THE EFFECT OF RESEARCH CAPACITY BUILDING PROGRAMMES ON INNOVATION

THE CASE OF DELTA AND CIRCLE

BY

EUNICE MUIHIA

UNITED STATES INTERNATIONAL UNIVERSITY

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A Research Report submitted to the Chandaria School of Business in Partial fulfillment of the requirements for the Award of a Degree in Global Executive Masters in Business Administration (GeMBA)

UNITED STATES INTERNATIONAL UNIVERSITY

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STUDENTS DECLARATION

I the undersigned do hereby declare that this research project is my own original work and has not been presented to any other university, college or institution of higher learning other than the United States International University for Academic Credit.

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Student Id

This research project has been presented for examination with my approval as the designated supervisor.

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ABSTRACT

The research sought to investigate the effect of research capacity building programs on innovation using DELTA and CIRCLES as the cases of the study. The specific objectives of the study were: to analyze the key success factors for research capacity building programs, to investigate the key challenges and analyze the major contributions of research capacity building programs.

To achieve the objectives of the research, this study adopted a descriptive research design using a mixed research methodology. This allowed for interrogation and description of numeric as well as qualitative variables. The population of the study was drawn from the management and research fellows in both Cases which totaled to 40. A census survey was conducted and thus the sample size was 40. To collect data, a research questionnaire was developed and coded online using Google forms with four sections and administered to the respondents using emails with a link to the online questionnaire. To ensure reliability and validity of data collected: professional instruction from the supervisor was used as well as a pilot study which identified gaps which were rectified. Data collected using a questionnaire as analyzed using descriptive statistics of means, modes, standard deviations and frequency distribution tables.

The study findings show that, the key success factors for research capacity building programs were: research grants, integration of education, research and innovation in levels of education, high numbers of individuals enrolled in post graduate studies, acquisition of soft skills in communication and project management, availability of resources and facilities for research, mentorship and career support and government support. Consequently, this study classified the key success factors for research capacity building programs into three: individual, organization and environmental key success factors.

The major challenges identified in this study include: lack of government support, lack of mentorship and networking opportunities and lack of finances and resources to undertake
research which was the most intense challenge. Consequently, this study found that the major challenges facing research capacity building programs could be classified into internal and external factors.

The key contributions of research capacity building programs include research papers and journal articles, new knowledge and information, knowledge sharing and dissemination, improved products and processes and acquisition of competitive edges which improved productivity in organizations.

This study concluded that there three major groups of key success factors for research capacity building programs. Individual, organization and environmental success factors.

Secondly, the study concluded that there are two major classes of key challenges facing research capacity building programs; internal and external challenges. The major contributions of research capacity building programs on innovation are: journal articles and paper, knowledge sharing and new information dissemination and innovations such as new products and processes.

This study recommended a three pronged approach: First, there must awareness creation on the need for individuals to enroll in post graduate studies. Secondly, the government must develop an enabling framework, environment through policy review, increased investment and provision of incentives. Finally, the government, private companies and donor agencies must continually invest in research capacity building programs. This will aid in overcoming the biggest challenge facing research capacity building programs.

The study also recommended that there is need to create more forums, events, workshops and conferences to allow for networking, collaboration and partnerships in research capacity building. This study recommended that private institutions and companies must continually invest in research capacity building to enhance their success rates.
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I would also like to thank my DFID colleagues for their support and access to CIRCLES and DELTAS. And to the management and Research fellows at CIRCLES and DELTAS thank you for your contribution.

Finally, to my family for their support, a big Thank you.
DEDICATION

Special dedication to my family for their belief and support of me.
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## ACRONYMS

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<thead>
<tr>
<th>Acronym</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>AAESA</td>
<td>Alliance for accelerating excellence in science in Africa</td>
</tr>
<tr>
<td>BRICS</td>
<td>Brazil, Russia, South Africa, India and China</td>
</tr>
<tr>
<td>CDC</td>
<td>Center for Disease Control</td>
</tr>
<tr>
<td>CDC</td>
<td>Centre for Disease Control</td>
</tr>
<tr>
<td>CIRCLE</td>
<td>Climate Impact Research Capacity and Leadership Enhancement</td>
</tr>
<tr>
<td>DFID</td>
<td>Department for International Development</td>
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<tr>
<td>GoK</td>
<td>Government of Kenya</td>
</tr>
<tr>
<td>ICIPE</td>
<td>International Centre for insect Physiology and Ecology</td>
</tr>
<tr>
<td>WAFC</td>
<td>World Agro-Forestry Centre</td>
</tr>
<tr>
<td>IPC</td>
<td>International Potato Centre,</td>
</tr>
<tr>
<td>ICRISAT</td>
<td>International Crops Research Institute for Semi-Arid Areas</td>
</tr>
<tr>
<td>ILRI</td>
<td>International Livestock Research Institute</td>
</tr>
<tr>
<td>KARI</td>
<td>Kenya Agricultural Research Institute</td>
</tr>
<tr>
<td>KEFRI</td>
<td>Kenya Forestry Research Institute</td>
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<tr>
<td>KEMRI</td>
<td>Kenya Medical Research Institute</td>
</tr>
<tr>
<td>KMFRI</td>
<td>Kenya Marine and Fisheries Research Institute</td>
</tr>
<tr>
<td>SIDA</td>
<td>Swedish Agency for Development and Cooperation</td>
</tr>
<tr>
<td>TRFK</td>
<td>Tea Research Foundation of Kenya</td>
</tr>
<tr>
<td>UKCDS</td>
<td>United Kingdom Collaborative on Development Sciences Program</td>
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<tr>
<td>USAID</td>
<td>United States Aid for International Development</td>
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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the Problem

Globally, there has been a growing emphasis on enhancing innovation and research as a key to achieving economic growth and expansion (Rugut, 2014). Countries are increasing their funding for science, technology, research and innovation with the aim of building and achieving macro-economic goals of productivity and national growth. In light of the growth of the Asian tigers and countries such as Brazil, Russia, South Africa, India and China commonly referred to as the BRICS, as a result of investment in research and innovation, countries in the developed and developing economies have strengthened their funding for research and innovation (Barnett et al., 2010). This has been through increased funding of research capacity building programs and direct funding of innovators and researcher.

Research capacity can be defined as a nation’s ability to use innovations, research knowledge and research output to develop products and services that meet their needs and wants (Vogel, 2011). Research capacity building programs are schemes developed to offer aid and support to individuals and people involved in the development of researchers and research teams with the aim of enhancing innovation, promoting high quality research and preparing future generations for intense research as a key to achieving national growth and development (Harle, 2011; Barnett et al. 2010). The Swedish Agency for Development and Cooperation (SIDA) defined research capacity building as the enhancement of conditions and factors that promote sustainable and high quality research possible.

According to Vogel (2011) research capacity building can take three major forms: the individual where the individual researchers are strengthened and supported to enhance their research capacity through trainings, scholarships, publishing of research findings and funding of research. Capacity building can also take place at the organization level where organizations are aided to develop research departments and divisions, collaborations with research institutions is enhanced, funding of think tanks, and establishment of research
institutes. Environment research capacity building revolves the changing of the environmental factors through the review of the national and regional policies, development of incentive frameworks for researchers, changing of the policy and regulatory framework (Vogel, 2011).

Across the world, governments are increasing their funding for research capacity building programs in their own countries as well as in neighboring or friendly countries. For example, the British government through the Department for International Development (DFID) has invested billions of pounds in its own country and other nations with the aim of building research capacity (DFID, 2014). Furthermore, the United Kingdom established the United Kingdom Collaborative on Development Sciences Program (UKCDS) in the year 2006 with the aim of fostering research capacity building and collaboration for the government (Vogel, 2011). The United States of America as a government and through its development organs such as the Center for Disease Control (CDC), the United States Aid for International Development (USAID) and other organizations has invested billions of dollars on research capacity building which has enhanced innovations and research success in the development of cures, medicines, breakthroughs in health and other related industries and also in other diverse areas of social interest (USAID, 2015).

Majority of developed countries have developed research development agencies or partnered with institutions of higher learning such as universities to enhance research capacity building. Countries such as Sweden through the Swedish agency for Development Cooperation, France, Netherlands, and Spain have all established agencies to support research capacity building as well enhance knowledge sharing (Barrett et al., 2010). This trend has also been evident in emerging and BRIC countries where investment in research and development has spurred economic growth and development (Rugut, 2010).

In Africa, where most of the countries and economies are developing, there has been limited investment by governments in the development of research capacity strengthening (Harle, 2011; Vogel, 2011). According to Vogel (2011) most African countries do not have internally funded research programs or institutes to foster research development and
constantly rely on funding and the actions of developed nations to finance and support research development and enhancement programs. Furthermore, Harle (2011) noted that most African countries research institutions are universities which rarely maintain a flow of doctoral students. In cases where a flow of doctoral students are achieved, there are various challenges and barriers that inhibit the development and growth of researchers in the African nations. This cascades down to the dissemination of information and research skills to other researchers and students (Barrett, et al., 2010). Nevertheless, South Africa stands out in the African continent as enhancing research development and capacity strengthening by establishing research capacity programs and institutes which has catapulted it above its peers in the region.

In the Eastern African region, as is the case in the African region, there are very few research capacity building programs due to limited funding. Countries in the Eastern Africa region often rely on foreign countries and multilateral development agencies to enhance their research capacity building programs (Jowi, Obamba, Mwema & Oanda, 2014). Very few countries in the East Africa region have government funded research capacity building programs or research institutes. These countries rely on the use of universities for research which are underfunded to undertaken extensive research (Jowi et al., 2014).

Kenya has for the past decades not invested much in research and development. Nevertheless, with the establishment of an economic blueprint towards middle income economic status by the year 2030 (Vision 2030) the government of Kenya has identified the investment in research and development as a key pillar to achieving the economic goals. The government has consequently increased its funding and support for governmental and non-governmental research capacity building programs (Francis, Bjorkman, & Manor, 2008; INASP, 2012; Jowi & Obamba, 2013). The increased investment in research and development has strengthened higher education institutions in Kenya in their research output. According to Jowi et al., (2013) and SCOPUS database records for 2000 - 2011, there were a total 3,800 research papers from local researchers and local research institutions. Nevertheless, this increase is majorly skewed in favor to the University of Nairobi which contributed over 65% of the total publications (Jowi et al., 2014).
The government of Kenya has over the years published various policy statements and documents on research and innovation. The earliest of these documents was the Sessional paper no. 5 of 1982 on science and technology development which identified the need to strengthen research to find solutions to national economic challenges. Other sessional papers include *Sessional Paper No 1 (2005) on the Policy Framework for Education Training and Research* which emphasized on the need for stimulating scientific research for economic growth, wealth creation and improving the living standards of Kenyans. The *Universities Act no 42. Of 2012* underscored the inclusion and important role of universities in spearheading research in Kenya. The *Kenya Vision 2030* clearly spells out the need for the country to invest in research capacity, science, technology and innovation to achieving economic development and improving the living standards of Kenyans (Government of Kenya (GoK) 1982; GoK (2005); Kenya (2007); Kenya, (2014).

