below:

Table 4.10 Results of the General Least Square

Model		Un-standardized coefficients		P values	T stat
		B	Std Error		
1	(Constant)	-18.009	3.5207	1.06E-05	-5.1149997
	X1 – Quality Management Systems	3.4049	1.1611	0.005814	2.9325337
	X2 – 3 rd Party Approval	1.5174	0.4756	0.002942	3.1903890
	X3 - Partnerships and Collaborative ventures	2.0114	0.8857	0.029224	2.27105
	X4 - Facilities and Infrastructure	1.7836	0.6198	0.006699	2.8775995

Source: Researcher’s computation 2014

With hypothesis testing at 95% confidence level, a variable is significant if the P value is less than 5% or 0.05. If it is greater than 5%, then the variable is not accepted.

From Table 4.10, the independent variables were all statistically significant with all of them displaying P values of less than 0.05. This means that the results of this study can therefore be said to be valid.

From Table 4.10, the established multiple regression equation is:

$$Y = -18.01 + 3.4X_1 + 1.52 X_2 + 2.01X_3 + 1.78 X_4 + 1.35$$

Table 4.11: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	F
1	0.8691127	0.7553569	0.7281743	1.345331	27.78828

Source: Researcher's computation 2014

Results from Table 4.11 show that R square, also called the coefficient of determination, equals 0.7554 which is a very good fit. It means that 75.5% of the changes in performance of the institutes are explained by the independent variables Quality management systems, 3rd party approvals, partnerships & collaborative ventures, and facilities & infrastructure. The remaining 24.5% is explained by other factors not in the model. The closer to one r square is, the better the regression line fits the data. The high coefficient of determination supports the position that in government institutes, quality of output plays a major role in the shaping perception of customers to the performance and usefulness of the Institutes, therefore conscious and robust actions need to be put in place to ensure this continued goodwill.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The first objective of the study was to establish the use of quality indicators to determine the quality of research in government research institutes. Here descriptive analysis was used. The second objective was to find out the relationship between these indicators and the performance of these institutes. Here regression analysis was carried out. The four indicators for determining quality were: establishment and operation of a quality management system, third party approval through peer reviews and certification, partnerships and collaborative ventures in research, and the state of facilities and infrastructure.

5.2 Summary of Findings

The study established that there was a genuine effort by all the institutes to manage and control the quality of their research products and services. All the institutions had established and were operating one or more quality management systems. Establishment of quality management system showed that there was a conscious decision to improve quality of offerings to the customer. Formalization of processes and documentation helped to streamline this effort and involvement of senior management in the process gave it credence and direction.

The study also established that the institutes were actively involved in determining the proposed research areas. This they did by ensuring that any research proposal is formally approved to ensure the research is relevant to the issues at hand, it is in line with the institute's mandate and to ensure maximum impact of the outcomes of

research. Monitoring the progress of research by management was also found to be going on and a number of outcomes were seen to be certified by third parties. Researchers in these institutes actively participated in local and international fora where their research was presented. The study however established that patenting of research outcomes was still a challenge. This could lead to loss of research material if not enhanced.

The study further established that the institutes were actively involved in collaborations and partnerships in order to improve their quality. These collaborations and partnerships had resulted in significant addition to knowledge, improvement of research equipment, and a number of research grants and a few education scholarships. However the study also established that regular calibration of research equipment was still a challenge. This could compromise the validity of results of research if not addressed and can lead to deterioration of research quality. The four quality indicators scored highly with all scores being above 70% approval rating.

5.3 Conclusion

The study found out that the quality of research in Kenya Medical Research Institute, Kenya Marine and Fisheries Research Institute, Kenya Agricultural Research Institute, Kenya Forest Research Institute, Kenya Industrial Research & Development Institute and Kenya Institute of Public Policy Research & Analysis is generally high and can therefore be dependent upon. In addition, that the institutes have embraced quality out of their own initiative due to the demands of an ever changing world and an even more educated populace.

The four quality indicators in this study i.e. establishment and operation of a quality management system, third party approval through peer reviews and certification, partnerships and collaborative ventures in research, and the state of facilities and infrastructure, are also valid indicators that are in application in the institutes and can therefore be used to determine the quality of research.

Performance of the institutes is 76 percent dependent on the indicators used while 24 percent is dependent on other indicators that should be investigated further.

5.4 Limitations of the Study

The study targeted middle level researchers and officers in charge of quality development and implementation. The main limitation of this study was that the respondents were asked to evaluate their institutes and therefore served as internal customers to the quality of the institute. The study therefore may not have fully captured the sentiments of external customers as they were not involved as direct respondents in this study.

