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UNIVERSITY OF TLEMCEM

**EFFECT OF OFF-GRID POWER ON GROWTH OF MICRO, SMALL AND
MEDIUM SIZE ENTERPRISES IN KENYA: A CASE OF MSMEs IN BUNGOMA
COUNTY.**

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**RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILMENT OF THE
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ALGERIA.**

2018

DECLARATION

I, Wekesa Daniel, declare that this thesis is my original work, except where due acknowledgement is made in the text, and has not been previously submitted to Pan African University or any other institution of higher learning for award of any degree, diploma or certificate.

Signature: _____ Date: _____

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SUPERVISOR'S DECLARATION

This research project is submitted for examination with my approval as the University Supervisor.

Signature:  Date: _____

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DEDICATION

I dedicate this study to my family and parents. I am truly grateful for their love, care and moral support they have portrayed during my schooling time, which has contributed much to my success. God bless you all.

TABLE OF CONTENTS

DECLARATION.....	ii
DEDICATION.....	iii
TABLE OF CONTENTS	iv
ACKNOWLEDGEMENT	vii
LIST OF ABBREVIATIONS	viii
LIST OF TABLES	ix
LIST OF FIGURES	x
EXECUTIVE SUMMARY	xi
CHAPTER ONE	1
INTRODUCTION.....	1
1.1 Background of the Study	1
1.2 Statement of the Problem.....	9
1.3 Objectives of the Study.....	12
1.4 Research Questions	12
1.5 Significance of the Study	13
1.6 Scope of the Study	13
1.7 Limitations of the Study.....	14
CHAPTER TWO	14
LITERATURE REVIEW	14
2.1 Introduction.....	14

2.2	Theoretical Literature.....	15
2.3	Conceptual Framework.....	19
2.4	Empirical Literature Review.....	27
2.5	Summary of the Reviewed Literature	32
2.6	Knowledge Gaps.....	32
CHAPTER THREE		34
RESEARCH DESIGN AND METHODOLOGY		34
3.1	Introduction.....	34
3.2	Research Design.....	34
3.3	Research Site and Rationale.....	35
3.4	Target Population.....	35
3.5	Sampling Procedure	35
3.6	Sample Size.....	36
3.7	Data Collection Procedure	37
3.8	Research Instruments	37
3.9	Data Analysis and Presentation	39
3.10	Ethical Considerations	40
CHAPTER FOUR.....		41
RESEARCH FINDINGS AND DISCUSSION.....		41
4.1	Introduction.....	41
4.2	Response Rate.....	42
4.3	Pilot Test Results	42
4.4	Demographic Results	43

4.5	Descriptive Statistics Results	47
4.6	Inferential Statistics Results.....	56
	CHAPTER FIVE	65
	SUMMARY, CONCLUSIONS AND RECOMMENDATIONS	65
5.1	Introduction.....	65
5.2	Summary of Findings.....	65
5.3	Conclusion	68
5.4	Recommendations of the Study	69
5.5	Areas of Further Study	70
	REFERENCES.....	71
	Appendix I: Research Work Plan	Error! Bookmark not defined.
	Appendix II: Estimated Research Budget.....	Error! Bookmark not defined.

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LIST OF ABBREVIATIONS

IEA	International Energy Agency
MSMEs	Micro and Small Sized Enterprises
GDP	Gross Domestic Product
SMEs	Small and Medium Enterprises
DOI	Diffusion of Innovation
EC	European Commission
IEA	International Energy Agency
OECD	Organisation for Economic Co-operation and Development

LIST OF TABLES

Table 4.1 Pilot Test Results.....	43
Table 4.2 Unreliability to Off-grid power	49
Table 4.3 Access to Off-grid power	51
Table 4.4 Affordability to Off-grid power	53
Table 4.5 Growth of Small and Medium Size Enterprises.....	55
Table 4.6 Correlation Tests Results	57
Table 4.7 Model Summary.....	61
Table 4.8 Analysis of Variance (Model Significance).....	61
Table 4.9 Regression Coefficients Results.....	61

LIST OF FIGURES

Figure 1.1 Conceptual Framework.....	20
Figure 4.1 Response Rate.....	42
Figure 4.2 Level of Education of respondents	44
Figure 4.3 Duration of running the business.....	45
Figure 4.4 the number of employees per business	46
Figure 4.5 Capital Size of the Business	47

EXECUTIVE SUMMARY

This study sought to establish the effect of off-grid power on growth of micro, small and medium size enterprises in Bungoma County. The study specifically focused on the effects of access to off-grid power, affordability of off-grid power and the unreliability of off-grid power. The study anchored on three theories namely the Diffusion of Innovation theory, Adam Smith Theory of Economic Growth and the Theory of Economics. The study adopted a descriptive research design. This study was conducted in Bungoma County where majority of the rural electrification programs aimed at connecting micro, small and medium size enterprises are situated. In Bungoma County, approximately 12,678 micro, small and medium size enterprises are in operation. Therefore, the target population of the study included 12,678 MSMEs owners in Bungoma County. The study used random sampling to select 385 MSMEs owners who were the respondents selected from the target population of 12,678 micro and small size enterprises. The study used primary data, which was collected using questionnaires, through simple random sampling to come up with the final sample. In this study, descriptive statistics, which involves frequencies and percentages, was used in analysis. The measures of central tendencies that was used in this study was standard deviation mean and dispersion respectively. The others that were used to analyse the relationship of the dependent and independent variable was inferential statistics; regression coefficient and bivariate correlation. The result obtained in this study was presented using tables and charts. The study findings were presented in form of tables, charts and graphs. The study findings revealed that unreliability of off-grid power had a negative and significant relationship with the performance of micro, small and medium

size enterprises. The study findings also revealed that access to off-grid power and affordability of off-grid power had a positive and significant relationship with the performance of micro, small and medium size enterprises. The study findings recommended that micro and small size enterprises in Bungoma County should invest more in access to off-grid power and affordability of off-grid power practices as these off-grid power practices improve the supply chain performance of micro, small and medium size enterprises.

CHAPTER ONE

INTRODUCTION

This chapter presents the background of the study. It further provides the statement of the problem, research objectives, research questions as well as significance of the study. The chapter finally presents the scope of the study and limitation of the study.

1.1 Background of the Study

Electricity service can have both a direct and indirect effect on the growth of micro and small size enterprises. Regardless of the value, the potential as well as the contributions of micro and small enterprises in the Kenyan market, numerous factors hamper their business, expansion, decline and closing. One of the reasons which may cause these issues is grid electricity services, since without accessible and consistent electricity services there is no likelihood of using current electrical appliances, welding kits, and machinery which may pave the way to small and cottage companies. There also no suitable lighting in businesses such as bars and retail shops, which decreases the number of clients, (Barnes, 2012).

Micro, small and medium sized enterprises have been of increasing interest for academics and policy makers in recent years since their role in both developed and developing economies has been established as being major. According to the European Union definition, small enterprises are those who have fewer than fifty employees and an annual turnover of less than 10,000,000 euro. Medium enterprises are defined as ones having fewer than 250 employees and a turnover of less than 50,000,000 euro. By annual turnover the European Commission (EC) means income from sales and services without VAT and

other indirect taxes. MSMEs contribute significantly to the economic growth of both developed and developing countries and insight into how they prosper is worthy of investigation. Micro, small and medium sized firms have been the primary source of employment creation worldwide over the last two decades. At the same time access to financing continues to be one of the most significant challenges for the creation, survival and growth of SMEs, especially innovative ones. Thus, increased attention has been paid to the key factors determining SME growth and success.

Visser (2013) argued that SMEs form the backbone of emerging economies and are a key source of income for most people in urban and rural communities. The rapid growth of SMEs in any economy indicates a positive progress for a nation especially indicated by profitability, market share, asset value and even sales turn over. Furthermore, Hamel and Sapienza (2014) reveal that in current business conditions, where product and business model life cycles have a short lifespan, such qualities are emphatically positively connected with better development and growth of enterprises. According to Rose, Kumar, and Yen (2013), a small business is a business which is privately owned and operated, with a small number of employees and low volume of sales.

Universal electricity access is a primary goal of the international community. Yet, the contribution of electricity to economic development is unclear. It is beyond discussion that the economic transition in nowadays industrialized countries would not have been possible without electrification. However, the right timing of electrification in developing countries is under open debate given high investment-costs and modest short-term impacts. For Asian and Latin American countries Lipscomb *et al.* (2013), find positive effects on various

socio-economic outcomes. For Africa, in contrast, it is less clear whether electrification triggers massive economic development (Dinkelman, 2011, Lenz *et al.* 2017, Peters and Sievert 2016). At the same time, the costs of electrification are substantial. OECD/IEA estimates that for Africa alone the investment requirements to achieve universal access by 2030 are at 19 billion USD annually, which corresponds to almost 45% of the yearly official development assistance influx to the continent (IEA 2011, World Development Indicators 2014)

A large proportion of the population are incapable to access current energy services like solar photovoltaic, grid-electricity and fuel-based production. A greater percentage of the population depends on the biomass for cooking fuel and heat; on kerosene wick lamps, battery-operated flash lights, or candles for lighting; and on human or animal energy-based mechanical power for tilling and weeding land, grinding and crushing, agro-processing, or transport. Poor family units use up a greater percentage of their income on energy since some type of energy are completely important to achieving such basic necessities as transport and cooked food. Households without access spend heavily for less modern energy services of poor quality implying services are unpredictable and erratic. Inadequate and defective electricity restricts the capability of enterprises to enlarge their activities or to be economical.

Tanzania has a population of about 53.5 million; this expected to grow by 30 million people, to 83 million, by 2030. In 2012, only 24% of the population had access to electricity (World Bank, 2011). In urban areas 71% had access, while in rural areas the proportion was only 7%. The off-grid sector already provides 2MW of power, largely solar, to around

15% of the population, according to interviewees. One also noted that there is emerging evidence of a ‘clean energy ladder’ where those who purchase small solar products begin to add additional purchases or buy larger systems (United Republic of Tanzania, 2014). The Tanzanian pico-solar market has grown rapidly and is one of the largest in Africa with several mature players, such as Off Grid: Electric, Mobisol, d.light and Greenlight Planet. This rapid growth has led to a huge influx of low quality products entering the market. Addressing this product quality challenge, enabling capital finance and raising awareness of solar in remote regions and with local government leaders, could accelerate the off-grid market and ensure that solar home systems become a more fundamental part of Tanzania’s electrification plans.

In comparing the costs that the Off-Grid Family would have spent on energy, the on-grid system might appear to be less expensive for the first three years. But the off-grid system can actually be more attractive and provide significant co-benefits (health, education, etc.) for several reasons. First, the off-grid system and appliances are owned free and clear after three years, which means that there will be limited future power costs. The On-Grid Family, on the other hand, probably will deal with broken appliances, often destroyed by power surges from the grid, not to mention power shortages (load shedding, brownouts and blackouts).

Power Africa continues to work with its partners and communities to identify the next highly efficient appliance families want to make their lives better. Power Africa, along with its partners, including Global LEAP, UKAID, and the Shell Foundation, is running a competition for the development of highly efficient off-grid refrigerators that can be

powered with solar home systems. Power Africa is a U.S. Government-led initiative, coordinated by USAID, and launched in 2013 to unlock the substantial natural gas, wind, solar, hydropower, biomass, and geothermal resources on the continent through partnerships. To date, Power Africa has leveraged over \$50 billion in commitments from the public and private sectors, including more than \$40 billion in commitments from the private sector. More than 80 projects comprising more than 7,300 MW have reached financial close. Power Africa has helped provide over 10 million electrical connections, which means tens of millions of people have access to electricity who did not prior to Power Africa's launch in 2013.

Kenya has a population of 46 million, in 2012, 20% of the population had access to electricity (United Nations, Department of Economic and Social Affairs, Population Division, 2015). In urban areas, 60% of the population had access, and in rural areas the proportion was 7%. Despite significant investment in grid expansion by the Kenyan government and donors, which has doubled access to electricity since 2000, millions are still without modern energy services (World Bank, 2015). The government has committed to achieve universal energy access by 2020, though this already significant challenge will be made even more difficult by rapid population growth. By 2020 the population is anticipated to rise by over 8 million, to 52.2 million.⁵

Advancement and proliferation of communication technologies as well as an increase in the flexibility of societies has been made probable for many individuals and households to create homes in somewhat isolated locations regarding the ease of use of conventional grid-based resources like electric power, natural gas, telephone, internet and cable television.

According to Akikur *et al* (2013), it is cost-prohibitive for utilities to set up the substantial facilities necessary to provide electrical power for one or a few prospective clients who live a satisfactory space away from existing connections, (Akikur *et al*, 2013). Accordingly, off-grid electrical power demand applications continues to rise, typically being fulfilled by an amalgamation of renewable sources, principally wind and solar, together with a fuel-fired motor generator, normally fed by propane because that can be delivered easily in large amounts, (Bhandari *et al*, 2014).