While the government has invested in research and development in Kenya, development agencies such as USAID and DFID have also intensified their efforts in aiding Kenya to improve on their research capacity. In Kenya, DFID has invested over 0.4% of the United Kingdom GDP on various programs in Kenya (DFID, 2014). Key among these projects are Climate Impact Research Capacity and Leadership Enhancement (CIRCLE) and Alliance for accelerating excellence in science in Africa (DELTAS) project which primarily aim at enhancing capacity building on policy making, science and innovations (DFID, 2014). All these efforts are aimed at enhancing research capacity in Kenya.

1.2 Statement of the Problem

There has been increased effort to enhance research capacity building not only in Kenya but also around the world. According to Vogel (2011) most developed nations set aside a proportion of their national budgets for research and innovation to spur economic growth, solve national problems and improve the living standards of the population. Furthermore, multiyear donor agencies have invested trillions of dollars in research development programs. Some of the multilateral agencies investing in research development programs include: DFID, USAID, SIDA, FIDA, United Nations, PEPFAR, UNESCO etc.
Despite the increased investment in research capacity building programs, there are key challenges that have been identified as hindering research capacity strengthening. Harle (2011) notes that the key challenges facing researchers include increased workload for researchers, lack of career and organization support for research, financial constraints, erosion of a research culture, increase in teaching and administrative workloads, low pay and ‘individualization’ of research (Harle, 2011; Vogel, 2011; DFID, 2014). These are some of the challenges facing research capacity building in developed and developing countries.

Despite, the increased investment in research capacity building programs around the world there exist very little empirical evidence on the actual impact of these programs on innovation (Barnett et al., 2010; Jowi et al., 2014). In spite of funding being directed to research development, there existed a scarcity of research on the actual impact of the programs, performance of the programs or the challenges facing the programs. Scholars have made effort to address gaps: Vogel (2011) analyzed research capacity strengthening programs from learning experience and noted that most research capacity programs face major challenges as enumerated above. Nevertheless, Vogel (2011) was a study undertaken using DFID research programs in the United Kingdom and thus some of the funds could not be generalizable to all nations. Jowi et al., (2013) mapped out the social science research landscape in Kenya and noted that there was increase in research capacity in Kenya. Nevertheless the study failed to address the key success factors leading to the increase, the key challenges facing the programs and the contribution of the programs to innovation other than research publications.

In Kenya specifically, there had been increased investment in research capacity building, but little research had been conducted on the actual impact of the programs on innovation. Consequently, there were gaps on the benefits of investing in research capacity programs in Kenya. Questions such as: what contribution did research capacity building programs have on innovation, solving the needs of Kenyans, improving the living standards of Kenyans or improving policy making in Kenya? Furthermore, what were the Kenya specific challenges facing research capacity building programs? What were the key success factors for research capacity building programs? These questions implied that there existed research and practice
gaps in the field. In addition, the scarcity of research on the impact of research capacity programs on innovation, key challenges and success factors implied that the frequent revision of science, development and research policies in Kenya was informed by external findings rather than internal studies thus implying a policy weakness.

1.3 General Research Objective

The general objective of this study was to analyze the effect of research capacity building programs on innovation using DELTAS and CIRCLES as the cases of the study.

1.4 Specific Research Objectives

The specific research objectives of the study were:

1.4.1 To examine the key success factors for research capacity building programs
1.4.2 To investigate the key challenges facing research programs
1.4.3 To analyze the contribution of research programs to innovation

1.5 Significance of the Study

This study is significant to the following stakeholders:

1.5.1 Government and Policy Makers

The government and policy makers find this study very informative to the policy formulation and implementation framework. By identifying the key success factors and key challenges, the government can use this study to draw a plan of action to enhance the impact of the programs as well as their capacity to overcome the challenges. Furthermore, the findings of this study could be informative in the policy revision process.

Capacity building Institutions such NACOSTI could also find this study very useful in informing their areas of actions to strengthen research in Kenya. With the findings NACOSTI could identify key areas of improvement and key pillars for enhancing capacity
building in research development. This would aid in the formulation of a strategic plan of action.

1.5.2 The Research Capacity Development Programs

Research capacity development programs will find this study useful in informing research capacity building interventions. Through the findings of this study, research capacity building programs could identify the most appropriate of actions to spur research. This will inform their choice of whether to use organizations in enhancing research capacity, use of individuals in capacity building or environmental factors in improving research capacity.

1.5.3 Academia

As noted, there exists research practice and policy gaps. Through this study the research gap is filled. This study contributes to the existing body of knowledge on research capacity building programs. Through a research project completed and accessible from the United States International University, this study is a source of literature and knowledge to the academia. Furthermore, the study it informs future and further research on research capacity building programs.

1.6 Scope of the Study

This study was conducted in the months of October and November 2016 using CIRCLES and DELTAS as the case of the study. The two programs had a total of 30 individuals being supported to enhance their research capacity. In addition, there were 10 individuals involved in the management of the programs. They formed the sampling frame of the study.

1.7 Definition of Terms

1.7.1 Research Capacity Building Programs

Research capacity building programs are schemes developed to offer aid and support to individuals and people involved in the development of researchers and research teams with
the aim of enhancing innovation, promoting high quality research and preparing future generations for intense research as a key to achieving national growth and development (Harle, 2011; Barnett et al. 2010).

1.7.2 Capacity

Capacity is defined as the ability of people, organizations, society as an entirety to manage the affairs and activities efficiently and effectively (OECD, 2006).

1.8 Chapter Summary

This chapter has presented the introduction to the study. It brings to the fore the concepts of research capacity development and programs and their status around the world and Kenya. In addition, the chapter illuminates the statement of the problem as well as the research objectives and purpose of the study. The scope of the study is discussed in this chapter as well as key definition of terms. Chapter two reviews the existing literature on the research objectives.

Chapter three presents the research methodology and design of the study highlighting the population, research design, sampling design and data collection processes. Chapter four presents the findings and results of the study based on data collected and analyzed. Chapter five summarizes the findings, discusses, concludes and provides the recommendations based on the findings of the results presented in chapter four.
CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

This chapter presents the review of literature on the key success factors, key challenges and contributions of research building capacity programs around the world. The literature is reviewed from existing studies and journal articles on the research objectives.

2.2 Key Success Factors of Research Building Capacity Programs

Globally science and technology has been identified as a key driver of economic and social growth and expansion (Rugut, 2014). Developed countries as well as emerging countries such as BRICS have utilized science and technology as key to enhancing economic growth and expansion. Science, Technology and Innovation provide a key paradigm shift from product based economics to knowledge based economies which can enhance sustainable development (Barnett et al. 2010).

Nikolov and Ilieva (2011) undertook a study on the models utilized to enhance software engineering research capacity in France that the integration of innovation, science and technology in institutions of higher learning and universities was key to enhancing and building research capacity in nations. Using the concept of research universities, Nikolov and Ilieva (2011) noted that universities must integrate education research and innovation at the highest levels of learning such as at the Masters and Doctorate levels. David and Foray (2003) noted that there was need for institutions of higher learning to exploit the immense resources available at the graduate levels of education as well as research programs to enhance research capacity in institutions of higher learning.

Key success factors to research capacity building can be mainly classified into three major groups. According to Vogel (2012) the three major categories of success factors for research
capacity building programs are: individual, organization and environmental key success factors. These are as shown in Figure 2.1 below:

![Figure 2.1: Key Success Factors](image)

Source: Vogel (2012)

**Figure 2.1: Key Success Factors**

### 2.2.1 Individual Key Success Factors

Individual key success factors revolve around the individual and the impact of the individual on research capacity programs. Some of the individual key success factors as identified by Vogel (2012) include: the high number of individuals undertaking PHD training, Post Doctorate training and those under fellowships. This number of individuals has been rising over the past years which imply the availability of individuals willing to be supported to enhance their research capacity (Harle, 2011).
Chowdhury et al., (2000) noted that individual factors such as having a critical mass of staff implying easy availability of individuals and people willing to undertake research or be trained in research is a key success factors for modern capacity building programs in research. This is supported by the findings of Ruffin and Flagg Newton (2001) who noted that for any research capacity building program to flourish, there is need for a critical mass of staff with diverse knowledge levels and disciplines.

Other individual key success factors for research capacity programs include: the acquisition of soft skills, attitudes, project management skills and communication in research building (Vogel, 2012). According to Vogel (2012) and supported by Harle (2011) and Barett et al., (2010), the presence of support schemes for enhancing research capacity building include the provision of research grants, support for career progression and growth, mentoring and peer review as well as opportunities for collaboration and knowledge sharing.

Other individual key success factors for capacity building programs in research include the availability of researchers with diverse levels of experience. It is important that individuals with different levels of experience be involved in the research programs (Chowdury et al., 2000). The concentration of research capacity building to senior researchers will have little impact on capacity building. Consequently, there is need to have a mix of researchers from different backgrounds, different levels of education and experience for any research capacity building program to flourish (Ruffin & Flagg-Newton, 2001).

Magwaza et al., (2003) in a study on enhancing research capacity building in health services in South Africa noted that there were various individualized strengths and key success factors. They included: the possession of collective writing and publication skills, high levels of computer literacy, acquisition of research skills such as data entry, analysis and collection by the research.

2.2.2 Organizational Key Success Factors

Organization key success factors are diverse from one area to another. Nevertheless, Leach and Waldman, (2009) summarizes the organization key success factors as: the availability of
research resources such as libraries, laboratories, research leadership in institutions, financial management, use of research in decision making and networking and collaboration opportunities for the researchers. According to Vogel (2013) the organization success factors are key to enhancing the success of research capacity building programs as they aid in the dissemination of knowledge especially in the academic publishing of data.

