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Influence of Project Service Outsourcing Strategy on Implementation of Energy Access Projects in Underserved Counties in Kenya

Evans Kituzi Avedi[1], Dr. Angeline Sabina Mulwa[2], Dorothy Ndunge Kyalo[3]

[1]PhD Candidate: School of Open and Distance Learning, University of Nairobi. Kenya

[2]Lecturer, School of Open and Distance Learning, University of Nairobi, Kenya

[3]Professor, Senior Lecturer: School of Open and Distance Learning, University of Nairobi, Kenya

Abstract: ***The objective of this article was to establish the extent to which project service outsourcing strategy influence the implementation of rural energy access projects in underserved counties in Kenya. The unit of analysis was households, commercial centers, schools, hospitals and a sample size of 373 respondents was selected from a target population of 5,604 respondents in areas where rural electrification has been implemented in underserved counties in Kenya through stratified sampling and purposive sampling techniques. Data was collected from the respondents through questionnaires, interviews and observation. The research outcome depicted that project service outsourcing had significant influence on the implementation of energy access projects in underserved counties in Kenya. The coefficient of determination R^2 was 0.064 and it depicted that project service outsourcing explained 6.4 % of variations in implementation of energy access projects in underserved counties in Kenya. The remaining 93.6% of variations in implementation of energy access projects in underserved counties remained unexplained and were explained by other variables other than project service outsourcing that were not captured in this model. The overall F statistic of $F = 6.842 (p < 0.05)$ was statistically significant at $P=0.000<0.05$ hence was suitable to measure project service outsourcing. This article found out that while each county has its own priorities and needs, entrepreneurs and energy access companies need to innovate technologies that are more user-friendly and develop models that match the needs of the rural communities.***

Keywords: Access to Energy, Project Service Outsourcing, Project Implementation, Rural electrification, Underserved Counties

1. Introduction

Project service outsourcing play a crucial role in finding new and innovative solutions to the challenges faced by underserved counties. Access to energy is globally recognized as an important factor for economic and social development. Low rates of access, particularly in remote rural areas in regions have led developing nations and international organizations to set ambitious goals and strategies to expand the reach of electricity. Decentralized solutions such as micro-grids have been proposed as cost effective solutions to reaching communities located far from central grid infrastructure. Lack of capital from public and donor sources has severely impeded achieving access goals, leading to calls for stakeholder participation in access to energy activities. However, due to the high level of risk associated with decentralized access to energy projects in low-income areas, marginal expected returns on investment, and a lack of clear and effective public policy, the private sector has not shown significant interest in participating in such projects.

The project outsourcing approach allows companies the benefits of external expertise, cost management and risk mitigation so they can concentrate existing resources on their core operations. Project service outsourcing is most beneficial when the engagement demonstrates a clear added value for all parties, improves energy access, promotes transparency and avoids conflicts of interest. Project service outsourcing strategies are intended primarily for electricity planners, policymakers and electricity-service providers in developing countries. These actors are working to close the electricity access gap in an energy development landscape that is rapidly evolving (Odarno, and Agarwal2016). To this end, several strategies in each of the three areas identified were critical for implementing effective electricity access initiatives. Key stakeholders should also be engaged in the process of change. The effective delivery of electricity services for the satisfaction of development needs requires that we look beyond conventional technology centric approaches and adopt a more holistic perspective of electricity access. When a broader range of activities are considered, electricity access solutions can be designed that respond to development priorities and are accompanied by strategic efforts to address affordability and quality of supply issues. Tackling energy poverty in the country is a major challenge and electrification has been the focus of extensive research of the past few years with most analysis of grid and off-grid connection for households in Kenya. Zeyringer (2015) argued that achieving universal electricity access in Kenya by 2030 would require considering both off-grid and centralized grid supply due to the short time horizon and the large part of population lacking access today. Devising strategies geared towards driving rural electrification expansion will require all key stakeholders to combined efforts and collaboration among stakeholders who will come up with suitable business models provide market related solutions. This will enable a more holistic analysis of possible electrification pathways and strategies for Kenya to reach SDG7 by 2030.