Whereas the first code of off-grid energy system design is to reduce energy demands through the utility of energy resourceful structure designs, proficient energy lighting and equipment, and resourceful energy functioning events, certainly, there will be some demand for electric power in a contemporary home. Additionally to the appliances and lighting, electric power is required for socket loads, but usually would not be suggested for water or space heating reasons if there was no fuel source on spot, as it is much more beneficial to deliver heating demands through the consumption of fuel, which can meet energy adaptation effectiveness of in excess of 90% against under 30% for motor/generators run using fuel. The difference between Off-grid power systems and grid connected ones is that they cannot utilize the electric grid to “accumulate” any surplus electrical power to recover for use afterwards.

Electricity is one of the primary drivers of all sectors in Kenya including small and medium term enterprises and hence the need to provide electricity to every part of the country (Ng’ang’a, Onyango & Kerre, 2009). The government of Kenya has re-affirmed its commitment to promoting small and medium enterprises in the country due to their

significant contribution to the national GDP and employment. The government commitment to enhancing the growth of SMEs in Kenya include the strengthening of financial and nonfinancial markets to meet the demand of SMEs, strengthening institutional support for employable skills and business and reducing critical investment constrains on SMEs. This is evidenced by the major strides that the government has taken to invest in electricity, water and roads in various parts of the country.

The effect of electric power load profiles on the utility of energy of off-grid suburban hybrid renewable electric power structures, and looks the favouritism of electric and gas refrigerators for off-grid residential applications for a typical range of refrigerator characteristics and operating conditions. While there has been a move towards even more energy efficient solar reliant systems for supplying power for refrigeration, (Del Pero *et al*, 2015).

Around 90 million formal micro, small and medium sized enterprises (MSMEs) provide over two-thirds of all jobs in the developing world, (World Bank, 2014). MSMEs vary widely in terms of size, sector and level of sophistication. The importance of increasing overall productivity in developing countries highlights the potential contribution to growth and job creation of expansion amongst manufacturing SMEs. Manufacturing sector SMEs account for 22% of all formal SMEs in developing countries.

The poor quality of electricity supplies in many developing countries is perceived by SMEs to impact their operations negatively. Voltage fluctuation and power outages can halt production, damage equipment and affect product quality. Enterprise development organisations, similarly, often regard insecure electricity supplies to be a serious constraint

on SME development and expansion. This brief summarises evidence from recent research on the impact of electricity insecurity on manufacturing SMEs in developing countries³. Despite the challenge, the sector has generated income and provided a source of livelihood for the low income in the country accounting for 12-14 % of GDP (Ngugi et al., 2012). According to Boswell, (2003), Growth of micro and small scale enterprises depends on the changing industry patterns and management; Storey, (2004) states that the growth of an enterprise is influenced by the background and the strategic decisions taken by the owner/manager. Kibera (2000) re-affirms that micro and small scale enterprises are engaged in a number of business activities characterized by the economic and political environment existing in the country. McMohan (2001) feels that business growth and performance by human capital outcomes are correlated. Starting and operating a small business includes a possibility of success as well as failure. Lack of planning, improper financing and poor human resources management has been suggested as the main causes of failure of small enterprises.

Numerous research on challenges facing micro-enterprises cite lack of planning, improper financing and poor human resources management as the main cause of failure of growth small business in Kenya (Longneck, 2006). A simple management mistake like over or under employment is likely to lead to death of the enterprise (Kings & MacGrath, 2002). While the government has put good policies in place, it is imperative to note that entrepreneurs do not take the challenges in engaging qualified human resources to produce high quality goods and services, hence their goods are rejected in preference for high

quality goods (Kibas, 2012). Human capital remains as one of the necessary ingredients not only for production but also for an enterprise's survival.

1.2 Statement of the Problem

In spite of the significance, contributions and prospective of MSMEs in the Kenyan markets, there are a number of factors that affect their expansion. One of the factors is accessibility to grid electricity services, since with no accessible and consistent electricity services there is no chance of using current electrical appliances and equipment, which may open the way for MSMEs. Connecting customers to the grid is costly. A grid connection in sub-Saharan Africa costs between \$400 and \$1,200, plus the costs of wiring a home and the regular required payments for power consumed into the indefinite future. About 1.2 billion people live without access to an electrical grid. The overwhelming majority of them -- about 95 percent -- live in Sub-Saharan Africa, according to the Off-Grid Solar Market Trends Report 2016 released earlier this year by Bloomberg New Energy Finance. In certain countries in Africa, less than 20 percent of the population has grid access. There is also no suitable lighting in companies such as retail shops and bars, which decreases the amount of clients, (Barnes, 2012).

Countryside areas carry on to be the domicile to most population in Kenya and the core of micro,small and medium enterprises. Deficiency in electricity supply influences approximately ninety percent of the population, (Abdullah and Markandya, 2012). Although, the striking benefits the management has made in supplying electricity to populations inhabiting in rural areas, Bungoma has not yet achieved the collective

electricity exposure and even in sections where the rural electrification program have been rolled out fully, a section of the population have not shifted. Consequently, reliable data on the impacts of rural electrification program on businesses and trends on the productive use of electricity in Bungoma are not available. The government of Kenya together with other private partners and donors has played a crucial role in the provision of electricity to rural areas in a bid to spur human, social and economic development in the country. Abdullaha *et al* (2012) looked at the major issue hampering the rural electrification programs in rural Kenya (high connection payments) and found out that the government needs to reform the energy subsidies, increase market ownership and performance of private suppliers, establish financial schemes and create markets that vary according to social-economic and demographic groups.

According to World Bank (2008) projections, well designed, cautiously targeted and effectively enforced rural electrification activities have the capability of creating chances for low-income rural individuals to boost their income and thus speed up rural growth. However, previous studies did not concentrate on the effects of rural electrification on the expansion of SMEs in Kenya. Few enterprises are able to utilize electricity services for income creation activities. Consequently lacking reliable data and information about significant positive impact of electricity services on micro-enterprises may limit the room for entrepreneurs to choose this type of modern energy for productive activities. Moreover, lack of data and information on the linkages between electricity services and SME development may have effects on national policy strategies to combat poverty as most of the rural poor depend on small and micro-enterprises for income creation, (Sawe, 2004).

This study therefore seeks to assess the effect of off-grid power on small and medium size enterprises in Bungoma County. Largely, empirical evidence on the effects of rural electrification on SMEs is lacking however, there is a convincing factor that electricity service has both direct and indirect impacts on MSME growth.

The findings of a study by Scott *et al* (2014) indicated that electricity insecurity has negative but at times also insignificantly positive effect on the efficiency of manufacturing SMEs. However, the results showed that electricity insecurity does not affect the cost-competitiveness of manufacturing SMEs, somewhat because electricity costs are usually a very small percentage of the total costs. Electricity insecurity affects investment in and by MSMEs, particularly the setting of investment, but evidence that it hinders investment is mixed.

Ahlborg *et al* (2011) carried out research to determine the key factors and barriers for rural electrification and off-grid solutions in Tanzania and Mozambique and found out that there existed country-specific institutional, financial and poverty-related drivers and barriers to grid and off-grid electrification. However, none of the study focused on the determinants of rural electrification adoption by micro-enterprises in Bungoma County in Kenya. Therefore, this study seeks to examine the effect of off-grid power on growth of small and medium size enterprises in Bungoma County.

1.3 Objectives of the Study

1.3.1 General Objective of the Study

The main objective of this study was to establish the effect of off-grid power on micro, small and medium size enterprises in Bungoma County.

1.3.2 Specific Objectives of the Study

- i. To investigate the effect of access to Off-grid power on performance of micro, small and medium size enterprises in Kenya.
- ii. To determine the effect of Unreliability of Off-grid power on performance of micro, small and medium size enterprises in Kenya.
- iii. To ascertain the effect of affordability of Off-grid power on performance of micro, small and medium size enterprises in Kenya.

1.4 Research Questions

- i. How does access to Off-grid power affect the performance of micro, small and medium size enterprises in Kenya?
- ii. How does the Unreliability of Off-grid power affect the performance of micro, small and medium size enterprises in Kenya?
- iii. How does the affordability of Off-grid power have on the performance of micro, small and medium size enterprises in Kenya?

1.5 Significance of the Study

The findings of the study are expected to help to policy makers in developing policies for mitigating the impact of electricity insecurity on SMEs by ensuring that outages are planned and by facilitating access to alternative supplies of electricity, including generators and renewable energy. The findings of this study are also expected to be of significance to policy makers both at the national and county levels. They might adopt the findings of this study in order to formulate and amend existing policies that hinder the off-grid power connectivity of MSMEs in counties especially in rural areas.

The findings of this study might also be used as the basis of budget allocation process where county governments are expected to be informed on the need for power connectivity subsidies for MSMEs. Moreover, the study might help the county governments spur growth and development in less developed rural areas in the country. The stakeholders of vision 2030 might adopt the study findings in their pursuit to spur economic development in areas that are underdeveloped.

1.6 Scope of the Study

The study intended to establish the effect of off-grid power on micro, small and medium size enterprises in Bungoma County. The factors that the study focused on include access to off-grid power, unreliability of off-grid power and affordability of off-grid power. The population for study comprised of all owners of the 12,678 micro, small and medium enterprises in Bungoma County. The study used descriptive research design.

1.7 Limitations of the Study

Issues of confidentiality hampered effective data collection process. Some respondents were afraid being victimized for providing information and participating in the study. The researcher assured the respondents that the study was for academic purposes and would not be used for any other reason except for the reason provided by the researcher. The study used a questionnaire to collect primary data and therefore the limitations encountered by using a questionnaire were the inability to tell whether the respondent is thinking within the full context of the situation and being honest in the process. The use of a questionnaire leads to inadequacy in understanding some forms of information regarding changes of emotions, behaviour and feelings.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews related literature materials depicting the research study. It comprises of theoretical review, conceptual framework, and empirical review, critique of existing

literature, research gap and summary of the chapter. The chapter has established the literature existing on the theme of the study.

2.2 Theoretical Literature

This section discussed the some of the selected theories that may be applied in the study that brings out the theoretical foundations that guide the study. The Theory of Economics, Adam Smith Theory of economic Growth and Diffusion of Innovation Theory guided the study.

2.2.1 The Theory of Economics

Adam Smith (1723) defined economics as follows: “Economics is the science of wealth”. He was the author of the famous book “Wealth of Nations” (1776). Adam smith was of the view that economics was concerned with the problems arising from wealth-getting and wealth-using activities of people. He was interested mainly in studying the ways by which the wealth of all nations could be increased. Economic theories try to explain economic phenomena, to interpret why and how the economy behaves and what is the best to solution - how to influence or to solve the economic phenomena. They are comprehensive system of assumptions, hypotheses, definitions and instructions what should be done in a certain economic situation. In principle, the approach to economic theory is divided into positive and normative.

The relevance of Adams smith writings was in advocating for large investments of capital and use of large scale machinery in a bid to produce wealth on a large scale. This theory is relevant to this study as it shows how wealth could be increased by SMEs. It is through large investment of capital and use of large scale machinery. Electrification requires large

investment of capital. Once electrification is adopted, it is expected to facilitate use of large scale machinery to produce wealth.

2.2.2 Diffusion of Innovation (DOI) Theory

The proponent of this theory was Rogers (1962). It originated in communication to explain how, over time, an idea or product gains momentum and diffuses (or spreads) through a specific population or social system. The end result of this diffusion is that people, as part of a social system, adopt a new idea, behavior, or product. Adoption means that a person does something differently than what they had previously (i.e., purchase or use a new product, acquire and perform a new behavior, etc.). The key to adoption is that the person must perceive the idea, behavior, or product as new or innovative. It is through this that diffusion is possible.

Adoption of a new idea, behavior, or product (i.e., "innovation") does not happen simultaneously in a social system; rather it is a process whereby some people are more apt to adopt the innovation than others. Researchers have found that people who adopt an innovation early have different characteristics than people who adopt an innovation later. When promoting an innovation to a target population, it is important to understand the characteristics of the target population that will help or hinder adoption of the innovation.

New information technologies represent innovations for potential adopters: "an idea, practice, or object that is perceived as new by an individual or other unit of adoption"(Rogers, 1995). One popular and enduring conceptualization of innovation adoption behavior is Rogers' theory of the diffusion of innovations. Although the overall

theory is rich and complex, its essence views the innovation adoption process as one of information gathering and uncertainty reduction. Information about the existence of an innovation, as well as its characteristics and features, flows through the social system within which adopters are situated.