Magwaza et al., (2003) in the study on research capacity building programs in South Africa noted that organization related factors included: the availability of research specific courses, collaboration opportunities for research fellows and the support provided by institutions to attend conferences, short courses and workshops which enhance the capacity building process. In addition, organizations enhance the participation of researchers in national projects and programs where they can exercise their knowledge and skills (Magwaza et al., 2003; Hartle, 2011).

### 2.2.3 Environmental Key Success Factors

Environmental constraints are the major barriers to research capacity building programs (Vogel, 2013). Nevertheless, environmental conditions are also key success factors for enhancing the success of research capacity building programs. According to Vogel (2013) and supported by Hartle (2011) and Leach and Waldman, (2009), environmental factors such as a proactive regulatory framework, availability of research support institutions, availability of incentives to conduct research are key environmental factors that enhance research capacity building. In addition, the availability and allocation of budgets by national and regional governments towards research capacity building, legal frameworks, the establishment and strengthening of research councils and structures, prioritization of research and improvement of infrastructural networks are key to enhancing research capacity building (Leach & Waldman, 2009; Rees & Power, 2007; Pollard, 2006).

In addition, other key success factors for research programs include the use of research products and output, innovation and research grants and public interest in research and debate on development challenges which stimulate the need for research (Vogel, 2011; Munn,
2008). The political and economic environment has also enhanced success of research capacity building programs. According to Reay (2009), Oancea (2009) and Fowler and Procter (2008) changes in the funding models for higher education has exerted labour market pressures on these institutions to enhance efficiency and reducing overheads towards research capacity programs. Consequently, institutions have had to increase the research staffs on contracts that are tied to research programs. According to Fowler and Procter (2008), “Fixed term contracts can be an inefficient means of growing research capacity: insecurity of tenure can generate anxiety and distract researchers from their current projects, restrict opportunities for professional development, and act against the individual’s development of a coherent body of expertise as they move between unrelated research projects.”

2.3 Key Challenges of Research Building Capacity Programs

There are various challenges that face research building capacity programs around the world. According to Vogel (2011) the major challenges facing research building capacity can be classified into financial, coordination and employee based challenges.

2.3.1 Financial Challenges

Financial constraints are a major challenge to research capacity building programs. According to Vogel (2011) funding for research capacity building programs is short term in nature while research capacity building programs have long term effects. This raises questions on the sustainability of research capacity building programs. While the funding may be adequate to meet short term needs, research capacity building programs are long term in nature and thus the financing model does not take into consideration the long term framework of research capacity building programs.

Harle (2011) argued that the financial challenges facing individual researchers include: financial constraints. Individual researchers often have limited access to resources and facilities especially journals, libraries and laboratories to conduct their research adequately. This lack of resources is a big disadvantage to research capacity building programs especially
in developing nations (Vogel, 2011). In addition, individual researchers often receive low pay thus under financing their research efforts which pushes most researchers to consultancy and private tutorials and teaching to support their finances. This is a major drawback to research capacity building programs.

Magwaza et al., (2003) contributes to the weaknesses and challenges facing research capacity building programs and notes that limited funding is a major challenge. According to Magwaza et al., (2003), researchers often face limited funding for their programs, thus put more effort on project completion as opposed to capacity building, donor dependence of research capacity building programs, limited funding to support research fellows attend networking, skills improvement and workshops necessary to develop their skills, lack of incentives such as pensions and a great imbalance in the remuneration of researchers in private and public sector institutions. Similar findings are identified by Harle (2011).

Wandera (2014) conducted a research on some of the factors influencing research development organizations using KEMRI as a case study. Wandera (2014) noted that financial constraints was one of the key challenges facing the development of research capacity as well as the expansion or growth of research capacity building programs in KEMRI. According to Wandera (2014) KEMRI had faced financial challenges in sponsoring researchers to build their research capacity as well as expand the program to include other researchers. Further, financial constrictions influenced the smooth running and operation of the organization and improvement of the organization systems and structures through strategies such as automation and employee retention and attraction.

**2.3.2 Coordination Challenges**

There are various coordination challenges that face research capacity building programs. According to Vogel (2011) there exists concerns on the actual coordination structures and systems with the aim of maximizing on the impact and reducing duplication of research capacity building programs. Vogel (2011) raises pertinent questions in coordination such as:
“Can the barriers of different mandates, skill-sets, timescales and pressures of different organizations be addressed through working more strategically and collectively?”

Other coordination challenges relate to the dissemination of information or knowledge gained in research capacity building programs. Barrett et al., (2010) notes that research capacity support is key in enhancing research amongst scholars around the world, nevertheless, there is a duplication of models such that if research capacity building programs are financed from international sources, then the models for publishing, preparing and dissemination of the information is internationalized thus having little impact on the local environment. For example, Barret et al., (2010) notes that Northern organizations support research capacity building programs in Southern countries. The direct management of grants and outputs by the northern make it difficult for the Southern countries to present and publish in Southern journals and thus having little lead effect on research projects. Leach and Waldman (2009) add to this challenge and note that, “the quality of research outputs is often assessed through peer review and publication in international journals rather than journals based in developing countries. The lack of established Southern-based journals that could provide quality assurance further serves to lead Southern researchers away from local agendas toward topics of international concern”.

2.3.3 Employee Based Challenges

Employees and staff are key drivers and challenges to research capacity building programs. According to Mwagaza et al., (2003) the major employee related challenges to research capacity building programs include: inability to retain staff to migration of researchers internationally and locally. Local research capacity building programs often face challenges in attracting researchers due to migration of researchers into international countries where there are better remuneration and benefits. For example, African countries often lose their researchers to developed nations due to attractive benefits and remuneration available. Furthermore, donor dependency of local research capacity building programs often increase this migration since researchers are not assured of continue support in research.
Other employee related challenges include: limited exposure to skills development in a research environment due to limited opportunities for collaboration with other departments as well as lack of necessary skills to conduct and define research programs. In addition, lack of capacity for support due to lack of time for mentorship of junior staff by senior staff and challenges in employee recruitment (Hartle, 2011; Castillo, 2000). Employee related challenges especially in African countries include: time limitations to enhance development of researchers, ambiguous expectations and outcomes by programs and lack of access to institutions and research capacity building programs (Magwaza et al., 2003).

Harle (2011) and Vogel (2011) identified employee related challenges that faced research capacity building programs. According to them, the key challenges facing individual researchers include: the increase in the number of graduate and undergraduate students which increases the workload of the researchers limiting their time to lecturing and administration. In addition, lack of career support and organization support is a major challenge to the researchers in enhancing research capacity (Essence, 2011; Leah & Waldman, 2009). Harle (2011) further notes that, “Pressures of teaching and administrative workloads and pursuing funding have led to competitive rather than collegiate cultures, leading to the ‘intellectual isolation’ of junior researchers.” Finally, Castillo (2003) notes that the lack of a research culture in universities indicates lack of support for junior researchers. In addition, the individualization of researcher confines research to departments thus inhibiting the process of research capacity building especially in institutions of higher learning (Leah & Waldman, 2009).

Wandera (2014) notes that attraction and retention of researchers in research capacity building programs is one of the major challenges facing capacity development programs in developing nations. Using KEMRI as a case study, Wandera (2014) noted that employee retention and attraction was constrained due to lack of resources for better remuneration and training. In addition, some researchers participated in research capacity building programs and ventured off to international markets rather than transfer knowledge in the local economy. This is one of the key challenges facing research capacity building programs especially in the health sector.
2.4 Contributions of Research Capacity Building Programs

There are various research around the world. In addition, donor agencies, governments and private sector players have devoted billions of dollars into research capacity building programs. This therefore raises key questions: what are the products or contributions of research capacity building programs.

2.4.1 Knowledge Sharing

There are various research capacity building programs around the world. The primary purpose of research capacity building programs is to enhance research and promote research in countries that have deficiencies (Tijssen, 2007). In addition, research capacity building programs aim at enhancing generation and dissemination of new knowledge and information.

Knowledge sharing involves the publication of information and new knowledge for individuals and companies. Around the world, the purpose of research is to generate and share new knowledge. New knowledge is shared through publication of findings as well as the compiling of reports or findings in a knowledge management system (NEPAD, 2010). Around the world millions of journal articles and papers are published every year. According to UNESCO (2015) there were over 2 million journal articles published in various journals across the world. However, majority of these articles were in Europe, America and Asian countries which contributed over 65% of the total articles (UNESCO, 2015).

According to a Study by NEPAD (2010) there exists big gaps in knowledge production and dissemination in Africa especially in refereed journals. Tijssen (2007) supports this finding and notes that there is a great gap in the production of knowledge in the African continent. Based on the articles listed in the SCOPUS database in the years 1990 – 2012, in a cross section of 19 countries in Africa, only 27,600 papers were listed in international journals indicating a low production of knowledge. The highest proportion of knowledge production was in South Africa with 40% of the total publications, Egypt had 15%, Nigeria 12%, Algeria 5% and Kenya had 5% of the total publications. This indicates that there was a great
gap in research capacity building programs. In comparison the Netherlands alone produced over 27,000 journal articles in the same years (Adams et al., 2010).

Similarly, capacity building programs are aimed at increasing the number of researchers in a country. Based on the most recent statistics from NEPAD (2010), there were a total 6,799 researchers in Kenya as at 2010. Two thousand and two hundred researchers were PHD holders while the rest had tertiary levels of training. This indicates that there was low concentration of researchers in the country. This statistics implied that for every 1 million people in Kenya, there were 35 researchers which is very low compared to the ration of 168 in Brazil, 2457 in European nations and 4103 in the United States of America (UNESCO, 2010; Jowi et al., 2014).

### 2.4.2 Papers and Journal Articles

Papers and journals are a key product of research capacity building programs. According to Tijssen (2007), the African Development Bank (2008) and UNESCO (2007) papers and journal articles are the most common contribution of research capacity building programs. There are millions of articles and papers published every year in the world. Nevertheless, Africa and Kenya contribute very little to this large swam of information. According to NEPAD (2010) research statistics, between the years 1999 and 2008 a total of 234,861 papers were published in the entire African continent. The highest proportion of knowledge production was in South Africa with 40% of the total publications, Egypt had 15%, Nigeria 12%, Algeria 5% and Kenya had 5% of the total publications (NEPAD, 2010).