1.1. Theoretical Framework

This article is anchored on the ladder of participation Theory. Ladder of participation theory was originally

developed and published by Arnstein, Sherry R.in 1969. Sherry Arnstein, writing in 1969 about citizen involvement in planning processes in the United States, described a ladder of citizen participation that showed participation ranging from high to low. Arnstein, (1969) detailed that the theory of ladder of participation explains the different levels of participation at community level from manipulation or therapy level of citizens, consultation level and to what is viewed as the genuine participation level like partnership and citizen control. One of the aims of access to energy is empower locals by giving them an opportunity to take part in decision making on projects to be implemented in their area. There are vital reasons for associating participation with community development as approach to community participation. The aim to meet basic needs obviously requires the participation of all who benefit from the project. Participation in implementation of a program improves effectiveness and efficiency through mobilization of local resources and the development of the capacity of the community to plan and implement which requires greater intensity and scope of participation as the projects proceeds. It is therefore important to note that the theory emphasizes the importance of beneficiaries' involvement in project cycle hence the need to use this theory as a relevant for this work (Sadiullah, 2009).

1.2 Conceptual Framework for the Study

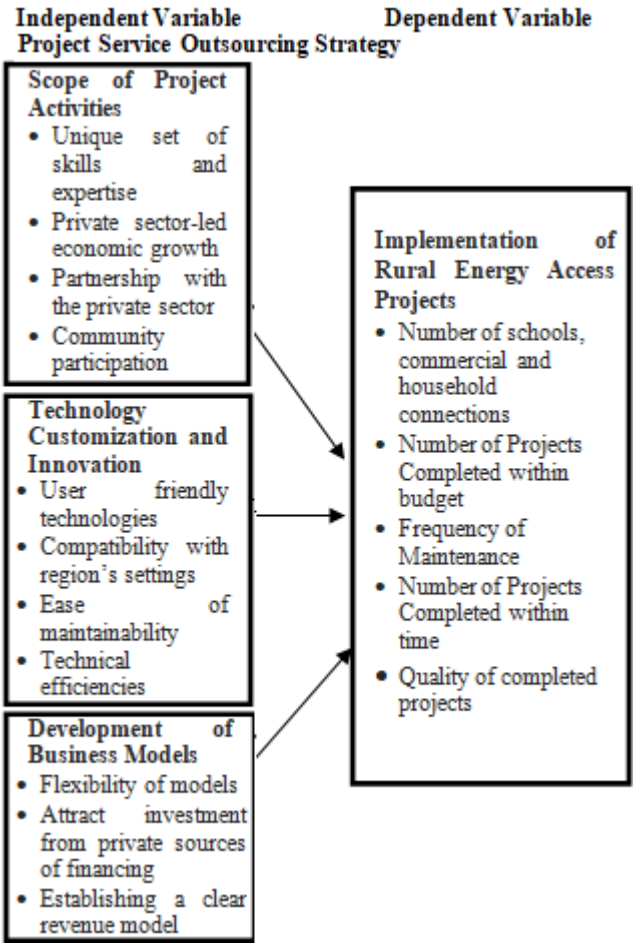

Figure 1: Conceptual Framework for the Influence of Project Service Outsourcing Strategy on Implementation of Energy Access Projects.

2. Literature Review

Project service outsourcing allows a company to execute entire projects using the resources of another firm. The project outsourcing approach allows companies the benefits of external expertise, cost management and risk mitigation so they can concentrate existing resources on their core operations. Franz and Bozhil, (2014) noted that project service outsourcing helps organizations deliver on their mandate by taking advantage of industry best practices that can be accomplished simply by using an outsourcer who follows best practices, outsourcing shoulders the responsibility of investing in the adoption, maintenance and improvement of best practices, taking a significant leverage when negotiating large contracts with outsourcers. Outsourced firms also take advantage of their own internal economies of scale for project work within their core competencies, overcoming lack of internal capabilities since companies that lack the internal capability to complete certain projects would typically find it more cost effective to outsource their project needs as opposed to developing those capabilities internally and delivering the outputs by bringing in results centric models.

In a public-sector approach, government entities oversee extension of the electricity grid. In the privatized approach, enterprises and community groups primarily carry out the electrification. In certain markets, the private sector may provide the quickest model for closing the access gap if it is supported by adequate policies and support. Many other sectors, such as telecommunications and banking, have created innovative ways to use private entities to extend access. The convergence of energy and communications technology has opened new opportunities for the energy sector to do the same (Tenenbaum and Chris, 2014). To date, the most effective model for providing distributed energy services to local consumers in a replicable and reliable model involves engaging small entities, such as private SMEs. Mills, (2014) further noted that with proper support and financing, small local enterprises can understand local markets to provide services that meet customers' needs. In turn, they can create local distribution channels and support services for their energy products which create local ownership and jobs and expand economic development opportunities in the areas they serve.