Innovations are not adopted by all individuals in a social system at the same time. Instead, they tend to adopt in a time sequence, and can be classified into adopter categories based upon how long it takes for them to begin using the new idea. Practically speaking, it's very useful for a change agent to be able to identify which category certain individuals belong to, since the short-term goal of most change agents is to facilitate the adoption of an innovation. Adoption of a new idea is caused by human interaction through interpersonal networks. If the initial adopter of an innovation discusses it with two members of a given social system, and these two become adopters who pass the innovation along to two peers, and so on, the resulting distribution follows a binomial expansion. Expect adopter distributions to follow a bell-shaped curve over time (Rogers, 1971).

Potential adopters engage in information seeking behaviors to learn about the expected consequences of using the innovation. An assessment and evaluation of this information manifests itself in the form of beliefs about the innovation, and is then a proximal antecedent of adoption behavior. The theory also contains predictions regarding the spread of an innovation through a social system, i.e., the diffusion process, which is postulated to follow S-shaped curve. The S-shaped curve of cumulative adopters gives rise to a bell-shaped distribution of adopters. Rogers utilizes this distribution to distinguish between five categories of adopters – ranging from “innovators” to “laggards” derived from their time

of adoption of the innovation. Based on a meta-analysis of findings from a wide range of studies in several innovation domains, he also offers several generalizations regarding early adopters versus the rest related to the socioeconomic status of adopters, personality characteristics, and communication behaviors (Burkhardt *et al*, 1990). This theory is relevant to this study as it is related to the role of SMES in spread of innovation.

2.2.3 Adam Smith Theory of Economic Growth

The proponent of the theory was Adam Smith in 1723. According to Adam, economics is the science of wealth. In his book “Wealth of Nations” in 1776, he states that economics is concerned with the problems arising from wealth-getting and wealth-using activities of people. He was interested mainly in studying the ways by which the wealth of all nations could be increased.

Adam Smith’s theory is based on the principle of ‘Laissez-Faire’ which requires that state should not impose any restriction on freedom of an individual. The theory of economic development rests on the pillars of saving, division of labour and wide extent of market. Saving or capital accumulation is the starting point of this theory. He believed that “there is a set of rules or rights of justice and perhaps even of morality in general which are, or may be known by all men by either reason or of a moral sense, and which possesses an authority superior to that of such commands of human sovereigns and such customary legal and moral regulations as may contravene them. The policy of laissez-faire allows the producers to produce as much they like, earn as much income as they can and save as much they like. Adam Smith believed that it is safe to leave the economy to be propelled,

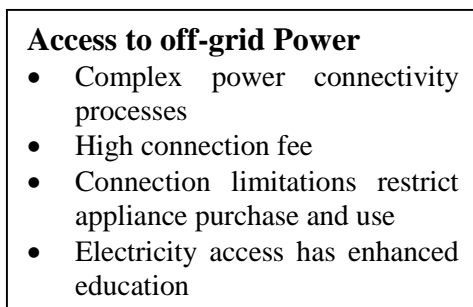
regulated and controlled by invisible hand i.e. the forces of competition motivated by self-interest be allowed to play their part in minimizing the volume of savings for development.

The relevance of Adams smith writings was in advocating for large investments of capital and use of large scale machinery in a bid to produce wealth on a large scale. This theory is relevant to this study as it shows how wealth could be increased by SMEs. It is through large investment of capital and use of large scale machinery. Rural electrification requires large investment of capital. Once rural electrification is adopted, it is expected to facilitate use of large scale machinery to produce wealth.

2.3 Conceptual Framework

The conceptual framework is designed to create a hypothesis abstract in order to guide the results of the study against being generalized beyond the specific conditions of a study (Finchman, 2008). A conceptual framework illustrates the hypothesized relationship between variables. The theoretical as well as conceptual aspects of the study are explored in order to form a coherent and consistent foundation for the development and identification of the dependent as well as the independent variables. The independent variable will comprise of compensation, growth opportunity, work-life balance and work environment while the dependent variable will be millennials retention.

Independent Variables



Dependent Variable

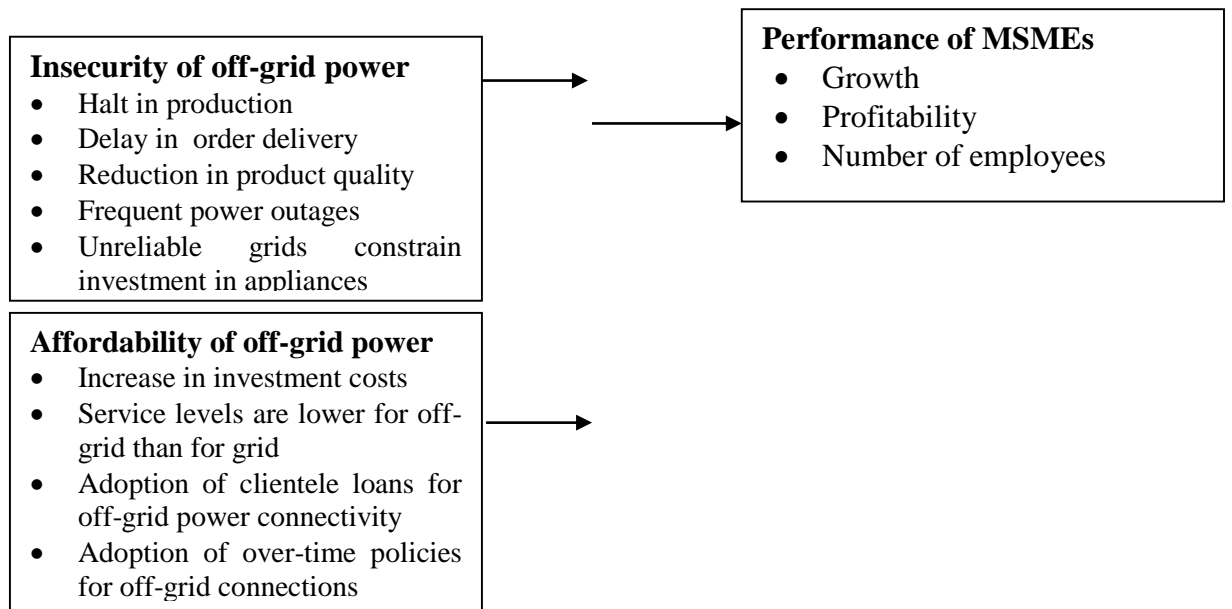


Figure 1.1 Conceptual Framework

Source: Author (2017)

2.3.1 Access to Off-Grid Power

According to IEA, access to electricity at the household level is a minimum level of electricity consumption, ranging from 250 kWh in rural areas to 500 kWh in urban setting per household annually. The electricity supplied must be affordable and reliable. The initial level of electricity consumption should increase over time, in line with economic development and income levels, reflecting the use of additional energy services. Bangladesh has the largest and most dynamic national off-grid electrification program in the world, which is a successful off-grid solution for bettering access to electricity especially for other nations.

Africa's off-grid population is growing, despite investments to extend electrical grids to reach more people, the number of people in Africa living off the grid has grown by 114 million since 2000, and that number is growing by several million each year, the report notes. While many households pay cash for their off-grid solar systems, pay-as-you-go solar systems have also contributed to affordability. Off-grid solar costs are also competitive with kerosene lanterns, battery-powered torches, and even candles.

Internationally, approximately 1.2 billion individuals lack access to electricity. Majority of them inhabit or reside far from the current electrical grid. Therefore, to achieve vision 2030 goals, off-grid electricity solutions should be scaled up. IEA (2013) states that to achieve worldwide electricity access, approximately 2/3 of the prospective energy investments should go to mini-grids and stand-alone systems. Attaining worldwide access to modern electricity services is among the goals for the Sustainable Energy for All (SE4ALL) programme by 2030 (SE4ALL 2012).

Thomas *et al* (2013) study based on World Bank data approximates that Africa misses out an estimated 2 to 4% in GDP growth yearly as a result of power shortages. Additionally, the projections on the failure to make some adjustments on the utilization and access of energy will put approximately a billion people to be still with no electricity by 2030. More than 1.2 billion people in the world, largely in developing Asia and sub-Saharan Africa, do not have access to electricity. Moreover, the majority of this population that lacks access to electricity service lives in rural areas. Renewable energy-based off grid and mini-grids (RE mini-grids) solutions offer a significant opportunity to increase access to reliable electricity services.

The off-grid sector in Kenya is one of the most established in Africa, and the largest presence of off-grid solar is in Western Kenya. The market in this region is becoming saturated and businesses are expanding to other areas. To some extent, geographic location determines the likelihood that companies will have commercial success. For example, while there is still huge room to extend the off-grid market into relatively wealthy regions around Lake Victoria, the Northern parts of Kenya which are further from the larger transport and commercial centres and have the smallest populations, present a challenge for the revenue streams of private companies (World Bank, 2015). Although the ease of doing business and supportive policy measures, such as the removal of VAT and tariffs, have led to a huge surge in off-grid solar, the sector is still requires significant financial support to reach low-income families and those living in remote regions. Despite the fast growing economy, 45.9% of the population still lives in extreme poverty, meaning that millions may struggle to purchase solar products and/or enter into solar pay as-you-go schemes.

2.3.2 Unreliability of Off-Grid Power

Electricity unreliability can influence investment decisions, but it is neither the only nor the most significant factor considered by SMEs in their operation and investment decisions, nor by external investors. Electricity Unreliability seems to affect the growth of medium and large-scale firms' more than small firms, and seems to influence the location of investments by SMEs.

Countries with high frequency of power outages have few small companies in electricity-intensive sectors (such as manufacturing) since only large firms are able to invest in generators to mitigate the effects of outages (Alby *et al*, 2011). Evidence from India suggests that in countries with high levels of electricity unreliability, firms may not have an incentive to move to productivity-enhancing industries or to grow larger, since doing so comes with the cost of having to rely on electricity (Abeberese, 2012).

The World Bank estimates that the cost of grid extension in developing countries ranges from US \$6,340 per kilometre in densely populated regions to as much as US \$19,070 per kilometre in regions with dispersed populations. The high cost of grid extension in remote areas presents enormous opportunities for off-grid electrification. In most cases, a single renewable technology will be insufficient to reliably meet electricity demand over long periods. To overcome this barrier, off-grid integrated renewable energy systems have been proposed to meet the growing demand from remote areas with locally available renewable energy resources.

The empirical evidence of the impacts of electricity Unreliability on SMEs indicates that it is not as big a constraint as perceptions suggest. This may be due to the on/off nature of the supply and the considerable stress and frustration of coping with electricity Unreliability, magnifying its actual impact on firm performance. Firms that complain most about outages may do so because they experience more outages, not because of the impacts (Hallward-Driemeier & Aterido, 2009).

Electricity Unreliability negatively affect the total factor productivity and labour productivity of manufacturing SMEs. As with electricity access, the impact of electricity Unreliability on productivity varies depending on factors related to both the external context that a firm operates in and its internal capabilities (World Bank, 2010; Cissokho and Seck, 2013). In general, power outages seem to affect small firms' more than large firms (Moyo, 2012). The duration of outages (typically measured by hours in a day) has far greater negative impact on firm productivity than the frequency of outages (days per month that outages occur). The impact of outages is not universally negative: a study in Senegal found that outages had a positive effect on manufacturing firms and SMEs, because outages stimulated better management practices to mitigate the negative impact of power cuts and less efficient, lower productivity firms had gone out of business (Cissokho & Seck, 2013). Firm competitiveness is also dependent on product quality and the ability to meet orders on time, as well as unit costs. Electricity Unreliability may impact both of these factors, e.g. by causing firms to resort to manual methods which reduce product quality, or to halt production and delay order delivery. However, there is an absence of empirical analysis and enterprise survey data does not capture this information.

2.3.3 Affordability of Off-Grid Power

Approximately, 2 billion people which are about 3 in every 10 people either lack access to consistent and affordable modern electricity or energy, hindering their health, education and their income potential, (SE4All, 2014). From this group, a larger proportion live completely with no electricity for cooking, lighting and heating at home, for community

services such as schools or health centres, or for bettering the efficiency of small business and farms. This insufficiency of energy forms an alarming hurdle to all-encompassing expansion and poverty alleviation which depicts narrow signs of declining.

In the global effort to make off-grid energy, and solar in particular, affordable to the 1.2 billion people currently without energy, there have been a number of encouraging breakthroughs in the past decade. When it comes to increasing solar' affordability and bringing off-grid energy within reach of the poor, these trends are undoubtedly encouraging. However, the growth we've seen in the sector is still a drop in the ocean when compared to the 600 million Africans who continue to live beyond the grid.

Off-grid power is affordable to many low-income households. While most people living off the grid are poor, the report estimates that tens of millions of households in Africa have an annual income that while modest is high enough for them to afford simple solar lanterns as well as some larger solar-powered appliances. Low-cost, off-grid solar energy could provide significant economic benefit to people living in some remote areas, but a new study suggests they generally lack the access to financial resources, commercial institutions and markets needed to bring solar electricity to their communities.