In addition, majority of the articles produced in Kenya concentrated on Agriculture which had 26%, Medicine (23%) and Bio Chemistry and Molecular biology with 10%. Articles on immunology were 11% while those in social sciences were 8% (NEPAD, 2010).

In a different study spanning the years 2000 and 2010, INASP (2012) noted that a total of 10,508 journal articles were listed in the SCOPUS database. The database drawn from 16,000 journals worldwide indicated that Kenya performed dismally in the production of new knowledge due to the low levels of journal articles publication. Though the database did not
include governmental reports, the production levels for articles and papers was still low in Kenya. Nevertheless Kenya has achieved various levels of growth in the production of new knowledge in the form of journal articles and papers over the period. As shown in Table 2.1 below:

**Table 2.1: Journal Articles Published in Kenya**

<table>
<thead>
<tr>
<th>Disciplines</th>
<th>Year and Number of Publications</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>200</td>
</tr>
<tr>
<td>Medical sciences</td>
<td>191</td>
</tr>
<tr>
<td>Agric.&amp; Biol.</td>
<td>211</td>
</tr>
<tr>
<td>Soc. sci./ econ.</td>
<td>63</td>
</tr>
<tr>
<td>Other disciplines</td>
<td>108</td>
</tr>
<tr>
<td>Total Publication</td>
<td>573</td>
</tr>
</tbody>
</table>

**Source: Scopus Database, (2012)**

In addition, it is important to note that majority of the articles published are from public funded research institutions and international research organizations (Jowi et al., 2014). According to the SCOPUS database in the years 2000 to 2010, Kenyan institutions of higher learning and universities had a total of 3781 papers published which was lower to the 5052 papers published by the public and international research institutes based in the country. Research productivity in the country was dominated by the University of Nairobi. This is as shown in Table 2.2 below.
Table 2.2: Some of the top Producers of Research Publications in Kenya (2000 – 2010)

<table>
<thead>
<tr>
<th>Universities</th>
<th>No. of Papers</th>
<th>Research Institutes</th>
<th>No. of Papers</th>
<th>International agencies</th>
<th>No of papers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nairobi university</td>
<td>2133</td>
<td>Tea Research</td>
<td>32</td>
<td>ICIPE</td>
<td>703</td>
</tr>
<tr>
<td>Kenyatta University</td>
<td>607</td>
<td>Coffee Research</td>
<td>11</td>
<td>ILRI</td>
<td>685</td>
</tr>
<tr>
<td>Moi University</td>
<td>562</td>
<td>Sugar Research</td>
<td>4</td>
<td>ICRAF</td>
<td>375</td>
</tr>
<tr>
<td>JHUAT</td>
<td>479</td>
<td>Forestry Research</td>
<td>64</td>
<td>ICRISAT</td>
<td>53</td>
</tr>
<tr>
<td>Maseno University</td>
<td>00*</td>
<td>Marine Research</td>
<td>116</td>
<td>Potato Centre</td>
<td>49</td>
</tr>
<tr>
<td>Masinde M. University</td>
<td>00*</td>
<td>KEMRI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Egerton University</td>
<td>00*</td>
<td>KEMRI-Welcome</td>
<td>401</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26 Private Universities</td>
<td>00*</td>
<td>KARI</td>
<td>394</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>3781</td>
<td>TOTAL</td>
<td>3187</td>
<td></td>
<td>1865</td>
</tr>
</tbody>
</table>

Source: compiled by the authors using data from the SCOPUS database

2.4.3 Innovations

Other important products of research capacity building programs are innovations. Innovations represent new ways of doing things, new processes, new products or services (INASP, 2012). Research capacity building programs aim at enhancing innovation and inventions in a country. Around the world, breakthroughs in medicine, engineering, transport, information technology and other fields have been the product of research capacity building programs (Jowi et al., 2014). In additional, companies that seek to acquire and maintain a competitive edge must continually innovate through investment in research capacity building programs. This has been the source of competitive advantage for companies such as Apple, BMW, Mercedes, HP, Epson, Microsoft and others which continually invest in research and development amongst its employees (Hartle, 2011).

In Kenya, research capacity building programs have given rise to innovations. Nevertheless, innovations have been majorly achieved in government funded research institutions such as Kenya Medical Research Institute (KEMRI), Kenya Agricultural Research Institute (KARI), Kenya Forestry Research Institute (KEFRI); Tea Research Foundation of Kenya (TRFK); and the Kenya Marine and Fisheries Research Institute (KMFRI) (Jowi et al., 2014). These
institutions have been the driving force of innovations in Kenya. However, it is also key to note that majority of the innovations have been in the agricultural sector.

International research agencies that have produced innovations in Kenya include: International Centre for insect Physiology and Ecology (ICIPE), International Potato Centre, International Crops Research Institute for Semi-Arid Tropics (ICRISAT), International Livestock Research Institute (ILRI), World Agro-Forestry Centre (ICRAF), and Centre for Disease Control (CDC) (Jowi et al., 2014).

2.5 Chapter Summary

This chapter has reviewed the existing literature on research capacity building around the world, in Africa and in Kenya. The study presents the available literature on the key success factors for research capacity programs majorly segmented into individual, organizational and environment. The key challenges include financial, coordination and employee related challenges while the major contributions of research capacity programs are knowledge sharing, articles and publications and innovations. While most of the studies have been reviewed from the international settings, very few studies have focused on Kenya. In addition, Jowi (2014) provides an overview of research capacity building programs in Kenya and notes major gaps in the research and sharing of findings. Jowi et al., base their findings from review of existing literature. This study will conduct an in-depth study using primary data.

Chapter three below presents the research methodology that was applied in the study including the research design, population and sampling frame, the data collection methods, research procedures and data analysis methods.
CHAPTER THREE

3.0 RESEARCH METHODOLOGY AND DESIGN

3.1 Introduction

This chapter presents the research framework utilized in the study. It highlights the research design, the population and sampling frame, the data collection methods, and the research procedures and data analysis techniques.

3.2 Research Design

A research design is defined as the overall strategy through which a researcher will acquire, process and present findings in a study (Blumberg et al., 2011). It is the blueprint of a study that acts as a strategy guide (Bryman & Bell, 2011).

There are various research designs that a study can use. This study sought to analyze the effect of research capacity building programs on innovation. Consequently, the study collects data with the aim of establishing the effect of research capacity building programs on innovations. This is synonymous with the definition of an explanatory research design which aims at collecting data to establish casual relationships between variables (Bryman & Bell, 2011). The use of an explanatory research design aids in analyzing the relationship between, key success factors, key challenges and the contribution of research capacity building programs.

A mixed research methodology was applied. In a mixed research methodology, the researcher focuses on qualitative as well as quantitative data and data collection methods (Bryman & Bell, 2011). Since some of the factors were not quantifiable, a mixed research methodology was justified for use. Furthermore, the issue of research capacity building had been rarely interrogated in the region. Therefore, there was a scarcity of articles and literature on the same which made it important to incorporate a mixed research approach to pioneer
research in the field. Consequently, it was important to provide the respondents opportunities to present their own findings and views on research capacity building programs as well as provide for provision of standardized responses by the respondents.

3.3 Population and Sampling Design

3.3.1 Population

A population refers to the total collection of cases that have unique and similar characteristics that a researcher intends to analyze (Cooper & Schindler, 2014). The unique and similar characteristics that the researcher sought to analyze is research capacity building programs. The cases that the study sought to use were CIRCLES and DELTAS, two donor funded programs by the Department for International Development. The 30 respondents were the fellows in both projects funded under this program and we reviewed. The cases were operational in Kenya and currently support researcher capacity building in Kenya and Africa as a whole.

3.3.2 Sampling Design

Sampling design refers to the collection of processes and procedures used to come up with a sample size that is adequate and representative (Cooper & Schindler, 2014).

3.3.2.1 Sampling Frame

The sampling frame refers to the individual elements within the cases. The two cases: DELTAS and CIRCLES had a total of 30 researchers being supported to enhance their research skills. The 30 researchers formed the sampling frame of the study. In addition, the study included the management of the two programs to decipher some of the organization related challenges that hinder the programs as well as the key success factors. In total the sampling frame of the study was 40 as shown in Table 3.1 below:
Table 3.1: Sampling Frame

<table>
<thead>
<tr>
<th>Details</th>
<th>DELTAS</th>
<th>CIRCLES</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Researchers</td>
<td>15</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>Management</td>
<td>5</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>20</strong></td>
<td><strong>20</strong></td>
<td><strong>40</strong></td>
</tr>
</tbody>
</table>

Source: Various (2016)

3.3.2.2 Sampling Technique

The sampling technique refers to the process of selecting the actual respondents to a study. This study was a census survey. According to Blumberg et al., (2011) a census survey is the inclusion of all the elements in the population in the study. It is appropriate for small data sets and where the population is not large. In this study the sampling frame was not large. Consequently, all the elements in the study were included in the study. Consequently, all the individuals within the sampling frame were included in the study. To ensure inclusion, random sampling technique was applied where every element in the sampling frame was given an equal chance for inclusion.

3.3.2.3 Sample Size

The sample size is the actual number to which the researcher seeks to administer a data collection instrument (Blumberg et al., 2011). There are various guidelines for selecting a sample size. Nevertheless, for small populations it is advisable that a census survey be conducted. This study had a total sampling frame of 40. Since the sampling frame was not large enough, a census survey was conducted. Consequently, all the individuals within the sampling frame were included in the study. The data collection instrument was thus administered to all the individuals within the sampling frame.
3.4 Data Collection

This study utilized primary data. Primary data was collected using a questionnaire. A questionnaire was justified for use as it was convenient, could collect qualitative as well as quantitative data, was easy to administer online or offline and was cheap (Saunders et al., 2007). A questionnaire for this study was developed utilizing open ended and closed ended questions in the four sections of the questionnaire. Open ended questions collected qualitative data while closed ended questions collected quantitative data. Likert Scale questions were also utilized using a scale of: Strongly agree, agree, Disagree, strongly disagree and not applicable.

The four sections of the questionnaire were: section A collecting background information about the respondents, Section B collected data on the key success factors for research capacity building programs, Section C collected data on key challenges for research capacity building programs while Section D collected data on the contributions of research capacity building programs.

3.5 Research Procedures

Research procedures refer to the processes and structures that are employed to ensure reliability and validity of data collected.