Throughout the world, small businesses are taking advantage of their small-scale and simpler decision-making processes to tap tremendous potential for flexibility and innovation. As an example, several countries are already seeing innovative business models transform energy access markets. By leveraging modern communication and mobile-money technology, energy service providers, such as M-KOPA Solar in Kenya and other countries, have developed pay-as-you-go models to allow customers to pay for energy services as they can afford them by using mobile systems for payments and mobile technology to monitor and authorize consumer energy use. Several private sector companies have attracted investment from private sources of financing. This brings an important new source of funding into energy access markets in developing countries (Wilson and Neha, 2014). Kishore and Gopal, (2013) suggested that while this represents an opportunity for smaller enterprises, there are

also roles for larger companies in the distributed energy access market, which represents billions of people and major opportunity. Multinational corporations would likely be involved in providing the technology underpinning the energy systems and appliances that are used throughout the developing world. In some cases, large companies have created or invested in smaller enterprises.

Working directly with customers to develop affordable energy services for each market and customer type as businesses expand their customer base is a decidedly retail-level business, but some small enterprises are working with established national businesses to leverage their retail base. One-size-fits-all models have yet to work well in this space, but some small enterprises are creating integrated business-to-business partnerships with national corporations. Desjardins and Chris, (2014) in support of this model, noted that these partnerships can provide SMEs with access to the customer relationships, brand recognition and marketing power associated with established businesses. One example is One Degree Solar - creator of an all-in-one personal solar electricity system that powers phones, radios, tablets, and lights which has partnered with Coca-Cola to distribute the solar product in Kenya.

A study by Murphy and Sharma (2014) on technology customization and standardization emphasized that it is the technology on which a business model thrives. Optimization of a technology plays a vital role in scaling up of an energy project. Considering the rural settings of developing countries such as India, it becomes necessary for entrepreneurs and energy companies to innovate technologies that are more user-friendly. Certain parameters are to be considered by the actors while devising their innovations, such as, the technology should be compatible with the region's physical and social settings and should be easy to handle/maintain by rural beneficiaries. Hence, developing and implementing certain technical standards helps in maximizing the business model compatibility, ease in operation and maintenance and replication or scale up of the project in future.

The technology needs to be built in a way that it can address the needs of the area where it is being implemented and can be easily handled by the local communities. Unless the technology addresses the needs, there would be no ownership of the system which results in its failure (Palit and Krithika 2014). Their study was well illustrated through example of cookstoves in India, which did not witness a large-scale uptake by users. With the aim of reducing fuel use and indoor smoke emissions, a large number of initiatives driven by local or international NGOs and some led by the Indian government have sought to introduce improved cooking technologies over the past two decades. The results of these initiatives have been mixed. The Indian government launched the first National Programme for Improved Cook stoves (NPIC) in 1984, wherein it aimed to supply 120 million energy-efficient cook stoves to households in 23 states and 5 union territories in order to address local deforestation by reducing biomass use at the household level, improve health and ease the burden of fuelwood gathering for rural women and girls. By 2002, roughly 34 million stoves had been distributed across India with 50% government subsidized cost of the stoves. It is thus important to ensure that the technology should not only depend only on technical efficiencies but also should be able to meet users' needs in terms of matching social, cultural and economic preferences. And, this explains that due to lack of considering these preferences have resisted the efforts to scale up access to improved cook stoves till date.

Engagement with the private sector also leads to an improvement in program effectiveness (beneficiary achievement of intended results) and/or efficiency (reduction in the rate and/or cost of program delivery). This benefit often comes because of the private sector provides a unique set of skills, technologies, or expertise that is not necessarily available within public or non-governmental organizations. According to Tien and Sharma, (2011) about 33% of the alliances assessed in their research measured and/or identified expertise as the primary contribution from the private sector. Businesses contributing expertise tended to be active strategic partners as well as providers of resources beyond financial capital. Of course, financial and product contributions can also yield increases in efficiency (for example through economies of scale) or effectiveness, but initial data suggested that private sector skills, technologies and expertise may offer especially valuable ways to improve effectiveness and efficiency.

A related study was conducted by Malviya, (2011) who noted that Off-grid energy model in Chhattisgarh is one such model that displays a successful demonstration of technical customization up to an extent and then standardizing the model to cover large number of villages which aids in smooth after-sales in a structured manner. In order to provide electricity in Chhattisgarh through renewable energy sources including off grid/decentralized energy systems, Chhattisgarh State Renewable Energy Development Agency (CREDA) was created. Most of the un-electrified villages in the state are in the tribal dominated districts of Sukma, Dantewada, Narayanpur and Bijapur. CREDA initiated with the solar home system (SHS) model in 2003 which could not sustain longer mainly due to two major reasons. First, heavy subsidy on the system could not make the beneficiaries realize the value of these systems and whenever the system owner faced any financial crunch they would mortgage the system at a low price. Secondly, there was large scale social problem of theft which negated the very purpose of the deployment (Malviya, 2011). This led to exploration of option of installing solar mini-grids by CREDA and therefore, the first mini-grid was commissioned in 2004 without discarding the Solar Home Systems(SHS). Solar mini-grids provided supply to larger villages with concentrated settlements whereas hamlets and villages with scattered households are provided with SHS.