An increasing amount of research shows that the barriers are complex and various, including, a lack of understanding of the demand for off-grid technologies, the complexity of Pay-As-You-Go (PAYG) business models and a limited focus on last mile distribution (Facebook and Bloomberg's New Energy Finance's last mile connectivity report, 2015). However, the single biggest challenge facing the sector is the lack of affordable financing.

According to Shell Foundation's financing report, (2010) achieving SDG7 will require over \$30 billion in commercial capital over the next 13 years. Juxta, (2008) pose that figure with the most recent off-grid solar market trends report, which states that less than a billion has been raised since 2012, and the size of this issue quickly becomes apparent.

According to Lee *et al* (2016) study on WTP for 3 varying off-grid solar technologies indicated that investment costs of these devices range between 13 and 180 US dollars, in relation to at least 1,000 US dollars per connection if the grid is unlimited. The cost-structure of on-grid electrification is much more difficult and case-specific since the necessary large scale infrastructure with power plants, transmission and distribution lines as well as the domestic connection. The distance to the existing grid and the population density play decisive roles. Cost considerations for off-grid solar are therefore much less sensitive to the underlying assumptions. At the same time, service levels are obviously lower for off-grid than for grid connections.

According to the majority of the policy makers, affordability issues for electricity for the poor are well documented. In reality, people are more willing to pay cost-covering prices, but in certainty are inhibited by a deficient liquidity to change consumption between today and tomorrow. For this reason, relaxing monetary hindrances through clientele loans or payment-over-time are favoured policies of World Bank's Lighting Global proposal, the flagship initiative for off-grid solar energy, (Lighting Global 2016).

2.4 Empirical Literature Review

This section reviews some of the existing studies in this area. The review comprises of global, regional and local studies. It explores past studies regarding the objectives of the study. It summarizes results from research in the same field of study under the theme; establish the effect of off-grid power on small and medium size enterprises in Bungoma County. From the review, critique of literature is conducted and research gaps identified.

Ahlborg *et al* (2011) conducted a study seeking to establish the specific drivers and barriers for rural electrification and off-grid solutions in Tanzania and Mozambique. The study was done across a stakeholder spectrum. It was part of a larger research effort, undertaken in collaboration between Swedish and African researchers from natural, engineering and social sciences, aiming at an interdisciplinary assessment of the potential for an enhanced utilization of available renewable sources in off-grid solutions. By qualitative methodology, data was collected in semi-structured stakeholder interviews carried out with ten national level energy sector actors. Findings revealed that there existed country-specific institutional, financial and poverty-related drivers and barriers to grid and off-grid electrification.

Breyer, and Gerlach, (2013) studied Cost-Benefit Analysis of Off-Grid Solar Investments in East Africa. The results of study analysis recommended that the future work in the off-grid solar energy market, donors should consider supporting solar investments that produce social welfare benefits, at least until companies can create financially sustainable investments in partner countries.

Grimm, Lenz, Peters, and Sievert, (2017) carried a study on demand for off-grid solar electricity experimental evidence from Rwanda. The study examined whether the objective and the associated costs are justified by the value that target beneficiaries assign to electricity. The study findings showed that households are willing to dedicate a substantial part of their expenditures to electricity. In absolute terms, though, the willing to pay does not suffice to reach cost-covering prices. If universal electricity access is to be achieved, direct subsidies might be necessary. The study, from a public policy perspective it is more rationale to promote off-grid solar than grid-based electrification because of its better cost-benefit performance.

Martinot, Cabraal, and Mathur, (2001) study on reliable and affordable off-grid electricity services for the poor: lessons from World Bank Group Experience. The study focused on experiences geared towards efficiently and effectively integrating off-grid electrification scale-up efforts with grid rollout within a national roadmap for achieving universal access in a given time-frame. Relevant findings and lessons are framed as strategic considerations to inform the design, development and implementation of country engagements tailored to the prevailing sector conditions and readiness; through capacity building, technical assistance, and investment lending.

Abdullaha *et al* (2009) investigated the major issue impeding rural electrification programs in rural Kenya (high connection payments). The study used estimates obtained from a stated preference study, namely a contingent valuation method completed in 2007, to examine the willingness to pay to connect to grid-electricity and photovoltaic services. The key findings suggested that the government needs to reform the energy subsidies, increase

market ownership and performance of private suppliers, establish financial schemes and create markets that vary according to social-economic and demographic groups.

Akuru (2011) sought to determine the effect of electricity power outages on the growth and survival of firms in Nigeria. Results of the study revealed that, between 2000 and 2008 around 820 manufacturing firms were closed down, with the figure moving up to 834 in the following year, all because of poor electricity power supply and high cost on the alternative energy supply. Tarun *et al* (2013), is also of the view that, electricity power outages have positive impact on the rise in operational of SMEs.

Ouma (2013) conducted a study to determine the effects of rural electrification on the growth of small and medium enterprises in Mbita Town. The target population for the study comprised of 280 SMEs. The study used surveys. The findings of the study revealed that constraining cost of connections and that the timing for those who were waiting to be connected was longer than one could have expected. The recommended the government to give incentives to encourage the people to get connected.

Barfour, (2013) conducted a study seeking to establish the barriers to rural electrification in Ghana. The results showed that there existed various challenges which include: level of the rural people; high cost of grid extension to thinly populated and remote areas; lackluster acceptability of off-grid systems; ownership, management and operations of renewable systems especially mini grid; inadequate funding from government budget; low level of electrification levy and lack of private capital lack of commitment of the utilities.

Isaksson (2010) also argue that output per capita and energy infrastructure are co-integrated and causation runs in two directions, but concludes from analysis of cross-country data that energy infrastructure is a significant factor in explaining differences in industrial development between countries. Similarly, Kaseke *et al* (2013) study on the relationship between energy consumption and GDP revealed a bi-directional causality and uni-directional causality in both directions, in different countries.

Muhoro (2010) conducted a study seeking to identify the factor that affects rural electrification in rural western Uganda. The study used both quantitative and qualitative methods, including informal surveys, intra-business energy allocation studies and historical analysis, to analyze off-grid electricity access among micro-enterprises. Data was obtained from 56 micro-enterprises located in 11 village-towns within 3 districts in Uganda. Findings showed that Micro-enterprises in rural Uganda created income for the poor; they acted as resources for poverty reduction. Further findings indicated that without subsidies, credit-based sales and better financing options, it is unlikely that access to electricity will increase beyond the levels established in the existing cash market.

Scott *et al* (2014) sought to determine how electricity Unreliability affects businesses in low and middle income countries. The target population for the comprised of World Bank Enterprise Surveys from 6 selected countries (Bangladesh, Nepal, Nigeria, Pakistan, Tanzania and Uganda) specifically the manufacturing SMEs. The findings of the study indicated that Electricity Unreliability has negative but at times also insignificantly positive effect on the efficiency of manufacturing SMEs. However, the results showed that Electricity Unreliability does not impact on the cost-competitiveness of manufacturing

SMEs, somewhat due to the fact that electricity costs are usually a very small percentage of the total costs. Electricity Unreliability affects investment in and by SMEs, particularly the setting of investment, but evidence that it hinders investment is mixed.

Crossland, Anuta, and Wade, (2015) studied the accelerating access to electricity in Africa. Rwanda has a population of 11.6 million,¹ and a high population density of 460 people per square kilometre. ² In 2012, only 17% had access to electricity, with a marked difference between urban and rural households. According to one interviewee 24.5% of the population now have access to electricity, 23% through on grid solutions and 1.5% using off-grid alternatives. The government has a strong focus on energy access. This commitment is demonstrated by its goal to double access to on-grid electricity by June 2018, to 48%, and to reach 22% of the population with offgrid solutions. This off-grid target is 15 times higher than the current population reached. One interviewee said the government has recently brought forward its ambition to achieve universal access to electricity from 2025 to 2020. with off-grid solar

Kirubi *et al.* (2009) carried out a study on community-based micro-girds in rural Kenya, and revealed that use of electricity can improve the productivity per worker by approximately 100-200% for carpenters and by 50-170% for tailors, depending on the item being produced. Also, Grimm *et al* (2011) concluded that tailors in Burkina Faso with access to electricity have revenues 51% higher than tailors without electricity, and links this to the use of electric sewing machines and longer working hours. Another study Chakravorty *et al* (2012) to examine the effect of rural electrification on household income

in India indicated that the reliability of electricity supply is more important than being connected to the grid.

2.5 Summary of the Reviewed Literature

This chapter reviewed literature in relation to the effect of off-grid power on the performance of small and medium size enterprises in Bungoma County. This study was anchored on theory of economics, Adam Smith Theory of economic Growth and diffusion of innovation theory. The researcher notes that while there are various studies most of them concentrate on rural electrification programs and their influence on micro and small enterprises and have not been conducted in the context of Bungoma County in particular since introduction of devolved government system in Kenya. Previous studies have also adopted different research designs mostly case studies of sole entities and not survey of different small and medium enterprises. This study therefore endeavours to assess the effect of off-grid power on the performance of small and medium size enterprises in Bungoma County by carrying out a survey on selected small and medium enterprises in Bungoma County.

2.6 Knowledge Gaps

Several factors hamper rural electrification and off grid power connectivity of small and medium enterprises in Kenya. Studies such as by Ahlborg *et al* (2011) focussed on the specific drivers and barriers for rural electrification and off-grid solutions in Tanzania and Mozambique. This study will look at the effect of off-grid power on the performance of small and medium size enterprises in Bungoma County. Abdullaha *et al* (2009) also looked

at the major issue impeding rural electrification programs in rural Kenya (high connection payments). This study will specifically focus on the effect of off-grid power on the performance of small and medium size enterprises in Bungoma County.

Moreover, Akuru (2011) carried out a study to determine the effect of electricity power outages on the growth and survival of firms in Nigeria while this study will seek to establish the effect of off-grid power on the performance of small and medium size enterprises in Bungoma County. Similarly Ouma (2013) looked at the effects of rural electrification on the growth of small and medium enterprises in Mbita Town while this study will attempt to examine the effect of off-grid power on the performance of small and medium size enterprises in Bungoma County.

Other studies such as by Barfour (2013) sought to establish the barriers to rural electrification in Ghana, Muhoro (2010) conducted a study seeking to identify the factor that affects rural electrification in rural western Uganda, Scott *et al* (2014) sought to determine how electricity Unreliability affects businesses in Bangladesh, Nepal, Nigeria, Pakistan, Tanzania and Uganda specifically the manufacturing SMEs. This study will seek to look at the effect of off-grid power on the performance of small and medium size enterprises in Bungoma County. Another study Chakravorty *et al* (2012) to examined the effect of rural electrification on household income in India.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This chapter discussed the methodology that was used in conducting the study. It consisted of the research design, target population, sampling procedure, data collection, reliability and validity of the research instruments, data analysis procedure and techniques.

3.2 Research Design

Lavrakas (2008) and Kothari (2004) state that research design represents the overall plan that the study employs in order to obtain responses to the questions being studied and the ways of handling any challenges that may be encountered in the process of undertaking the study. The study used descriptive research design. The choice of this research design is due to the fact that a descriptive research design according to Creswell (2003) is well suitable

for identifying the type of association and explaining complex relationships of numerous factors that explain an outcome and predict an outcome from one or two predictors.

3.3 Research Site and Rationale

This study was conducted in Bungoma County. The rationale behind the selection of this region is based on the fact that establishes the specific drivers and barriers for rural electrification and off-grid solutions in Kenya of available renewable sources in off-grid solutions. This is because Bungoma County have several rural electrification programs that are currently being undertaken.

3.4 Target Population

Nachiamis and Nachamis (2012) define population as the entire set of relevant units of analysis or data while Ott *et al* (2015) argue that a target population consists of a list of elements or individual members of the overall population from which a sample is drawn. The target population of the study included all registered small and enterprises within Bungoma County. The target population of the study included 12,678 SMEs in all the Bungoma County. The unit of analysis was the MSME owners, one from each MSME in cases where there are more than one owner.

3.5 Sampling Procedure

A sample design is the architecture or the strategy used to select study participants or respondents (Kothari, 2004). A sampling frame is a list of population from which a sample is drawn (Williams, 2011). Sampling refers to the systematic selection of a limited number of elements out of a theoretically specified population of elements. The rationale is to draw

conclusions about the entire population. The study used random sampling technique to come up with the final sample because of its accurate representation of the larger population.

3.6 Sample Size

Fostgate (2012) recommends that a formula should be used for calculating the sample size. In this study, the Fisher (1998) formula was used to determine sample size. Other studies that have used this formula include Fostgate (2005), Georgiadis, Johnson and Gardner, (2005) who carried out studies in different fields.