Pilot testing was one key research procedure. The questionnaire was developed and pretested using 5 respondents to test for accuracy and clarity of the questions. The pretesting stage included the acquisition of expert views on the appropriateness of the questionnaire as well as the efficacy in achieving intended results. After the pre testing stage, the questionnaire was administered online through Google documents. Since most of the researchers were computer literate and could access the website, it was easier to undertake online questionnaire administration as opposed to manual administration of the questionnaire.

After collection of data, split half technique was applied to ensure the validity of data collected. Data collected was split into two and correlation analysis undertaken, correlation
analysis was confirm on the reliability and validity of data collected. A strong correlation indicated a high reliability while weak correlation indicated a low reliability.

To ensure for ethics in data collection, confidentiality in data collection was emphasized as well as authority to collect data acquired from the researchers, the research capacity building programs and the University.

### 3.6 Data Analysis

Data analysis involves the manipulation of data for findings that provide meaningful insights and information for findings (Mugenda & Mugenda, 2010). Data analysis was undertaken after the data collection process in the field.

Data collected was inspected, edited and coded. Keying of data was done to SPSS vs. 21 which was the statistical software for analysis. The software was key in conducting descriptive statistics analysis such as means, modes and frequency distributions. Descriptive statistics were used to present patterns and trends in the data. This included the use of frequency distribution tables, means, modes and standard deviations.

To infer relationships in the study, correlation analysis was undertaken. Pearsons correlation coefficients were used since they are the most appropriate for nominal and quantitative data. This provides for ease of interpretation of findings on the type and strength of relationships in the findings.

### 3.7 Chapter Summary

This chapter has presented the research methodology of the study. It has detailed the descriptive research design to be used, the population and sampling design as well as the sample size. The chapter also detailed the research procedures of pilot testing, split half technique, data instrument administration and data analysis methods.

Chapter four below presents the findings and results of the study based on data collected and analyzed.
CHAPTER FOUR

4.0 RESULTS AND FINDINGS

4.1 Introduction

This research investigated the effect of research capacity building programs on innovation in Kenya using CIRCLES and DELTAS as case studies for the research. In effect, the research analyzes the contribution of research capacity building programs, the challenges and key success factors for research capacity building programs. To achieve this, the study included 40 respondents drawn from 30 researchers and 10 management officials in CIRCLES and DELTAS. This ensured that findings were provided and validated by individuals participating and managing research capacity building programs. Out of the sample size of 40 respondents, 32 responded representing an 80% response rate. Split half analysis had a Pearson’s correlation coefficient of 0.815 indicating a high level of reliability in the data.

4.2 Background of the Study

4.2.1 Gender

A total of 32 respondents participated in this study. Twenty four of the respondents were male (75%) and 8 (25%) were female. The findings show that majority of the participants in research capacity building programs are men among the regular respondents.

Figure 4.2: Gender of Respondents
4.2.2 Level of Involvement

Two major clusters of participants in research capacity building programs were involved in this study. Research fellows who included individuals directly involved in research capacity building accounted for 74% of the total respondents and managerial and administration officials accounted for 26% of the respondents.

![Figure 4.3: Level of Involvement](image)

4.2.3 Education Level

For the research fellows, eight individuals were at the Doctorate level of study representing 29% of the total respondents, 57% of the respondents had a Post Doctorate level of study while other levels of studies were identified by 14% of the respondents. This implies that CIRCLES and DELTAS were focused on capacity building at a Doctorate and Post Doctorate level of study.

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctorate</td>
<td>8</td>
<td>29</td>
</tr>
<tr>
<td>Post Doctorate</td>
<td>16</td>
<td>57</td>
</tr>
<tr>
<td>Others</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>28</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
4.2.4 Length in the Program

Sixty nine percent of the respondents in this study had been in the research capacity building program for less than 1 year while 31% of the individuals had been involved for between 1 – 2 years.

![Chart showing length in the program](chart.png)

**Figure 4.4: Length in the Program**

### 4.3 Key Success Factors for Research Capacity Building Programs

#### 4.3.1 Major Factors

This study posed an open ended question on the major factors informing the success of research capacity building programs the respondents were involved in. Majority of the respondents cited mentorship, support received from the programme team, research support and grants, access to specialist advisors and resources and time management. The findings thus imply that access to financial support, mentorship and specialist support were the major key success factors for research capacity building programs.

#### 4.3.2 Integration of Education Research and Innovation

Sixty nine percent of the respondents to this study strongly agreed that the integration of education research and innovation at Masters Level was key to building research capacity.
Similarly, 25% of the respondents agreed and 6% were neutral that the integration of education, research and innovation at Masters Level was key to building research capacity.

### Table 4.3: Integration of Education, Research & Innovation at Masters Level

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>22</td>
<td>69</td>
</tr>
<tr>
<td>Agree</td>
<td>8</td>
<td>25</td>
</tr>
<tr>
<td>Neutral</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>32</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Similar to the findings of the above, this study found that the integration of education, research and innovation at Doctorate levels was key to building successful research capacity building programs. The study found that 78% of the respondents strongly agreed and 22% agreed. Consequently, this study finds that the integration of education, research and innovation at various education levels was key to enhancing success of research capacity building programs.

### Table 4.4: Integration of Education, Research & Innovation at Doctorate Level

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>25</td>
<td>78</td>
</tr>
<tr>
<td>Agree</td>
<td>7</td>
<td>22</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>32</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

### 4.3.3 High Number of Individuals in Graduate Research

A high number of individuals and students involved in post graduate research and studies is key to building research capacity. This is deduced from the findings of this study which found that to over 80% of the respondents the high number of individuals involved in post graduate research was key to enhancing success of research capacity programs. According to this study, 56% of the respondents strongly agreed, 31% agreed and 13% were neutral.
Table 4.5: High Number of Graduate Students

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>18</td>
<td>56</td>
</tr>
<tr>
<td>Agree</td>
<td>10</td>
<td>31</td>
</tr>
<tr>
<td>Neutral</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>32</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

4.3.4 Availability of Research Grants

Availability of research grants was identified by the largest proportion of individuals as key to enhancing research capacity building. Ninety four percent of the respondents strongly agreed and 6% agreed that the availability of research grants was key to building research capacity. The findings show that research grants was one of the most success factors for building research capacity.

Figure 4.5: Availability of Research Grants

4.3.5 Acquisition of Soft Skills

This study analyzed the acquisition of soft skills in project management as well as communication as key in enhancing research capacity building. The study found that,
acquisition of soft skills in communication was rated as more important than acquisition or soft skills in project management.

Table 4.6: Acquisition of Soft Skills in Project Management

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>18</td>
<td>56</td>
</tr>
<tr>
<td>Agree</td>
<td>9</td>
<td>28</td>
</tr>
<tr>
<td>Neutral</td>
<td>5</td>
<td>16</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>32</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Forty seven percent of the respondents to this study strongly agreed that acquisition of soft skills in communication was key in enhancing research capacity building. In addition, 53% of the respondents agreed that acquisition of soft skills in communication was key.

Figure 4.6: Acquisition of Communication Skills

On the other hand, project management skills was identified as important by 56% of the respondents who strongly agreed and 28% who agreed. In addition, 16% of the respondents were neutral that the acquisition of soft skills in project management was to enhancing research capacity building.
4.3.6 Career Support and Mentorship

Career support was key to enhancing research capacity building according to 91% of the respondents to this study. Forty four percent of the respondents strongly agreed and 47% of the respondents agreed. Nevertheless, 9% of the respondents were neutral.

### Table 4.7: Career Support

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
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<tbody>
<tr>
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<td>44</td>
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<tr>
<td>Agree</td>
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<td>47</td>
</tr>
<tr>
<td>Neutral</td>
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<td>9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>32</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

On the other hand, mentorship and availability of mentors was identified as key to enhancing research capacity building by 97% of the respondents. Fifty percent of the respondents strongly agreed and 38% agreed. On the other hand, 3% of the respondents were neutral that the availability of mentors on peer review is key to enhancing research capacity building.

![Figure 4.7: Integration of Education, Innovation and Research at Doctorate Level](image.png)
### 4.3.7 Availability of Opportunities

Availability of opportunities for networking and collaboration was examined as a key success factor for research capacity building. The study found that 50% of the respondents strongly agreed that the availability of networking opportunities was key to enhancing the success of research capacity building programs. In addition, 47% of the respondents agreed and 3% were neutral.

#### Table 4.8: Availability of Networking Opportunities

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
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<td>50</td>
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<td>Agree</td>
<td>15</td>
<td>47</td>
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<tr>
<td>Neutral</td>
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<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>32</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Similar to the findings above, this study found that 56% of the respondents strongly agreed that the availability of opportunities for collaboration was key to enhancing research capacity building programs. In addition, 44% of the respondents agreed that availability of collaboration opportunities was key. The findings indicate the provision of opportunities for networking and collaboration was key to enhancing success of research capacity building programs.
4.3.8 Availability of Facilities

All the respondents to this study indicated that the availability of facilities such as laboratories was key to enhancing research capacity building programs. The findings of the study imply that facilities are a key driver of research capacity building programs. Eighty-one percent of the respondents strongly agreed and 19% agreed respectively.

<table>
<thead>
<tr>
<th>Table 4.9: Availability of Facilities</th>
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<tbody>
<tr>
<td></td>
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<td>----------------</td>
</tr>
<tr>
<td>Agree</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

4.3.9 Research Leadership

Research leadership was identified as key to enhancing research capacity by 59% and 38% of the respondents. On the other hand, 3% of the respondents were neutral. The findings imply that the availability of research leadership was key to enhancing research capacity building.
4.3.10 Research Culture

Forty seven percent of the respondents to this study strongly agreed, 31% agreed and 22% were neutral that a research culture was key to enhancing research capacity. The findings of this study that majority of the respondents were convinced that a research culture was key to building research capacity while a significant proportion (22%) was not convinced.

Table 4.10: Research Culture

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
<td>Agree</td>
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<td>31</td>
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<tr>
<td>Neutral</td>
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<td>22</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>32</td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

4.3.11 Environmental Factors

Environmental factors such as national budgets were key to enhancing research capacity building according to 31% of the respondents to this study. In addition, 50% of the
37 respondents to this study agreed and 19% disagreed that environmental factors such as national budgets were key to enhancing research capacity building.