3. Statement of the Problem

In sub-Saharan Africa, only 290 million out of 915 million people have access to electricity and the total number without access is rising. Nearly 80% of those lacking access to electricity across sub-Saharan Africa are in rural areas, an important distinction when considering appropriate energy access strategies and technical solutions (IEA, 2014). Kenya like any other developing country is not an exception

in facing an energy problem. In Kenya only 46% of the population has access to electricity (2015) which means most of the population to rely on traditional fuels for energy such as firewood, charcoal, kerosene. The total number fun-electrified households is 1.2 million in the 14 underserved counties in Kenya (Republic of Kenya, 2013). Beside accounting for 72 per cent of the country's total land area and 20 percent of the country's population, access to energy in these counties is still very low compared to other counties in Kenya. Failures of completion of energy access projects within time, quality and budget in underserved counties has resulted in these areas remaining economically underdeveloped. The implementation of rural electricity programs has been a challenge to the government with only 36% of the rural population having access to electricity.

The Government of Kenya through the Kenya Rural Electrification Programme has played crucial role in the provision of electricity to rural areas in bid to spur human, social and economic development in the country. The energy sector has been restructured as per the Sessional Paper No.4 of 2004 and the Energy Act No.12 of 2006 (Stern, 2011). It is a requirement of this session paper that the Rural Electrification Authority (REA) develops a strategy to enhance rural electrification in the country. Kenya has a long-term development strategy, The Vision 2030, whose aim is to drive the country into a globally competitive and prosperous economy with high quality of life. Covering the period 2008 to 2030, the country's new development blueprint aims to transform Kenya into a newly industrializing, middle-income country providing a high-quality life to all its citizens by the year 2030. The level and the intensity of energy use in a country is a key indicator of economic growth and development. The Kenya Vision 2030 identified energy as one of the infrastructure enablers of its social economic pillar. Sustainable, affordable and reliable energy for all citizens is a key factor in realization of this Vision.

The underserved counties of Kenya present profound infrastructure deficits, including lack of access to roads, electricity, water, and social services. Many cultures in marginalized areas were historically nomadic, based on pastor a list lifestyles, and with low population densities. There is also significant insecurity in certain areas, giving rise to substantial numbers of displaced persons and livelihood adaptations that further undermine economic prosperity.(Republic of Kenya, 2013). Due to the specific challenges posed by low population density, low energy demand and undeveloped rural economies, there is need for strategies that require special financing conditions, design and construction standards specifically formulated to address rural power-supply characteristics, and a project control mechanism that involved coordination and sequencing of the relevant projects so that losses arising from gaps between strategies and implementation are mitigated.

Governments have a role to play in harmonizing the efforts of all development sectors to realize the full benefits of energy access initiatives. Shrestha and Jiwan, (2015) argued that a demand driven response to the energy access challenge also facilitates a clearer understanding of the actual development priorities that energy services can or should satisfy. This, in turn, creates opportunities for building the robust demand for energy services that will underpin the long-term sustainability of energy access initiatives. Establishing linkages and exploiting synergies between electricity supply and other sectors of development demands well-coordinated interaction between stakeholders in these different sectors. Together with the private sector and civil society, policymakers and planners can also devise effective solutions to address the affordability and quality of supply issues that too often impede access to electricity services and the satisfaction of salient development needs, even when the appropriate technologies are readily available. It is against these arguments that the article sought to determine the influence of project service outsourcing strategy on the implementation of energy access projects in underserved counties in Kenya.

3.1 Purpose of the Study

The purpose of this study was to establish the extent to which project service outsourcing influence implementation of rural energy access projects in underserved counties in Kenya,

3.2 Objective of the Study

To establish the extent to which project service outsourcing influence implementation of rural energy access projects in underserved counties in Kenya,

3.3 Research Question of the Study

To what extent does project service outsourcing influence the implementation of rural energy access projects in underserved counties in Kenya?