The formula used is:

$$n = Z^2 pq / e^2$$

Where:

n represents the expected sample size

Z represents the abscissa of a curve that is normal and cuts the area α at the tails that is $1 - \alpha$ which is equal to the desired level of confidence level which is 95% in this case

P represents an estimated proportion of a population attribute

q Is obtained by calculating $1-p$

e represents the desired precision level

Therefore a sample size of 385 was obtained as follows:

$$n = \frac{(1.96)^2 (0.5) (0.5)}{(0.05)^2}$$

=385 SMEs

Hence, the sample size for this study was 385 SMEs. The study used proportionate sampling to make sure that all the SMEs had fair representation. Random sampling was used to select the SMEs where the questionnaires were administered. The owners of the SMEs were the respondents in this survey.

3.7 Data Collection Procedure

The researcher sought authorization from the management of the selected MSMEs to collect data. This is after having acquired the introductory letter from the university. In order to enhance the response rate, the researcher considered the research ethical issues. The respondents were given instruction to mark each answer with any mark in the appropriate box representing their answer or fill a blank space in case of open-ended questions. The questionnaire was administered through drop and pick-later method to the sampled respondents.

3.8 Research Instruments

Parahoo (2014) define data collection instrument as a tool used to collect data. This study will use both primary and secondary data. Primary data was used in this study. Primary data in this study was collected through a questionnaire. Marshall and Rossman (2011) points out that questionnaire are appropriate for studies because they collect information that is not directly observable as they inquire about opinion, motivations, feelings, achievements as well as experiences of those respondents under study. A combination of ratio and nominal scales was used in the questionnaire. The questionnaire was divided into

five different sections. Section A used nominal measurements whereby the respondents was asked to indicate their academic qualification, experience, age, and so on. The second to fifth sections tackled each research objective/question. Five-point Likert scale where each item has five response categories, ranging from ‘strongly disagree’ to a ‘strongly agree’ was utilized and Appendix ii shows a sample of the questionnaire to be used. Likert scale is an interval scale that specifically uses five anchors of strongly disagrees, disagree, neutral, agree and strongly agree. The likert measures the level of agreement or disagreement. This type of questionnaires was more appropriate because it enabled consistency in questions asked and data yielded was easy to analyze. Likert scales are good in measuring perception, attitude, values and behavior. The Likert scale has scales that assist in converting the qualitative responses into quantitative values (Upagade & Shende, 2012).

3.8.1 Piloting of Research Instruments

Before actual data collection, a pilot study was conducted on 10 respondents that were drawn from the selected small and medium enterprises hence were included in the final study. The pilot data was not incorporated in the actual study and the reason for this is to allow for pre-testing of the research instrument. Pre-testing provided the opportunity to refine the questionnaire by revealing errors in the questions, the sequence and design and see how the questionnaire was performed under actual conditions (Churchill & Iacobucci, 2002).

3.8.2 Validity of Research Instruments

Validity is the degree by which the sample of test items represents the content the test is designed to measure (Borg & Gall 1989). To ensure content validity, the questionnaire was subjected to thorough examination by selected SMEs experts. They were asked to evaluate the statements in the questionnaire for relevance and whether they are meaningful, clear and loaded off offensive. On the basis of the evaluation, the instrument was adjusted appropriately before subjecting it to the final data collection exercise. Their reviewed comments were used to ensure that content validity is enhanced.

3.8.3 Reliability of Research Instruments

In this study internal consistency testing was done using Cronbach's Alpha. Cronbach's alpha is a measure of internal consistency, that is, how closely related a set of items are as a group. A "high" value of alpha is often used as evidence that the items measure an underlying (or latent) construct, (Warmbrod, 2001). Feininger and Demotte (2007) stated that to ensure reliability, a predetermined threshold of 0.7 is needed. That is, values above 0.7 indicate presence of reliability while values below signified lack of reliability. The Cronbach's statistics for all the four independent variables and one dependent variable was computed.

3.9 Data Analysis and Presentation

Once data has been collected, the completed and returned questionnaires were edited for completeness, coded and entries made into Statistical Package for Social Sciences (SPSS version 20). Coding consists of technical procedures where symbols which are normally

numerals are given to the raw data in order to transform it into an easily tabulated and counted format, (Churchill & Iacobucci, 2002). It assists in reducing the replies to a few categories containing information required for analysis. Thus, codes were given to each individual response. In this study, descriptive analysis involved frequencies in their absolute and relative forms. Standard deviations and mean were also used as measures of central tendencies and dispersion respectively. Inferential statistics; regression coefficient and bivariate correlation were used to analyse the relationship of the dependent variable and the independent variables. The following regression model was used in determination of coefficients of the independent in relation to the dependent variable. The multivariate model was as follows;

$$Y = \beta + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

Where;

Y = Growth of SMEs

X₁ = Access to off-grid power

X₂ = Unreliability of off-grid power

X₃ = Affordability of off-grid power

ε = Error term

In the model, β = the constant term while the coefficient β_i = 1...3

3.10 Ethical Considerations

The researcher obtained an informal consent from every respondent and authorization from the University. The researcher obtained an informal consent from every respondent and all the relevant authorities were consulted. The informal consent sought by asking the respondents of their willingness to participate in the filling of the questionnaire. Only those

willing were allowed to participate in filling the questionnaires. The researcher informed the respondents that participation in this study was purely voluntary and withdrawing from participation is acceptable. No one was to be victimized for refusing to participate in the research.

The researcher gave respondents assurance that confidentiality was observed. This was done by assuring the respondents that information they provided was to be used for academic purpose only and that there was no disclosure of the information to anyone whatsoever. The researcher assured the respondents of their anonymity and their response was not disclosed to anyone. The researcher was also ensured that the respondents' name was not included in the questionnaire. The researcher assured the respondents of their privacy.

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSION

4.1 Introduction

This chapter contains analysis of data collected for the study. It also contains results presentation for this study; the results were presented in forms of figures and tables. Figures were used to present results on demographics while tables were used to show results on

descriptive and inferential analysis. The analysed data was arranged under themes that reflect the research objectives.

4.2 Response Rate

The study administered 385 questionnaires to 385 owners of the SMEs in Bungoma County, out of which 242 questionnaires were dully filled and returned which represented a response rate of 62.9%. According to Babbie (2004) a return rates of 50% is acceptable to analyse and publish, while 60% is good and above 70% is very good. Mugenda and Mugenda (2003) argue that a return rate of 50% is acceptable. According to Awino (2011), a response of above 65 percent is acceptable. A response rate of 62.9% was hence good for the study. The high response rate was achieved because of the pick and drop method which was effective. The respondents who were busy were given more time to respond to the questionnaire before they were picked. Persistence by the researcher also played a role in achieving the high response rate

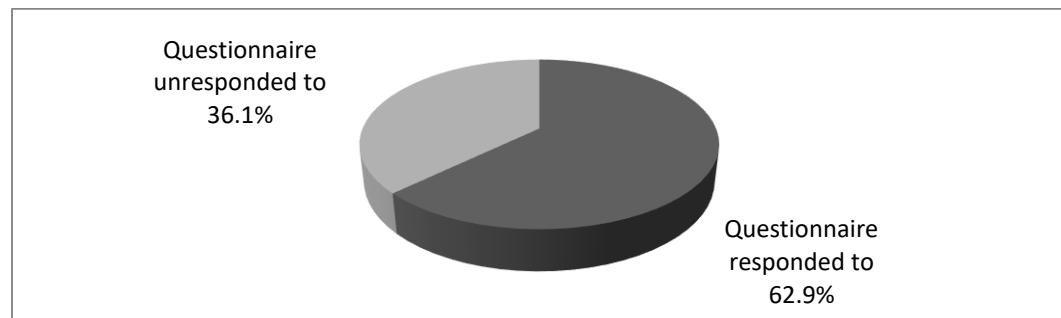


Figure 4.1 Response Rate

4.3 Pilot Test Results

Pretesting of the research instrument was done to a set of 10 respondents who did not participate in the final study. The questionnaires were then analysed to establish the

reliability of the research instrument. The pilot test results indicated that all the variable constrains had Cronbach’s Alpha above the minimum acceptable reliability coefficient of 0.7 which implied good internal consistency. Based on this analysis, all items measuring various variables were accepted and considered for the study. According to Sekara, (2008) the closer a Cronbach’s Alpha is to 1 the higher the reliability and a value of at least 0.7 is recommended.

Table 4.1 Pilot Test Results

Variables	Cronbach’s alpha	Number of Items	Comment
Unreliability to Off-grid power	0.726	5	Reliable
Access to Off-grid power	0.730	5	Reliable
Affordability to Off-grid power	0.771	5	Reliable
Growth	0.755	5	Reliable

4.4 Demographic Results

The study sought to establish the demographic characteristics of the respondents ranging from the level of education, the duration of the respondents in the business, number of employees in the organisation and the capital size of the micro, small and medium size enterprises in Bungoma County. The level of education is helpful in understanding the respondents’ ability in interpretation of the questions while the work experience indicates institutional knowledge on the subject matter.

4.4.1 Level of Education of respondents

The findings on the level of education showed that majority 49.6% of the respondents had bachelor degree level of education, 22.7% had diploma level of education while 22.3% had

certificate level of education and only 5.4% had postgraduate level of education. These findings indicate that majority of micro, small and medium size enterprises in Bungoma County are owned by highly educated individuals, the respondents had high intellectual capacity to be able to respond to interpret the questions and respond accordingly. An argument by Noe, Hollenbeck, Gerhart and Wright (2010) is that good strategies are formed by employees who have high intellectual capacity and education level.

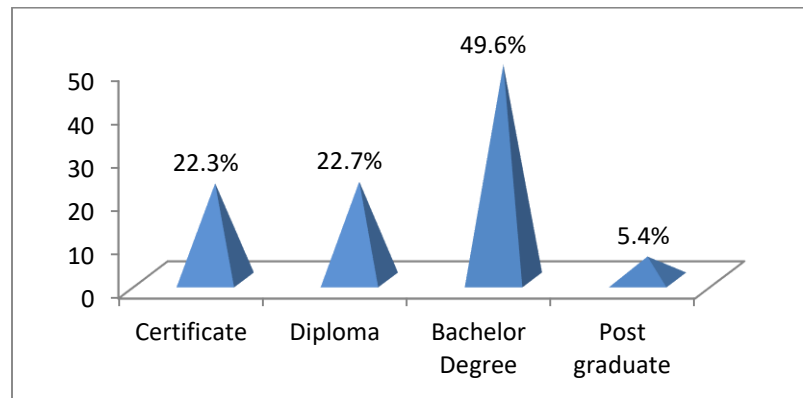


Figure 4.2 Level of Education of respondents

4.4.2 Duration of Running the Business

The findings on duration of running the business by the respondent revealed that majority 55% of the respondents had been operating the business for a period less than 2 years; another 11% had been operating the business for a period between 5-10 years. Those who had been operating the business for a period between 2-5 years were 34 %. This study finding reveals that starting and operating a small business includes a possibility of success as well as failure. Lack of planning, improper financing and poor human resources management has been suggested as the main causes of failure of small enterprises (McMohan 2001).

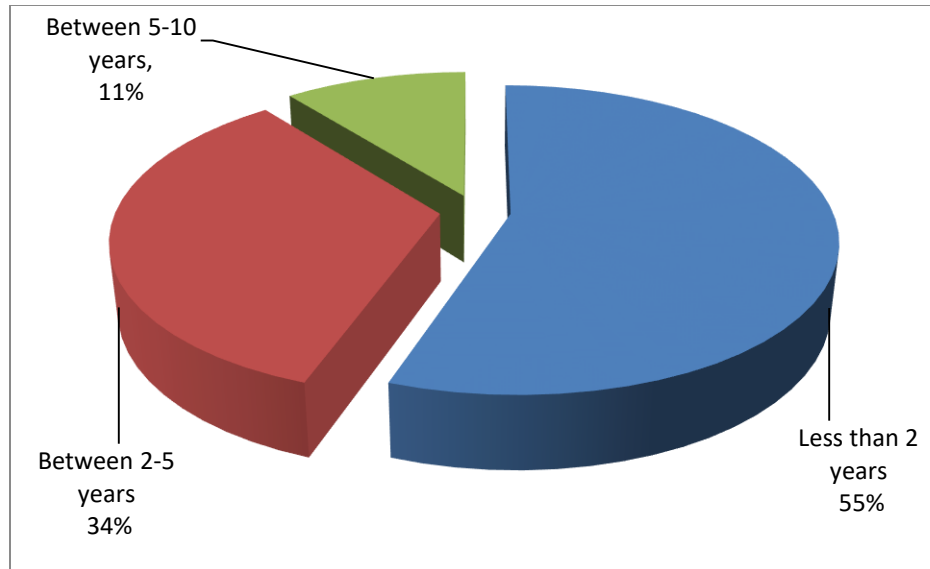


Figure 4.3 Duration of running the business

4.4.3 The Number of Employees per Business

The findings on number of employees per business revealed that majority 83.9% of the SMEs indicated to have less than five employees; another 10.7 % indicated to have between 5-20 employees. Those MSMEs indicated to above 20 employees were 5.4 %. The study findings revealed that human capital remains one of the necessary ingredients not only for production but also for an enterprise’s survival (Kibas, 2012). A simple management mistake like over or under employment is likely to lead to death of the enterprise (Kings & MacGrath, 2002).