![Figure 4.10: Environmental Factors](image)

**4.3.12 National Research Councils**

Fifty six percent of the respondents to this study strongly agreed that national research councils and other programs such as NACOSTI were key to enhancing research capacity building programs. In addition, 41% of the respondents agreed and 3% were neutral that national research councils were key to enhancing research capacity building programs.

<table>
<thead>
<tr>
<th>Table 11: National Research Council</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
</tr>
<tr>
<td>Strongly Agree</td>
</tr>
<tr>
<td>Agree</td>
</tr>
<tr>
<td>Neutral</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>
4.3.13 Innovation Policies

Forty seven percent of the respondents to this study disagreed that Kenya had innovation policies and strategies that enhanced the success of research capacity building programs. Nevertheless, 31% of the respondents strongly agreed and 22% agreed that Kenya had innovation policies and strategies that have enhanced the success of research capacity and building programs.

Table 4.12: Innovation Policies

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
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<td>31</td>
</tr>
<tr>
<td>Agree</td>
<td>7</td>
<td>22</td>
</tr>
<tr>
<td>Disagree</td>
<td>15</td>
<td>47</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>32</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

4.4 Key Challenges facing Research Capacity Building Programs

4.4.1 Key Challenges

Respondents cited the shortage of financial resources and grants, lack of government support and too much bureaucracy in research capacity building programs as the major challenges that have an effect of research capacity building programs.

Table 4.13: Key Challenges

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Mean</th>
<th>Mode</th>
<th>Std Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial Challenges</td>
<td>32</td>
<td>3.067</td>
<td>3</td>
<td>0.62</td>
</tr>
<tr>
<td>Coordination Challenges</td>
<td>32</td>
<td>2.512</td>
<td>2</td>
<td>0.50</td>
</tr>
<tr>
<td>Employee Challenges</td>
<td>32</td>
<td>2.158</td>
<td>2</td>
<td>0.32</td>
</tr>
</tbody>
</table>

In addition, the respondents rated the key challenges identified as affecting research capacity building programs. Some of the challenges identified include: financial challenges with a mean of 3.067, a mode of 3 and standard deviation of 0.62. In addition, coordination challenges had a mean of 2.512 with a mode of 2 and standard deviation of 0.50. Finally, employee challenges had a mean of 2.158 a mode of 2 and standard deviation of 0.32. The findings imply that financial challenges were most intense, followed by coordination and employee challenges respectively.
4.4.2 Financial Challenges

Forty seven percent of the respondents to this study strongly agreed that financial challenges were the most intense challenges facing research capacity building programs. Fifty percent of the respondents agreed and 3% of the respondents disagreed respectively. The findings show that financial challenges are intense challenges facing research capacity building programs.

![Financial Challenges](image.png)

**Figure 4.11: Financial Challenges**

In the analysis of financial challenges, this study sought to investigate what influenced financial constraints. According to 80% of the respondents in this study the short term nature of financing of research capacity building programs was a major factor contributing to financial challenges in research capacity building programs. This is deduced from 47% of the respondents who strongly agreed, 31% agreed, 16% disagreed and 6% strongly disagreed respectively.

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
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</thead>
<tbody>
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<td>47</td>
</tr>
<tr>
<td>Agree</td>
<td>10</td>
<td>31</td>
</tr>
<tr>
<td>Disagree</td>
<td>5</td>
<td>16</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>32</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

**Table 4.14: Financial Challenges**
4.4.3 Coordination Challenges

Nineteen percent of the respondents to this study strongly agreed and 25% agreed that research capacity building programs faced coordination challenges which hampered effective research capacity building. On the other hand, 31% of the respondents disagreed and 25% strongly disagreed. The study findings imply that to majority of the respondents there were no coordination challenges in research capacity building programs while in 44% of the respondents there were coordination challenges in research capacity building programs.

![Figure 4.12: Coordination Challenges](image)

One key aspect of coordination in research capacity building programs was duplication of programs. Twenty eight percent of the respondents to this study strongly agreed, 22% agreed, 31% disagreed and 19% strongly disagreed that the duplication of programs was a key challenge facing research capacity building programs. The findings show that there were very few cases of duplication of research capacity building programs in Kenya. In fact, the findings points to a shortage in research capacity building programs.
Figure 4.13: Duplication of Programs

4.4.4 Low Levels of Peer Reviewed Journals

Twenty five percent of the respondents in this study strongly agreed that low levels of peer reviewed journals in the region hampered research capacity building. In addition, 25% of the respondents agreed while 47% disagreed and 3% strongly disagreed respectively. The findings show that there was even distribution amongst respondents on local peer reviewed journals access and its impact on research capacity building programs. This indecisiveness in findings could be a result of ease of access to journals whether local or international by researchers all over the world.

Table 4.15: Low Levels of Peer Reviewed Journals

<table>
<thead>
<tr>
<th></th>
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<tr>
<td>Agree</td>
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<td>25</td>
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<td>47</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>32</td>
<td>100</td>
</tr>
</tbody>
</table>
4.4.5 Lack of Capacity

Lack of capacity to retain and attract employees is not a major challenge facing research capacity building in Kenya. According to the findings of this study majority of the respondents disagreed that lack of capacity to retain and attract employees was a major challenge. Forty seven percent of the respondents disagreed and 9% strongly disagreed while 28% and 16% of the respondents strongly agreed and agreed respectively.

![Figure 4.14: Lack of Capacity](image)

4.4.6 Donor Dependency

The dependency of research capacity building programs on Donors was identified as a key challenge facing research capacity building programs in Kenya. According to the study, 50% of the respondents strongly agreed, 34% agreed while only 16% of the respondents disagreed that donor dependency of research capacity programs was a major challenge.
Table 4.16: Donor Dependency

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
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<tbody>
<tr>
<td>Strongly Agree</td>
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<td>50</td>
</tr>
<tr>
<td>Agree</td>
<td>11</td>
<td>34</td>
</tr>
<tr>
<td>Disagree</td>
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<td>16</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>32</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

### 4.4.7 Migration of Researchers

The loss of researchers to other nations or brain drain was identified as a key challenge facing research capacity building programs. Thirty one percent of the respondents strongly agreed, 34% agreed, while 19% disagreed and 16% strongly disagreed respectively. The findings of the study indicate that migration of researchers was a key challenge facing research capacity building programs.

![Figure 4.15: Migration of Researchers](image-url)
4.4.8 Limited Exposure to Skills Development

Forty seven percent of the respondents to this study strongly agreed, 50% agreed and 3% disagreed that limited exposure to skills development in a research environment by employees was a major challenge facing research capacity building programs. The findings of the study show that lack of exposure to skills development was a key challenge facing research capacity building programs.

Table 4.17: Limited Exposure of Skills Development

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
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<td>Disagree</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>32</td>
</tr>
</tbody>
</table>

4.4.9 Limited Collaboration Opportunities

Lack of collaboration and mentorship opportunities was a key challenge facing research capacity building programs. On one hand, this study found that 31% and 47% of the respondents to this study strongly agreed and agreed respectively. On the other hand, 22% of the respondents disagreed.

Figure 4.16: Limited Collaboration
Similarly, a majority proportion of the respondents to this study strongly agreed that lack of mentorship opportunities was a key challenge facing research capacity building programs. In addition, 50% of the respondents agreed and 13% disagreed respectively. The study findings indicate that lack of mentorship opportunities inhibited the success of research capacity building programs.

Table 18: Lack of Mentorship Opportunities

<table>
<thead>
<tr>
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<tbody>
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<td>13</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>32</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

4.4.10 Lack of Necessary Skills

Thirty one percent of the respondents to this study strongly agreed that the lack of necessary skills to conduct and define research programs was a major challenge facing research capacity building programs. In addition, 28% of the respondents agreed and 41% of the respondents disagreed respectively. The study findings show that lack of necessary skills to conduct and define research programs was a major challenge facing research capacity building programs.
Figure 4.17: Lack of Necessary Skills

4.4.11 Lack of Government Support

Fifty six percent of the respondents to this study strongly agreed that lack of government support was a major challenge facing research capacity building programs. In addition, 31% of the respondents agreed and 13% disagreed that lack of support by the government was a key challenge. The findings of this study indicate that lack of government support was a key challenge.

Table 4.19: Lack of Government Support

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
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<tbody>
<tr>
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<td>31</td>
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<td>13</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>32</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

4.5 Contribution of Research Capacity Building Programs

4.5.1 Major Contributions

The major contributions of research capacity building programs are: innovations, better products and services, journal articles, dissertation and other academic papers. Respondents were asked to rank the importance of the outputs of research capacity building programs. Twenty four percent of the respondents indicated that it was knowledge sharing, 51%
indicated that it was papers and journal articles and 25% cited innovations as a key output of research capacity building programs.

![Figure 4.18: Research Capacity Output](image)

### 4.5.2 Knowledge Sharing

Forty seven percent of the respondents to this study strongly agreed that knowledge sharing was one of the major contributions of research capacity building programs. In addition, 50% of the respondents agreed and 3% were neutral. The study findings show that knowledge sharing was a key output of research capacity building programs.
4.5.3 New Knowledge Dissemination

New knowledge dissemination was identified as key output of research capacity building programs by 44 and 56% of the respondents to this study. Consequently, 100% of the respondents to this study agreed that new knowledge dissemination was an output of research capacity building programs.

Table 4.20: New Knowledge Dissemination

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
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<tbody>
<tr>
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<td>56</td>
</tr>
<tr>
<td>Total</td>
<td>32</td>
<td>100</td>
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</tbody>
</table>

4.5.4 Journal Articles

Ninety one percent of the respondents to this study strongly agreed that journal articles were a major contribution of research capacity building programs. Nine percent of the respondents agreed that journal articles were a major output of research capacity building programs. This
shows that one of the most common outputs of research capacity building programs was journal articles and papers.

Figure 4.20: Journal Articles

4.5.5 New Products and Processes

Fifty three percent of the respondents to this study strongly agreed that research capacity building programs led to new products and services. Thirty four percent of the respondents agreed and 13% of the respondents were neutral. Consequently, majority of the respondents agreed that new products and processes were a significant contribution of research capacity building programs.

Table 4.21: New Products and Processes

<table>
<thead>
<tr>
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<td>13</td>
</tr>
<tr>
<td>Total</td>
<td>32</td>
<td>100</td>
</tr>
</tbody>
</table>
4.5.6 Information Sharing Policy

Information sharing policies were identified as a key output of research capacity building programs by 50% of the respondents to this study. On the other hand, 34% and 16% totaling 50% of the respondents disagreed that information sharing policies were a key output of research capacity building programs. The indecisiveness in the findings of the study could be attributed to the lack of a clear framework on information sharing.