5.5 Recommendations

The study found out that the institutions have embraced quality in their operations and Future studies should be carried out to find out if there are other indicators that may play a role in influencing the quality of research apart from the ones captured in this study. Comparable studies should be carried out to evaluate the quality of government research institutes in Kenya to similar government research institutes in the East African region

5.6 Suggestion for Further Studies

This study on quality of research focused on government research institutes in Kenya. However the study should be extended to the private research institutes in Kenya in

order to establish what the quality of their research is. These private research institutes offer alternative contribution of research to the citizen, and therefore play a significant role in the wellbeing of the country.

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APPENDICES

Appendix I: Introduction Letter

Appendix II: Questionnaire

RESEARCH QUESTIONNAIRE

SECTION A: GENERAL INFORMATION

1. Name: (*Optional*) _____ 2. Department: _____

3. Job Title: _____

4. Number of years worked at the institute (*Tick whichever applies*)

Less than 3 years [] Between 8 and 11 years []

Between 4 and 7 years [] Above 12 years []

SECTION B: MANAGEMENT PROCESSES

5. Does the institute have any quality management system for its service operations?

Yes []

No []

6. If yes, which one (specify _____
_____)

Please rate the Institute for the following indicators

(*Tick the applicable box, where 1 is the lowest score and 5 is the highest score*):

Performance of quality management system	1	2	3	4	5
1. Emphasis on customer focused outputs					
2. Implementation of customer feedback					
3. Quick rectification of customer complaints					
4. Learning from mistakes					
5. Implementing suggested improvements					
6. Removing inter departmental bottlenecks					
7. Efficiency in procurement					
8. Evaluating research proposals					
9. Monitoring research					
10. Evaluating outcomes of research					
11. Impact assessment of research					
12. Availing funds for research					

SECTION C: THIRD PARTY APPROVALS

7. Is there documented procedure for conducting research in the Department/Section?

Yes [] No []

8. If yes, who created this procedure?

Myself [] Top management of the institute []
 My department [] Other (specify) _____

9. Is this procedure for conducting research used by all research departments of the Institute? Yes [] No []

10. Is there an external body/organization that checks your research process?

Yes [] No []

11. Which are some of the research outcomes/ outputs from the Institute? (Please name a few) _____

12. Who proposes the area of study of a research in the Institute? (Tick all that apply)

Myself [] My Department/ Section []
 The Institute [] other (specify) _____

13. Does the area of study have to be formally approved by top management?

Yes [] No []

14. Is there an external body/organization that certifies your products before release to the public? Yes [] No []

Please rate your final Research Outputs/ Outcomes for the following indicators:

(Tick the applicable box, where 1 is the lowest score and 5 is the highest score)

Performance of third party approval	1	2	3	4	5
1. Research is peer reviewed					
2. Research steps are certified by external body					
3. Outcomes of research are certified by external body					
4. Research outcomes are patented					
5. Research is presented in national scientific forums					
6. Research is presented in international scientific forums					

SECTION D : PARTNERSHIPS AND COLLABORATIONS

15. Have you been involved in any collaborative research partnerships with other research Organizations/Institutes within the last 2 years?

Yes []

No []

16. Who initiated the partnership?

Myself []

The institute []

Other (specify) _____

17. What was the purpose of the collaborative research partnership? (*Explain*)

18. Does the institute actively encourage research collaborations and partnerships?

Yes []

No []

Please rate the impact of the partnerships and collaborations:

(*Tick the applicable box, where 1 is the lowest score and 5 is the highest score*)

Performance of partnerships and collaborations	1	2	3	4	5
1. Changed the way an aspect of research was being done					
2. Added knowledge that was not previously known					
3. Resulted in a research grant					
4. Resulted in improvement of equipment and facilities					
5. Resulted in an education scholarship					

SECTION E : FACILITIES AND INFRASTRUCTURE

Please rate the institute facilities:

(*Tick the applicable box, where 1 is the lowest score and 5 is the highest score*)

Performance of facilities and infrastructure	1	2	3	4	5
1. Quality of research equipment					
2. Quality of research Laboratories					
3. Suitability of offices and office space					
5. Calibration of equipment					
6. Maintenance of equipment					
7. Maintenance of facilities					

SECTION F: QUALITY INDICATORS

Please rank the level the following indicators have on overall Performance of the Institute

(Tick the applicable box, where 1 is the lowest score and 5 is the highest score)

Performance of quality indicators	1	2	3	4	5
Quality management systems					
Third party approval					
Partnerships and collaborative ventures in research					
Facilities and Infrastructure					

Thank you very much for your time