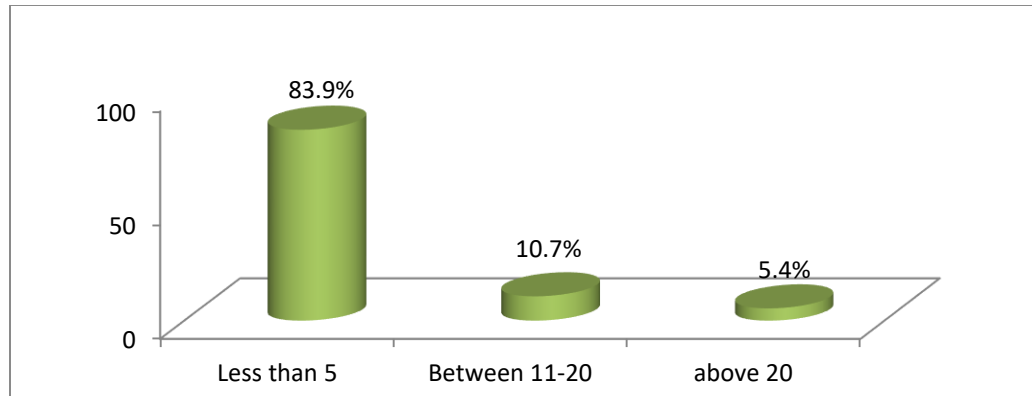


Figure 4.4 the number of employees per business

4.4.4 Capital Size of the Business

The findings on the capital size of the business showed that majority 61.2% of the respondents indicated that the capital size of their business was less \$1,000 while 38.2% of the respondents indicated that the capital size of their business was between \$1,000 and \$5,000. These study findings showed that challenges facing micro, small and medium size enterprises include lack of planning, improper financing and poor human resources management as the main cause of failure of growth small business in Kenya (Longneck, 2006).

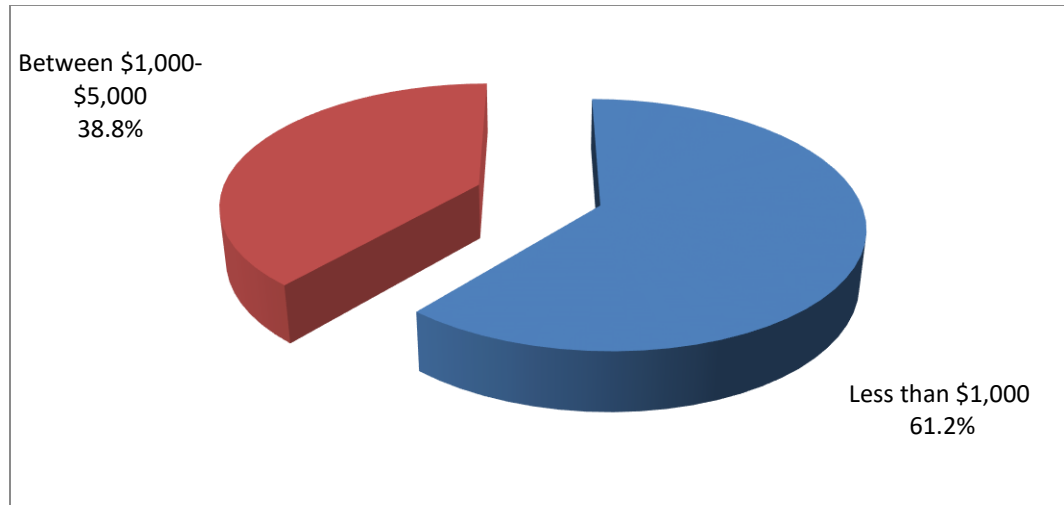


Figure 4.5 Capital Size of the Business

4.5 Descriptive Statistics Results

Descriptive findings were used to establish the mean and standard deviation of the responses on the Likert scales used in the study. A scale of 1 to 5 was used in the study. Quantification of Likert scale categories was done by assigning numerical values to the various categories in order to facilitate statistical representation of data. The data was analysed using SPSS version 21 using frequency and percentage tables and it is from those the recommendations were derived. Descriptive findings were presented per objective.

4.5.1 Unreliability to Off-grid power

The study sought to determine the effect of unreliability of Off-grid power on growth of small and medium size enterprises in Kenya. The descriptive results are presented in Table 4.2. The findings indicate that a total of 45.0% of the respondents agreed that unreliability of off-grid power significantly affect the production in small and micro enterprises, 16.6% of the respondents disagreed while 38.4% of respondents neither disagreed nor agreed with

the statement. The majority 72.8% of respondents agreed that SMEs delay in order delivery is affected by unreliability of off-grid power, 11.2% were not sure while 16.1% disagreed with the statement. On whether reduction in product quality in SMEs is caused by unreliability in off-grid power, 55.8% of the respondents agreed, 22.4% disagreed while 21.9% of the respondents were not sure with the statement. Those who agreed that the frequent power outages influence the growth of SMEs and unreliable grids constrain investment in appliances were 50.0% and 67.3% respectively.

On average, the respondents agreed on statements concerning unreliability to Off-grid power. The standard deviation also indicates that there was a small variation in the responses given by the respondents. The findings are inconsistent with an argument by Tarun *et al* (2013), is also of the view that, electricity power outages have positive impact on the rise in operational of MSMEs. Countries with high frequency of power outages have few small companies in electricity-intensive sectors (such as manufacturing) since only large firms are able to invest in generators to mitigate the effects of outages (Alby et al, 2011). The findings imply that firms that complain most about outages may do so because they experience more outages, not because of the impacts (Hallward-Driemeier & Aterido, 2009). Tarun *et al* (2013), is also of the view that, electricity power outages have positive impact on the rise in operational of MSMEs. Evidence from India suggests that in countries with high levels of electricity unreliability, firms may not have an incentive to move to productivity-enhancing industries or to grow larger, since doing so comes with the cost of having to rely on electricity (Abeberese, 2012). Electricity unreliability can influence investment decisions, but it is neither the only nor the most significant factor considered

by MSMEs in their operation and investment decisions, nor by external investors. Electricity unreliability seems to affect the growth of medium and large-scale firms' more than small firms, and seems to influence the location of investments by MSMEs. Countries with high frequency of power outages have few small companies in electricity-intensive sectors (such as manufacturing) since only large firms are able to invest in generators to mitigate the effects of outages (Alby *et al*, 2011)

Table 4.2 Unreliability to Off-grid power

	Very much disagree	Disagree	not sure	Agree	very much agree	Mean	Std Dev
Unreliability of off-grid power significant affects the production in small and micro enterprises.	11.2%	5.4%	38.4%	22.3%	22.7%	3.40	1.22
SMEs delay in order delivery is affected by unreliability of off-grid power.	5.0%	11.1%	11.2%	61.6%	11.2%	3.68	0.88
Reduction in product quality in SMEs is caused by unreliability in off-grid power	11.2%	11.2%	21.9%	50.0%	5.8%	3.28	1.10
Frequent power outages influence the growth of SMEs	10.7%	33.9%	5.4%	27.7%	22.3%	3.77	1.38
Unreliable grids constrain investment in appliances	5.4%	16.5%	10.7%	45.0%	22.3%	3.62	1.16
Average						3.55	1.15

4.5.2 Access to Off-grid power

The study sought to investigate the effect of access to Off-grid power on growth of small and medium size enterprises in Kenya. The descriptive results are presented in Table 4.3.

The findings indicated that majority of the respondents, 55.8% agreed that the power connectivity processes is very complex and takes a lot of time, 38.9% disagreed while only 5.4% were neutral with statement. 48.0% of the respondents agreed that the there is a high connection fee for off grid power most SMEs cannot afford, 28.5% were not sure with the statement while 23.5% of the respondents disagreed. On whether power connection limitations restrict appliance purchase and use of the business, 50.0% of the respondents, a total of 21.9% disagreed while 28.1% of respondents were not sure with the statement.

The respondents who agreed that there is limited access to electricity for small and micro enterprises in this region were 72.3%, 11.2% were not sure while 16.6% disagreed. Lastly, 71.5% of the respondents also agreed that the access to off-grid power influence the growth of small and micro enterprise to a large extent while 16.6% disagreed. Those who were neutral were 21.9%.

The mean average of 3.66 indicates that respondents agreed on most statements of access to Off-grid power. The variation in the responses was also small. The study findings are consistent with Akuru (2011) study that revealed, between the year 2000 and 2008 around 820 manufacturing firms were closed down, with the figure moving up to 834 in the following year, all because of poor electricity power supply and high cost on the alternative energy supply. Attaining worldwide access to modern electricity services is among the goals for the Sustainable Energy for All (SE4ALL) programme by 2030. Internationally, approximately 1.2 billion individuals lack access to electricity. Majority of them inhabit or reside far from the current electrical grid. Therefore, to achieve vision 2030 goals, off-grid electricity solutions should be scaled up. IEA (2013) states that to achieve worldwide

electricity access, approximately 2/3 of the prospective energy investments should go to mini-grids and stand-alone systems. Attaining worldwide access to modern electricity services is among the goals for the Sustainable Energy for All (SE4ALL) programme by 2030 (SE4ALL 2012). Thomas *et al* (2013) study based on World Bank data approximates that Africa misses out an estimated 2 to 4% in GDP growth yearly as a result of power shortages. Additionally, the projections on the failure to make some adjustments on the utilization and access of energy will put approximately a billion people to be still with no electricity by 2030.

Table 4.3 Access to Off-grid power

	Very much disagree	Disagree	not sure	Agree	very much agree	Mean	Std Dev
Power connectivity processes is very complex at takes a lot of time	11.2%	27.7%	5.4%	21.9%	33.9%	3.40	1.47
There is a high connection fee for off grid power most SMEs cannot afford	10.0%	13.5%	28.5%	38.0%	10.0%	3.85	0.85
Power connection limitations restrict	5.4%	16.5%	28.1%	27.7%	22.3%	3.45	1.16

appliance purchase and use								
There is limited access to electricity for small and micro enterprises in this region	5.4%	11.2%	11.2%	33.9%	38.4%	3.89	1.19	
Access to off-grid power influence the performance of small and micro enterprise to a large extent	11.2%	5.4%	21.9%	22.7%	38.8%	3.73	1.33	
Average						3.66	1.20	

4.5.3 Affordability to Off-grid power

The final objective of the study was to ascertain the effect of affordability of Off-grid power on growth of small and medium size enterprises in Kenya. The descriptive results are presented in Table 4.4. The findings indicated that the respondents who agreed that increase in off-grid power costs has affected the growth of small and micro enterprises were 72.8%, 21.9% disagreed while 5.4% were not sure with the statement. On whether the service levels are lower for off-grid than for grid, 61.5% of the respondents agreed with statement while 11.2% of the respondents were not sure and 27.3% disagreed. 67.3% of the respondents agreed that the adoption of clientele loans for off-grid power connectivity influence growth of SMEs in the region, 21.5% of the respondents disagreed with the statement while 11.2% were not sure. 56.6% of the respondents agreed that the adoption of over-time policies for off-grid connections influence the growth of SMEs while 16.1% of the respondents disagreed with the statement while 27.3% were not sure. On whether inadequate and defective electricity restricts the capability of enterprises to enlarge their

activities or to be economical, 83.8% of the respondents agreed while only 10.4% disagreed and 5.8% of the respondents were not sure.

On average the respondents agreed with the statement on affordability of Off-grid power on growth of small and medium size enterprises in Kenya. The variation in the responses was also small as indicated by the standard deviation. These results findings are consistent with a study by Ahlborg et al (2011) which revealed that there existed country-specific institutional, financial and poverty-related drivers and barriers to grid and off-grid electrification. Low-cost, off-grid solar energy could provide significant economic benefit to people living in some remote areas, but a new study suggests they generally lack the access to financial resources, commercial institutions and markets needed to bring solar electricity to their communities. According to the majority of the policy makers, affordability issues for electricity for the poor are well documented. In reality, people are more willing to pay cost-covering prices, but in certainty are inhibited by a deficient liquidity to change consumption between today and tomorrow. For this reason, relaxing monetary hindrances through clientele loans or payment-over-time are favoured policies of World Bank’s Lighting Global proposal, the flagship initiative for off-grid solar energy, (Lighting Global 2016).