Table 4.22: Information Sharing Policies

<table>
<thead>
<tr>
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<th>Frequency</th>
<th>Percent</th>
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</thead>
<tbody>
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<td>34</td>
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<td>16</td>
</tr>
<tr>
<td>Disagree</td>
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<td>34</td>
</tr>
<tr>
<td>Strongly Disagree</td>
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</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>32</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

4.5.7 Competitive Advantage

Nineteen percent of the respondents to this study strongly agreed and agreed respectively that research capacity building programs led to competitive advantages for companies and organizations. On the other hand, majority of the respondents 53% disagreed and 9% strongly disagreed that research capacity building programs led to acquisition of competitive advantage in companies. This findings could be attributed to the low levels of investment and involvement of private companies in research capacity building programs and the lack of a link between capacity building programs and organization efficiency and effectiveness.

Table 4.23: Competitive Advantage

<table>
<thead>
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<tbody>
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<tr>
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<tr>
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<tr>
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</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>32</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
4.5.8 Improved Productivity

Fifty six percent of the respondents to this study strongly agreed that research capacity building programs led to improved productivity in the country. On the other hand 25% of the respondents agreed and 19% disagreed that investment in research capacity building programs led to improved productivity in the country.

Figure 4.21: Improved Productivity

4.6 Chapter Summary

This study sought to investigate the effect of research capacity building programs on innovation. The study analyzed the key success factors, key challenges and contribution of research capacity building programs. The study findings show that, the key success factors for research capacity building programs were: research grants, integration of education, research and innovation in levels of education, high numbers of individuals enrolled in post graduate studies, acquisition of soft skills in communication and project management,
availability of resources and facilities for research, mentorship and career support and government support.

The major challenges identified in this study include: lack of government support, lack of mentorship and networking opportunities and lack of finances and resources to undertake research which was the most intense challenge.

The key contributions of research capacity building programs include research papers and journal articles, new knowledge and information, knowledge sharing and dissemination, improved products and processes and acquisition of competitive edges which improved productivity in organizations.

Chapter five below presents the discussion of major findings of this study, the summary of findings the conclusions and recommendations of the study.
CHAPTER FIVE

5.0 DISCUSSION OF RESULTS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

Chapter five presents the summary of findings, the discussion of key findings and results as presented in chapter four, the conclusions of the study, recommendations for improvement and recommendations for further studies.

5.2 Summary of Findings

The research sought to investigate the effect of research capacity building programs on innovation using DELTA and CIRCLES as the cases of the study. The specific objectives of the study were: to analyze the key success factors for research capacity building programs, to investigate the key challenges and analyze the major contributions of research capacity building programs.

To achieve the objectives of the research, this study adopted a descriptive research design using a mixed research methodology. This allowed for interrogation and description of numeric as well as qualitative variables. The population of the study was drawn from the management and research fellows in both Cases which totaled to 40. A census survey was conducted and thus the sample size was 40. To collect data, a research questionnaire was developed and coded online using Google forms with 4 sections and administered to the respondents using emails with a link to the online questionnaire. To ensure reliability and validity of data collected: professional instruction from the supervisor was used as well as a pilot study which identified gaps which were rectified. Data collected using a questionnaire as analyzed using descriptive statistics of means, modes, standard deviations and frequency distribution tables.
The study findings show that, the key success factors for research capacity building programs were: research grants, integration of education, research and innovation in levels of education, high numbers of individuals enrolled in post graduate studies, acquisition of soft skills in communication and project management, availability of resources and facilities for research, mentorship and career support and government support. Consequently, this study classified the key success factors for research capacity building programs into three: individual, organization and environmental key success factors.

The major challenges identified in this study include: lack of government support, lack of mentorship and networking opportunities and lack of finances and resources to undertake research which was the most intense challenge. Consequently, this study found that the major challenges facing research capacity building programs could be classified into internal and external factors.

The key contributions of research capacity building programs include research papers and journal articles, new knowledge and information, knowledge sharing and dissemination, improved products and processes and acquisition of competitive edges which improved productivity in organizations.

5.3 Discussion of Results
5.3.1 Key Success Factors

There exists limited research on research capacity building programs especially in Africa and the East African region. Studies on the same are very few in Kenya. This could be attributed to the low number of research capacity building programs in the country as well as the dependency on foreign and donor funding for research capacity building programs.

Nevertheless, this study found that there exists many factors that practitioners, research fellows and managers of research capacity building programs found to be useful and key to enhancing the success of the programs. Key among the factors include provision of research grants, integration of research, education and innovation in education levels such as Masters and Doctorate levels of education. This is similar to the findings of Nikolov and Ilieva (2011)
who noted that universities must integrate education research and innovation at the highest levels of learning such as at the Masters and Doctorate levels. The findings of this study are supported and validated by those of David and Foray (2003) who noted that there was need for institutions of higher learning to exploit the immense resources available at the graduate levels of education as well as research programs to enhance research capacity in institutions of higher learning.

The findings of this study are synonymous to those of Vogel (2012) who classified key success factors for research capacity programs into three: individual, organization and environmental key success factors. Individual key success factors as identified in this study include: high number of individuals undertaking post graduate training and the position of soft skills in project management and communication skills, availability of mentorship and training opportunities, access to peer reviewed journals and research grants. Synonymous with the findings of this study Chowdhury *et al.*, (2000) noted that individual factors such as having a critical mass of staff implying easy availability of individuals and people willing to undertake research or be trained in research is a key success factors for modern capacity building programs in research. This is supported by the findings of Ruffin and Flagg Newton (2001), Magwaza *et al.*, (2003) who noted that for any research capacity building program to flourish, there is need for a critical mass of staff with diverse knowledge levels and disciplines. Similarly, Vogel (2012) and supported by Harle (2011) and Barett *et al.*, (2010), noted that the acquisition of soft skills, attitudes, project management skills and communication in research building, the presence of support schemes for enhancing research capacity building include the provision of research grants, support for career progression and growth, mentoring and peer review as well as opportunities for collaboration and knowledge sharing were key to building research capacity. This is similar to the factors identified in this study.

Organization factors identified in this study include availability and access to facilities such as laboratories, availability of networking and collaboration opportunities and provision of opportunities to acquire skills in research. The findings of this study are similar to those of Magwaza *et al.*, (2003) in South Africa who noted that organization related factors included:
the availability of research specific courses, collaboration opportunities for research fellows and the support provided by institutions to attend conferences, short courses and workshops which enhance the capacity building process. In addition, organizations enhance the participation of researchers in national projects and programs where they can exercise their knowledge and skills (Magwaza et al., 2003; Hartle, 2011).

Finally, this study found that the key environmental success factor for research and capacity building programs was the availability of enabling policy and regulatory framework as well as support by the government. Government support can be in the form of subsidies, incentives and availability of government funding of research capacity building. In comparison to the findings of this study, Vogel (2013) and supported by Hartle (2011) and Leach and Waldman, (2009), found that environmental factors such as a proactive regulatory framework, availability of research support institutions, availability of incentives to conduct research are key environmental factors that enhance research capacity building. In addition, the availability and allocation of budgets by national and regional governments towards research capacity building, legal frameworks, the establishment and strengthening of research councils and structures, prioritization of research and improvement of infrastructural networks are key to enhancing research capacity building (Leach & Waldman, 2009; Rees & Power, 2007; Pollard, 2006).

5.3.2 Key Challenge’s

There are various key challenges that inhibit the effect of research capacity building programs around the world. Nevertheless, this study classifies the major factors that inhibit research capacity building programs into internal and external factors.

Internal challenges facing research capacity building programs include: lack of resources, short term nature of financing sources, shortage of research capacity building programs, limited exposure to skills for researchers, limited collaboration, networking and mentorship opportunities, lack of skills to conduct and define research programs. These are challenges that are within the control of individuals and research capacity building programs. Similar to
the findings of this study according to Vogel (2011) funding for research capacity building programs is short term in nature while research capacity building programs have long term effect leading to sustainability questions for research capacity building programs. In addition, Harle (2011) argued that the financial challenges facing individual researchers include: financial constraints. Individual researchers often have limited access to resources and facilities especially journals, libraries and laboratories to conduct their research adequately. This lack of resources is a big disadvantage to research capacity building programs especially in developing nations (Vogel, 2011). Magwaza et al., (2003) contributes to the weaknesses and challenges facing research capacity building programs and notes that limited funding is a major challenge. According to Magwaza et al., (2003), researchers often face limited funding for their programs, thus put more effort on project completion as opposed to capacity building, donor dependence of research capacity building programs, limited funding to support research fellows attend networking, skills improvement and workshops necessary to develop their skills, lack of incentives such as pensions and a great imbalance in the remuneration of researchers in private and public sector institutions. Similar findings are identified by Harle (2011).

Contrary to the findings of this study Vogel (2011) found there exists concerns on the actual coordination structures and systems with the aim of maximizing on the impact and reducing duplication of research capacity building programs. This study did not identify coordination challenges due to the low number of research capacity building programs in the continent. According to Barrett et al., (2010) coordination challenges were occasioned by there is a duplication of models such that if research capacity building programs are financed from international sources, then the models for publishing, preparing and dissemination of the information is internationalized thus having little impact on the local environment. This challenge was not identified partly due to two reasons: one there was mixed approaches in funding research capacity building programs and two the local standards in reporting was similar to the international standards.

External factors are the factors outside the control of individuals and research capacity building programs. These factors include: lack of government support, donor dependency of
research capacity building programs and migration of researchers. In support of these findings, Mwagaza et al., (2003) noted the major employee related challenges to research capacity building programs include: inability to retain staff to migration of researchers internationally and locally. Local research capacity building programs often face challenges in attracting researchers due to migration of researchers into international countries where there are better remuneration and benefits. For example, African countries often lose their researchers to developed nations due to attractive benefits and remuneration available. Furthermore, donor dependency of local research capacity building programs often increase this migration since researchers are not assured of continue support in research. This is particularly key in this study since the population of the study is drawn from the same continent.

5.3.3 Contribution to Innovation

Research capacity building programs are designed and developed for a number of objectives. Nevertheless the primary purpose of research capacity building programs is to enhance research and promote research in countries that have deficiencies (Tijssen, 2007). In addition, research capacity building programs aim at enhancing generation and dissemination of new knowledge and information.