Table 4.4 Affordability to Off-grid power

	Very much disagree	Disagree	not sure	Agree	very much agree	Mean	Std Dev
Increase in off-grid power costs has affected the growth of	5.4%	16.5%	5.4%	39.3%	33.5%	3.79	1.22

small and micro enterprises								
Service levels are lower for off-grid than for grid	10.1%	17.2%	11.2%	45.0%	16.5%	3.51	1.06	
Adoption of clientele loans for off-grid power connectivity influence growth of SMEs in this region	21.5%	0.0%	11.2%	44.2%	23.1%	3.48	1.42	
Adoption of over-time policies for off-grid connections influence the growth of SMEs	10.7%	5.4%	27.3%	28.9%	27.7%	3.57	1.25	
Inadequate and defective electricity restricts the capability of enterprises to enlarge their activities or to be economical	4.2%	6.2%	5.8%	45.0%	38.8%	4.33	0.58	
Average						3.74	1.11	

4.5.4 Growth of Small and Medium Size Enterprises

The study sought to establish the growth of small and medium size enterprises Bungoma County. The descriptive results are presented in Table 4.5. Out of the 242 respondents who took part in the study, those who indicated that their business had increased in profitability in the last one year to high extent were 49.6%, 28.1% indicated to moderate extent while 22.3% indicated to a low extend. 33.9% indicated that their business had increased its capital in the last one year to high extent, 33.5% indicated moderate extend while 32.6% indicated to a low extend. The respondents who indicated that the number of employees have been growing steadily to high extend were 38.8%, 28.1% indicated to moderate extent while 33.1% indicated to low extend. Those who indicated that the business has increased its production capacity in the last one year to high extend were 50.0%, 22.3% indicated to

moderate extent while 27.4% indicated to low extend. Lastly on whether the business has enlarged its activities to be economical, 55.4% indicated to high extend, 22.3% indicated low extend while 22.3% also indicated to moderate extent. The overall mean of 3.33 indicated a moderate extent with statements on growth of small and medium size enterprises in Bungoma County. The variation in the responses was also small as indicated by the standard deviation of 1.12. Visser (2013) argued that SMEs form the backbone of emerging economies and are a key source of income for most people in urban and rural communities. The rapid growth of SMEs in any economy indicates a positive progress for a nation especially indicated by profitability, market share, asset value and even sales turn over. Furthermore, Hamel and Sapienza (2014) reveal that in current business conditions, where product and business model life cycles have a short lifespan, such qualities are emphatically positively connected with better development and growth of enterprises.

Table 4.5 Growth of Small and Medium Size Enterprises

	very low extent	low extent	moderate extent	high extent	very high extent	Mean	Std Dev
My business has increased in profitability in the last one year	5.4%	16.9%	28.1%	27.3%	22.3%	3.44	1.17
My business have increased its capital in the last one year	0.0%	32.6%	33.5%	28.1%	5.8%	3.07	0.92
Our number of employees have been growing steadily	11.2%	21.9%	28.1%	16.9%	21.9%	3.17	1.30
Our business has increased its production capacity in the last one year	5.4%	22.3%	22.3%	44.2%	5.8%	3.23	1.03

My business has enlarged its activities to be economical	0.0%	22.3%	22.3%	16.1%	39.3%	3.72	1.20
Average						3.33	1.12

4.6 Inferential Statistics Results

To further to establish the effect of off-grid power on growth of small and medium size enterprises in Bungoma County, the study employed a linear regression and correlation analysis. According to Kothari (2014), the correlation coefficient range from -1 to +1, with -1 indicating a perfect negative correlation, +1 indicating a perfect positive correlation, and 0 indicating no correlation at all. According to Kothari (2014), regression is the determination of a statistical relationship between two or more variables. In simple regression, there are two variables, one variable (defined as independent) is the cause of the behaviour of another one (defined as dependent variable). When there are two or more than two independent variables, the analysis concerning relationship is known as multiple regressions and the equation describing such relationship as the multiple regression equation.

4.6.1 Correlation Analysis

The study used a correlation analysis to establish the association among the variables used in the study. A Pearson correlation was used since the data was discrete. Correlation indicates the direction in one variable if another variable changes. A negative Pearson correlation value indicates negative correlation while a positive Pearson correlation value indicates a positive correlation. The strength of the association increases as the value

approaches either negative 1 or positive 1. The correlation findings are presented in Table 4.6.

Table 4.6 Correlation Tests Results

		Unreliability to Off-grid power	Access to Off-grid power	Affordability to Off-grid power	Growth of SMEs
Unreliability to Off-grid power	Pearson Correlation Sig. (2-tailed)	1			
Access to Off- grid power	Pearson Correlation Sig. (2-tailed)	0.298** 0.000	1		

Affordability to Off-grid power	Pearson Correlation	0.487**	0.319**	1	
	Sig. (2-tailed)	0.000	0.000		
growth of SMEs	Pearson Correlation	-0.48**	0.192**	0.311**	1
	Sig. (2-tailed)	0.002	0.003	0.000	
	N	242	242	242	242

** Correlation is significant at the 0.01 level (2-tailed).

The study findings indicated that unreliability to Off-grid power and growth of micro, small and medium size enterprises in Bungoma County were negatively and significantly correlated ($R = -0.48$, $Sig = 0.002$) at 5% level of significance. This implies that unreliability to Off-grid power negatively affects the growth of small and medium size enterprises in Bungoma County. The findings are consistent with an argument by Tarun *et al* (2013), is also of the view that, electricity power outages have positive impact on the rise in operational of SMEs. Evidence from India suggests that in countries with high levels of electricity unreliability, firms may not have an incentive to move to productivity-enhancing industries or to grow larger, since doing so comes with the cost of having to rely on electricity (Abeberese, 2012).

Electricity unreliability can influence investment decisions, but it is neither the only nor the most significant factor considered by MSMEs in their operation and investment decisions, nor by external investors. Electricity unreliability seems to affect the growth of medium and large-scale firms' more than small firms, and seems to influence the location

of investments by MSMEs. Countries with high frequency of power outages have few small companies in electricity-intensive sectors (such as manufacturing) since only large firms are able to invest in generators to mitigate the effects of outages (Alby *et al*, 2011).

The study findings indicated that access to Off-grid power and growth of small and medium size enterprises in Bungoma County were positively and significantly correlated ($R=0.192$, $Sig = 0.003$) at 5% level of significance. This implies that an improvement in the indicators of access to Off-grid power positively leads to an increase in growth of small and medium size enterprises in Bungoma County. The study findings are similar to the findings of Grimm *et al* (2011) that revealed tailors in Burkina Faso with access to electricity have revenues 51% higher than tailors without electricity, and links this to the use of electric sewing machines and longer working hours. Internationally, approximately 1.2 billion individuals lack access to electricity. Majority of them inhabit or reside far from the current electrical grid. Therefore, to achieve vision 2030 goals, off-grid electricity solutions should be scaled up. IEA (2013) states that to achieve worldwide electricity access, approximately 2/3 of the prospective energy investments should go to mini-grids and stand-alone systems. Attaining worldwide access to modern electricity services is among the goals for the Sustainable Energy for All (SE4ALL) programme by 2030 (SE4ALL 2012). Thomas *et al* (2013) study based on World Bank data approximates that Africa misses out an estimated 2 to 4% in GDP growth yearly as a result of power shortages. Additionally, the projections on the failure to make some adjustments on the utilization and access of energy will put approximately a billion people to be still with no electricity by 2030.

The study findings indicated that affordability to Off-grid power and growth of small and medium size enterprises in Bungoma County were positively and significantly correlated ($R=0.311$, $Sig = 0.000$) at 5% level of significance. This implies that an improvement in the indicators of affordability to Off-grid power for instance ensuring that the service levels are lower for off-grid than for grid and increasing adoption of clientele loans for off-grid power connectivity positively leads to an increase in growth of small and medium size enterprises in Bungoma County. The study findings are consistent with Ahlborg *et al* (2011) who found that there existed country-specific institutional, financial and poverty-related drivers and barriers to grid and off-grid electrification. Low-cost, off-grid solar energy could provide significant economic benefit to people living in some remote areas, but a new study suggests they generally lack the access to financial resources, commercial institutions and markets needed to bring solar electricity to their communities. According to the majority of the policy makers, affordability issues for electricity for the poor are well documented. In reality, people are more willing to pay cost-covering prices, but in certainty are inhibited by a deficient liquidity to change consumption between today and tomorrow. For this reason, relaxing monetary hindrances through clientele loans or payment-over-time are favoured policies of World Bank's Lighting Global proposal, the flagship initiative for off-grid solar energy, (Lighting Global 2016).

4.6.2 Multivariate Regression Analysis

The results presented in Table 4.7 revealed a relationship $R= 0.642$, indicating a strong positive association between Affordability to Off-grid power, Access to Off-grid power and Unreliability to Off-grid power. $R\text{-squared}= 0.412$ indicated that 41.2% of variation

off-grid power on growth of small and medium size enterprises can be explained by Affordability to Off-grid power, Access to Off-grid power and Unreliability to Off-grid power.

Table 4.7 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.642	0.412164	0.186	0.739767

Predictors: (Constant), Affordability to Off-grid power, Access to Off-grid power, Unreliability to Off-grid power.

The results of ANOVA test showed that the F value was 19.305 with a significance of p value = 0.000 which was less than 0.05, meaning that there is a significant relationship between by affordability to off-grid power, access to off-grid power, unreliability to off-grid power and growth of small and medium size enterprises in Bungoma County.

Table 4.8 Analysis of Variance (Model Significance)

	Sum of Squares	Df	Mean Square	F	Sig.
Regression	31.694	3	10.565	19.305	0.000
Residual	130.247	238	0.547		
Total	161.941	241			

Dependent Variable: Growth of SMEs

Predictors: (Constant), Affordability to Off-grid power, Access to Off-grid power, Unreliability to Off-grid power.

Table 4.9 Regression Coefficients Results

Predictor	Beta	Std. Error	t	Sig.
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(Constant)	3.01	0.331	9.103	0.000
Unreliability to Off-grid power	-0.086	0.26961	-3.135	0.047
Access to Off-grid power	0.393	0.078	5.017	0.000
Affordability to Off-grid power	0.532	0.081	6.583	0.000

Dependent Variable: Growth of SMEs

The optimal Regression Model;

$$\text{Growth of SMEs} = 3.01 + 0.086 (X_1) + 0.393(X_2) + 0.532(X_3) + \varepsilon$$

X_1 = Unreliability to Off-grid power

X_2 = Access to Off-grid power

X_3 = Affordability to Off-grid power

The regression coefficient of affordability to Off-grid power was positive and significant with growth of small and medium size enterprises in Bungoma County ($\beta=0.532$, $\text{sig}=0.000$). The results implied that a unit increase in affordability to Off-grid power would result to an increase of 0.276 units in growth of small and medium size enterprises in Bungoma County. Low-cost, off-grid solar energy could provide significant economic benefit to people living in some remote areas, but a new study suggests they generally lack the access to financial resources, commercial institutions and markets needed to bring solar electricity to their communities. According to the majority of the policy makers, affordability issues for electricity for the poor are well documented. In reality, people are more willing to pay cost-covering prices, but in certainty are inhibited by a deficient liquidity to change consumption between today and tomorrow. For this reason, relaxing monetary hindrances through clientele loans or payment-over-time are favoured policies

of World Bank's Lighting Global proposal, the flagship initiative for off-grid solar energy, (Lighting Global 2016).

The access to Off-grid power had a positive and significant effect on growth of small and medium size enterprises in Bungoma County (Beta = 0.393, Sig = 0.000). The results implied that a unit increase in access to Off-grid power would result to an increase of 0.393 units in growth of small and medium size enterprises in Bungoma. These findings correspond with the findings of Akuru (2011) study that revealed, between 2000 and 2008 around 820 manufacturing firms were closed down, with the figure moving up to 834 in the following year, all because of poor electricity power supply and high cost on the alternative energy supply. Internationally, approximately 1.2 billion individuals lack access to electricity. Majority of them inhabit or reside far from the current electrical grid. Therefore, to achieve vision 2030 goals, off-grid electricity solutions should be scaled up. IEA (2013) states that to achieve worldwide electricity access, approximately 2/3 of the prospective energy investments should go to mini-grids and stand-alone systems. Attaining worldwide access to modern electricity services is among the goals for the Sustainable Energy for All (SE4ALL) programme by 2030 (SE4ALL 2012). Thomas *et al* (2013) study based on World Bank data approximates that Africa misses out an estimated 2 to 4% in GDP growth yearly as a result of power shortages. Additionally, the projections on the failure to make some adjustments on the utilization and access of energy will put approximately a billion people to be still with no electricity by 2030.

The effect of unreliability to Off-grid power on growth of small and medium size enterprises in Bungoma County was negative and significant (Beta = -0.086, Sig = 0.047).

This shows that a unit increase in unreliability to Off-grid power would result to an increase of 0.086 units on growth of small and medium size enterprises in Bungoma County. The findings are inconsistent with an argument by Tarun *et al* (2013), is also of the view that, electricity power outages have positive impact on the rise in operational of SMEs. Evidence from India suggests that in countries with high levels of electricity unreliability, firms may not have an incentive to move to productivity-enhancing industries or to grow larger, since doing so comes with the cost of having to rely on electricity (Abeberese, 2012). Electricity unreliability can influence investment decisions, but it is neither the only nor the most significant factor considered by SMEs in their operation and investment decisions, nor by external investors. Electricity unreliability seems to affect the growth of medium and large-scale firms' more than small firms, and seems to influence the location of investments by SMEs. Countries with high frequency of power outages have few small companies in electricity-intensive sectors (such as manufacturing) since only large firms are able to invest in generators to mitigate the effects of outages (Alby *et al*, 2011).

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter contained a summary of the findings, recommendations, conclusions and areas for further studies that the study identified. The summary of the findings was done in line with the study objectives. The conclusions were also presented per objective.

5.2 Summary of Findings

This study sought to establish the effect of off-grid power on growth of small and medium size enterprises in Bungoma County. The study specifically focused on the effects of access to off-grid power, affordability of off-grid power and the unreliability of off-grid power. The study was anchored on three theories namely the Diffusion of Innovation theory, Adam Smith Theory of economic Growth and the Theory of Economics. The study adopted a descriptive research design. This study was conducted in Bungoma County where majority

of the rural electrification programs aimed at connecting the small and medium enterprises are situated. In Bungoma County, approximately 12678 small and medium enterprises are in operation. Therefore, the target population of the study included 12678 SMEs owners in Bungoma County. The study used random sampling to select 385 SMEs owners who were the respondents selected from the target population of 12678 small and medium enterprises. The study used primary data which was collected using questionnaires, through simple random sampling to come up with the final sample. In this study, descriptive statistics, which involves frequencies and percentages, was used in analysis. The measure of central tendencies that was used in this study was standard deviation mean and dispersion respectively. The others that were used to analyse the relationship of the dependent and independent variable was inferential statistics; regression coefficient and bivariate correlation.

5.2.1 Unreliability to Off-grid power

On average, descriptive results revealed that the respondents agreed on statements concerning unreliability to Off-grid power. The standard deviation also indicates that there was a small variation in the responses given by the respondents. The study revealed that there was negative and significant correlation between unreliability to Off-grid power and growth of small and medium size enterprises in Bungoma. Electricity unreliability can influence investment decisions, but it is neither the only nor the most significant factor considered by SMEs in their operation and investment decisions, nor by external investors. Electricity unreliability seems to affect the growth of medium and large-scale firms' more than small firms, and seems to influence the location of investments by SMEs.

Countries with high frequency of power outages have few small companies in electricity-intensive sectors (such as manufacturing) since only large firms are able to invest in generators to mitigate the effects of outages. The regression results also revealed negative and significant relationship unreliability to Off-grid power and growth of small and medium size enterprises in Bungoma. Some of the unreliability to Off-grid power practices includes frequent power outages and unreliable grids constrain investment in appliances.

5.2.2 Access to Off-grid power

The results of the study indicated that there was a positive and significant correlation between access to Off-grid power and growth of small and medium size enterprises in Bungoma. Internationally, approximately 1.2 billion individuals lack access to electricity. Majority of them inhabit or reside far from the current electrical grid. Therefore, to achieve vision 2030 goals, off-grid electricity solutions should be scaled up. The regression results further revealed that access to Off-grid power had a positive and significant effect on growth of small and medium size enterprises in Bungoma County. Some of the access to Off-grid power practices includes power connectivity processes is very complex at takes a lot of time, high connection fee for off grid power most SMEs cannot afford and power connection limitations restrict appliance purchase and use.

5.2.3 Affordability to Off-grid power

The findings of the study indicated that there was a positive and significant correlation between affordability to Off-grid power and growth of micro, small and medium size enterprises in Bungoma County. Low-cost, off-grid energy could provide significant

economic benefit to people living in some remote areas, but a new study suggests they generally lack the access to financial resources, commercial institutions and markets needed to bring solar electricity to their communities. The regression result also indicated that affordability to Off-grid power affect growth of small and medium size enterprises in Bungoma County positively and significantly. Some of the affordability to Off-grid power practices includes adoption of clientele loans for off-grid power connectivity, adoption of over-time policies for off-grid connections and inadequate and defective electricity that restricts the capability of enterprises to enlarge their activities.

5.3 Conclusion

The study concluded that unreliability to Off-grid power was negatively and significantly related with growth of small and medium size enterprises. Electricity unreliability can influence investment decisions, but it is neither the only nor the most significant factor considered by SMEs in their operation and investment decisions, nor by external investors. Electricity unreliability seems to affect the growth of medium and large-scale firms' more than small firms, and seems to influence the location of investments by SMEs. Countries with high frequency of power outages have few small companies in electricity-intensive sectors (such as manufacturing) since only large firms are able to invest in generators to mitigate the effects of outages. This implies that an increase in unreliability to Off-grid power leads to a negative and significant effect on growth of small and medium size enterprises. This implies that an increase in unreliability to Off-grid power practices such as frequent power outages and unreliable grids constrain investment in appliances leads to a significant decrease in growth of small and medium size enterprises.

The study also concluded that access to Off-grid power had a positive and significant effect on growth of small and medium size enterprises. Internationally, approximately 1.2 billion individuals lack access to electricity. Majority of them inhabit or reside far from the current electrical grid. Therefore, to achieve vision 2030 goals, off-grid electricity solutions should be scaled up. This shows that an increase in access to Off-grid power practices such as ensuring effective power connection processes and provision of low connection fee for off grid power that most SMEs can afford leads to significant increase in growth of small and medium size enterprises.

The study lastly concluded that affordability to Off-grid power was positively and significantly related to growth of small and medium size enterprises; this shows that an increase in affordability to Off-grid power practices such as adoption of clientele loans for off-grid power connectivity, ensuring the service levels for off-grid are lower than for grid and adoption of over-time policies for off-grid connections leads to significant increase in growth of small and medium size enterprises. Low-cost, off-grid solar could provide significant economic benefit to people living in some remote areas, but a new study suggests they generally lack the access to financial resources, commercial institutions and markets needed to bring solar electricity to their communities.

5.4 Recommendations of the Study

Internationally, approximately 1.2 billion individuals lack access to electricity. Majority of them inhabit or reside far from the current electrical grid. Therefore, to achieve vision 2030 goals, off-grid electricity solutions should be scaled up. Based on the study analysis results,

the study recommends micro, small and medium size enterprises in Kenya to adopt access to Off-grid power practices such as ensuring effective power connection processes and provision of low connection fee for off grid power that most SMEs can afford as these activities promotes growth of small and medium size enterprises.

The study further recommends that micro, small and medium size enterprises in Kenya to increase their investment in affordability to Off-grid power activities such adoption of clientele loans for off-grid power connectivity, ensuring the service levels for off-grid are lower than for grid and adoption of over-time policies for off-grid connections as they increases the growth of small and medium size enterprises.

5.5 Areas of Further Study

The study recommends future research studies to look at other factors influencing growth of small and medium size enterprises since Unreliability to Off-grid power, access to Off-grid power and affordability to Off-grid power account for only 41.2% of the variation in growth of small and medium size enterprises. Further studies should also be conducted to establish the effect of off-grid power on micro, small and medium size enterprises in other counties other than Bungoma.

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Appendix I: Questionnaire

Daniel Wekesa

P.O. Box 1624-50200

Bungoma, Kenya

Dear Respondent,

RE: DATA COLLECTION

I am a Master student at the Pan African University Institute of Water and Energy Sciences (PAUWES) in Tlemcen, Algeria pursuing Degree in Masters of Science in Energy (Policy option). I am currently conducting a research study on “*Effect of Off-Grid Power on Micro, Small and Medium Size Enterprises in Bungoma County*” to fulfil the requirements of degree award. You have been selected to participate in this study and I would highly appreciate if you assisted me by responding to all questions as completely, correctly and honestly as possible. Your response will be treated with utmost confidentiality and will be used only for research purposes of this study only.

Thank you in advance for your co-operation.

Yours Faithfully,

Daniel Wekesa

Questionnaire

Effect of Off-Grid Power on Micro, Small and Medium Size Enterprises in Bungoma County

Date

Please supply the required data by filling in the blanks where space is provided or by ticking [√] against the most appropriate answer.

Section A: Respondents' background information

1. Kindly indicate your highest education level
 - a) Certificate []
 - b) Diploma []
 - c) Bachelor Degree []
 - d) Post graduate []

2. How long have you been running your own business?
 - a) Less than 2 years []
 - b) Between 2-5 years []
 - c) Between 5-10 years []
 - d) Above 10 years []

3. How many employees does your business have?
 - a) Less than 5 []
 - b) Between 6-10 []
 - c) Between 11-20 []
 - d) Above 20 []

4. What is your capital size in kshs?
 - e) Less than 100,000 []
 - f) Between 100,000-500,000 []
 - g) Between 500,000-1,000,000 []
 - h) Above 1,000,000 []

SECTION B: ACCESS TO OFF-GRID POWER

On a scale of 1-5, where 1-very much disagree, 2-disagree, 3-not sure, 4-agree, 5-very much agree, state the extent to which you agree with the following statements on access to Off-grid power.

Description		Response				
		1	2	3	4	5
1	Power connectivity processes is very complex at takes a lot of time					
2	There is a high connection fee for off grid power most SMEs cannot afford					
3	Power connection limitations restrict appliance purchase and use					
4	There is limited access to electricity for small and micro enterprises in this region					
5	Access to off-grid power influence the performance of small and micro enterprise to a large extent					

What are some of the other ways access to off-grid power has influenced the growth of small and micro enterprises

SECTION C: INSECURITY OF OFF-GRID POWER

On a scale of 1-5, where 1-very much disagree, 2-disagree, 3-not sure, 4-agree, 5-very much agree, state the extent to which you agree with the following statement on Insecurity of Off-Grid Power.

Description		Response				
		1	2	3	4	5
1	Insecurity in off-grid power significant affect the production in small and micro enterprises					
2	SMEs delay in order delivery is affected by insecurity of off-grid power					
3	Reduction in product quality in SMEs is caused by insecurity in off-grid power					
4	Frequent power outages influence the growth of SMEs					
5	Unreliable grids constrain investment in appliances					

Apart from the practices mentioned above, what are the other ways insecurity of off-grid power influence growth of small and micro enterprises?

SECTION D: AFFORDABILITY OF OFF-GRID POWER

On a scale of 1-5, where 1-very much disagree, 2-disagree, 3-not sure, 4-agree, 5-very much agree, state the extent to which you agree with the following statement on Affordability of off-grid power.

Description		Response				
		1	2	3	4	5
1	Increase in off-grid power costs has affected the growth of small and micro enterprises					
2	Service levels are lower for off-grid than for grid					
3	Adoption of clientele loans for off-grid power connectivity influence growth of SMEs in this region					
4	Adoption of over-time policies for off-grid connections influence the growth of SMEs					
5	Inadequate and defective electricity restricts the capability of enterprises to enlarge their activities or to be economical					

1. Mention other ways affordability of off-grid power influence the growth of small and micro enterprises

SECTION E: SUPPLY CHAIN PERFORMANCE

On a scale of 1-5, where 1-very low extent, 2-low extent, 3-moderate extent, 4-high extent, 5-very high extent, state the extent to which you agree with the following statement on performance of small and medium size enterprises.

Description		Response				
		1	2	3	4	5
1	My business has increased in profitability in the last one year					
2	My business have increased its capital in the last one year					
3	Our number of employees have been growing steadily					

4	Our business has increased its production capacity in the last one year					
5	My business has enlarged its activities to be economical					

Appendix II

Expenditure Expenses for the Research Grant

Item Description	Quantity	Unit cost in Ksh.	Total Cost in Ksh.
Qatar Airways Return Economy Class Ticket from ALG to NBO			86,044
Taxify taxi services for travels within Nairobi	5 Trips		9,570
Zuku Internet	5 Months	13,350	67,500
Great Rift Return Ticket from Nairobi to Bungoma	3 Trips	6,400	19,200
Printing, Photocopying and Binding	10,000 pages		57,200
SPSS purchase and consultation			40,000
Data Collection			20,000
Total			299,514

Exchange rate: 1 USD= Ksh. 98.50

This gives a total cost of 3,040 USD.