The first and most common contribution of research capacity building programs in the study was journal articles and papers. More than 90% of the respondents in this study identified journal articles and papers as the most common output of research programs in the continent. This is similar to the findings of Tijssen (2007). According to Tijssen (2007), the African Development Bank (2008) and UNESCO (2007) papers and journal articles are the most common contribution of research capacity building programs. There are millions of articles and papers published every year in the world. Nevertheless, Africa and Kenya contribute very little to this large swam of information. According to UNESCO (2015) there were over 2 million journal articles published in various journals across the world. However, majority of this articles were in Europe, America and Asian countries which contributed over 65% of the total articles (UNESCO, 2015).
The second most important contribution of research capacity building programs is knowledge sharing and dissemination. According to this study, knowledge sharing and dissemination of new knowledge was a key component and output of research capacity building programs. Over 80% of the respondents identified new knowledge and knowledge sharing as key outputs. Similar to the findings of this study, NEPAD (2010) and UNESCO (2015) found that the purpose of research is to generate and share new knowledge. New knowledge is shared through publication of findings as well as the compiling of reports or findings in a knowledge management system (NEPAD, 2010). Around the world millions of journal articles and papers are published every year. According to UNESCO (2015) there were over 2 million journal articles published in various journals across the world.

Other outputs of research capacity building programs as identified in this study are: innovations in the form of new products and processes. Innovations represent new ways of doing things, new processes, new products or services (INASP, 2012). According to this study, the major output of research capacity building programs was new products and processes (innovations). Jowi et al., (2014) supports the findings of this study and notes that Research capacity building programs aim at enhancing innovation and inventions in a country. Around the world, breakthroughs in medicine, engineering, transport, information technology and other fields have been the product of research capacity building programs (Jowi et al., 2014). As a result of innovations companies are able to acquire competitive advantages and improve productivity. This is supported by the findings of Hartler (2011) who found that companies that seek to acquire and maintain a competitive edge must continually innovate through investment in research capacity building programs. This has been the source of competitive advantage for companies such as Apple, BMW, Mercedes, HP, Epson, Microsoft and others which continually invest in research and development amongst its employees (Hartle, 2011). This was however not predominantly identified in this study since there was very minimal private practice and private corporate involvement in research capacity building programs.
5.4 Conclusions of the Study

5.4.1 Key Success Factors

This study concludes that there three major groups of key success factors for research capacity building programs. Individual, organization and environmental success factors.

Individual key success factors include: high number of individuals undertaking post graduate training and the position of soft skills in project management and communication skills, availability of mentorship and training opportunities, access to peer reviewed journals and research grants.

Organizational key success factors include: availability and access to facilities such as laboratories, availability of networking and collaboration opportunities and provision of opportunities to acquire skills in research.

Environmental key success factors identified include: the availability of enabling policy and regulatory framework as well as support by the government.

5.4.2 Key Challenge’s

The study concludes that there are two major classes of key challenges facing research capacity building programs. Internal and external challenges.

Internal challenges include: lack of resources, short term nature of financing sources, shortage of research capacity building programs, limited exposure to skills for researchers, limited collaboration, networking and mentorship opportunities, lack of skills to conduct and define research programs

External challenges include: lack of government support, donor dependency of research capacity building programs and migration of researcher’s
5.4.3 Contribution to Innovation

The major contributions of research capacity building programs on innovation are: journal articles and paper, knowledge sharing and new information dissemination and innovations such as new products and processes.

5.5 Recommendations of the Study

5.5.1 Recommendations for Improvement

5.5.1.1 Key Success Factors

This study recommends a three pronged approach: First, there must awareness creation on the need for individuals to enroll in post graduate studies to enhance success of research capacity building programs. Secondly, organizations in capacity building must build linkages with universities and other institutions of research to build capacity and develop opportunities for networking and growth. Finally, the government must develop an enabling framework, environment through policy review, increased investment and provision of incentives.

5.5.1.2 Key Challenge’s

This study has identified the key success factors for research capacity building programs. Based on the findings this study makes recommendations that the government, private companies and donor agencies must continually invest in research capacity building programs. This will aid in overcoming the biggest challenge facing research capacity building programs.

Secondly, this study recommends that the is need to create more forums, events, workshops and conferences to allow for networking, collaboration and partnerships in research capacity building. This will also aid in mentorship and career support opportunities.
5.5.1.3 Contribution to Innovation

This study recommends that private institutions and companies must continually invest in research capacity building to enhance their success rates. Private companies have largely abstained from investing in research capacity building programs. For them to be competitive and enhance their productivity they must embrace research capacity building programs.

5.5.2 Recommendations for Further Studies

This study recommends further studies on the effect of public research capacity building programs such as NACOSTI on innovation and research capacity building in Kenya. This study focused on donor driven programs rather than public programs which could provide opportunities for comparison.

Secondly, this study recommends further studies on the relationship between investment in research capacity building and organization performance. This will inform private companies on the need to invest in research capacity building programs especially in Kenya.
REFERENCES


65


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The Presidents Emergency Plan for AIDS Relief (PEPFAR, 2013). Capacity Building and Strengthening Framework. Vs. 2


APPENDIX I: QUESTIONNAIRE

This questionnaire is designed to collect data on the effect of research capacity building programs on innovation: The Case of Delta and Circles Programs. The information collected is meant to enhance understanding on the major challenges, key success factors and policy actions in research capacity building. Please complete all the questions and DO NOT provide any personal information in the questionnaire.

Background Information

1. Indicate your gender?
   
   Male { } Female { }

2. Select the research capacity building program you are currently enrolled:
   
   Circles { } Deltas { }

3. At what academic level are you involved in the program
   
   Managerial / Administration { } Research Fellow { }
   
   Others:……………………………………

4. At what education level are currently involved in:
   
   Masters { } Doctorate { }
   
   Post Doctorate { } Others:………………………………………………

5. How long have been involved in the program:…………………………………………

Key Success Factors

6. What are the major factors that have informed the success of the research capacity building program you are currently involved in: (applicable to your program only)
Please rate the following statements on key success factors for research capacity building programs on your level of agreement or disagreement

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<tr>
<th></th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
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<td>7. The integration of education research and innovation at masters level is key to building research capacity</td>
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<td>8. The integration of education research and innovation at doctorate level is key to building research capacity</td>
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<td>9. The high number of individuals undertaking post graduate research is key to building research capacity</td>
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<td>10. The availability of research grants is key to building research capacity</td>
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<td>11. Acquisition of soft skills in project management is key to enhancing research capacity building</td>
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<td>12. Acquisition of soft skills in communication is key to enhancing research capacity building</td>
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<td>13. Career support is key to enhancing research capacity building</td>
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<td>14. Availability of mentors on peer review is key to enhancing research capacity building</td>
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<td>15. Opportunities for networking enhances research capacity</td>
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<td>building programs</td>
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<td>16. Opportunities for collaboration enhances research capacity building programs</td>
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<td>17. Availability of facilities such as laboratories is key to enhancing research capacity building programs</td>
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<td>18. The availability or research leadership, is key to enhancing research capacity building</td>
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<td>19. The research culture is key to enhancing research capacity building</td>
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<td>20. Environmental factors such as national budgets are key to enhancing research capacity building</td>
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<td>21. National research councils and other programs such as NACOSTI are key to enhancing research capacity building programs</td>
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<td>22. Kenya has innovation policies and strategies that have enhanced the success of research capacity building programs.</td>
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Key Challenges

23. What are the key challenges facing research capacity building programs in Kenya (Please list)

24. On a scale of 1 – 5 with 1 being the lowest intensity and 5 being the highest intensity, please rate the following challenges on their intensity in facing research capacity building programs.

  Financial Challenges ..........................................................

  Coordination challenges .....................................................

  Employee challenges .........................................................

  Others/Specify: .................................................................

Please rate the following statements on challenges for research capacity building programs on your level of agreement or disagreement

<table>
<thead>
<tr>
<th></th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>Not Applicable</th>
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<tr>
<td>25. Financial challenges are the most intense challenge facing research capacity building programs</td>
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<td>26. Most research capacity building programs are financed using short term finances</td>
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<td>27. Individuals have limited access to resources which limits research capacity building</td>
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<td>programs</td>
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<td>28. Research capacity building face coordination challenges which hamper capacity building</td>
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<td>29. Duplication of research capacity programs is a major challenge facing research capacity building</td>
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<td>30. Low levels of peer reviewed journals in the region hampers research capacity building</td>
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<td>31. Lack of capacity to retain and attract employees is a major challenge facing research capacity building</td>
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<td>32. Donor dependency of research capacity programs is a major challenge</td>
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<td>33. Migration of researchers around the world is a major challenge facing research capacity building programs</td>
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<td>34. Limited exposure to skills development in a research environment by employees is a major challenge</td>
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<td>35. Limited collaboration opportunities for researchers is a major challenge facing research capacity building programs</td>
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<td>36. Lack of mentorship of junior researchers is a major challenge facing researchers</td>
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</table>
37. Lack of necessary skills to conduct and define research programs is a major challenge facing research capacity building programs.

38. Lack of government support is a major challenge facing research capacity building programs.

**Contribution to Innovation**

39. What are the major contributions of research capacity building programs?

40. Please rank in order of importance the following outputs of research capacity building programs?

   - Knowledge Sharing  {   }
   - Paper and Journal Articles  {   }
   - Innovations  {   }
   - Others (Please specify):…………………………………………………
41. Please rate the following statements on challenges for research capacity building programs on your level of agreement or disagreement

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Agree</th>
<th>Agree</th>
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<tr>
<td>42. Knowledge sharing is one of the major contributions of research capacity building programs</td>
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<td>43. New Knowledge dissemination is one of the major contributions of research capacity building programs.</td>
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<td>44. Journal articles are a major contribution of research capacity building programs</td>
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<td>45. Research capacity building programs have led to new products and processes</td>
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<td>46. Research capacity building programs have led information sharing policy making in the region</td>
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<td>47. Research capacity building programs have led to acquisition of a competitive edge by organizations</td>
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<td>48. Research capacity building programs have led to improved productivity in the country</td>
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</table>

49. Make comments on the contribution of research capacity building programs and why there is need for increased investment in research capacity building programs (you can even use examples).