3.4 Hypothesis of the Study

The following hypothesis was tested:

i) H_0: Project service outsourcing does not significantly influence the implementation of rural energy access projects in underserved counties in Kenya.
ii) H_1: Project service outsourcing significantly influences the implementation of rural energy access projects in underserved counties in Kenya.

Project service outsourcing strategy was thus considered a function of three possible strategies; scope of project activities, technology customization and innovation and development of business models.

4. Research Methodology

This section presents aspects of research methodology that was used to conduct the study. These include research paradigm and research design, target population, sample size and sampling procedures, research instruments, data collection procedures and data analysis techniques.

4.1 Research Design of the Study

The study on this article used pragmatism paradigm. Mixed method research looks at many approaches for collecting

and analyzing data rather than subscribing to only one way either qualitative or quantitative. Migiro and Magangi (2011) states that mixed methods research encourages researchers to use multiple approaches to collecting and analyzing data within a single study, recognizing the limitations of using a single method. In this article, quantitative data was collected using structured questionnaires whilst qualitative data was collected using interview schedules and observation guide.

4.2 Target Population of the Study

The unit of analysis was households, commercial centers, schools, hospitals and Project managers of the key organizations involved in rural energy access sector projects. The projects were in 14 counties under equalization fund and spread out in the 14 counties in underserved counties in Kenya. The target population was 5,604 respondents drawn from the 6 service territories based on county allocations derived from scale of challenge (un-electrified population and community facilities), poverty index and population density to achieve greatest impact with limited resources, deliver services where the need is the largest, consider additional costs due to low population density and consider principles of equity such that all counties should benefit in a similar manner. Such a division allows economies of scale in procurement and elicits private sector contractors to be present in these undeserved counties over a long term.

4.3 Sample Size

Sample size that was used for the study was obtained using Slovin's formula denoted by the population size and the acceptable margin error of 0.05 as indicated in the following formula:

$$\text{Sample size (n)} = \frac{N}{(1+Ne^2)}$$

Where:
n = Number of samples
N = Population size
e = Margin of error/ error margin
Calculating the sample size gives;

$$n = \frac{5,604}{(1+5,604 \times 0.05^2)}$$

= 373

Hence sample size for the study was 373 respondents. The allocation of a sample into the strata was done using Neyman allocation formula. The purpose of this method was to maximize sample survey precision from the calculated sample size. With Neyman allocation the sample size for stratum is as shown in Table 1.

Table 1: Sample Size Calculation for the Study

County	Lot Number	Number of Projects	Target Population	Number of Respondents Sampled per Lot $n_h = \left(\frac{N_h}{N}\right) x\ n =$ (1380/5,604) * 373 = 92
West Pokot	1	6	1,380	
Turkana				92
Marsabit	2	3	660	
Samburu				44
Isiolo				
Mandera	3	6	1,074	
Wajir				71
Garissa	4	4	880	
Tana River				59
Lamu				
Kilifi	5	3	690	
Kwale				46
TaitaTaveta	6	4	920	
Narok				61
	Total	**26**	**5,604**	**373**

Source: REA Electrification Baseline Information, (2016)

4.4 Sampling Procedures

The procedure of how the 373 respondents were selected out of the total population of 5,604 was summarized in Table 1. The samples size of this study was 373 respondents. In order to collect enough data and information, the study sampling frame was put into clusters and a cluster sampling used to cluster the regions and simple random sampling was used to select respondents as shown in Table1. Purposive sampling was used to select key informant interviewees who in this case were project team leaders from the four participating energy players. Thus, in the current study four key project team leaders from the four energy sectors in the study and 6 project site agents/engineers were selected purposively to participate in the in-depth interviews while simple random sampling was used to select respondents from the strata who were given questionnaires to complete.

4.5 Research Instruments

Data was obtained using questionnaires, interview guide and observation. For this study data collected entailed all the responses on the study variables which included project service outsourcing strategy and implementation of energy access projects. Data obtained from the questionnaires was triangulated with the data from the interview guides and the observation guide. The use of various data collection was in tandem with the pragmatism paradigm which allowed the use of various tools.

4.6 Data Collection Procedures

Prior to the commencement of data collection, permission was sought from the University and the National Commission for Science Technology and Innovation (NACOSTI) to ensure adherence to ethical issues in research. Subsequently approvals were sought from the Council of Governors, REA headquarters and from Energy access companies. Contact details of all project site personnel and resident managers were obtained from various players. Questionnaires were used in gathering qualitative and quantitative data. Data collection involved a self-administered questionnaire. The researcher used a drop and pick approach to have the questionnaire filled. The researcher personally administered the questionnaires to the respondent's residents to ensure the right data was collected from the respondents and on time. Therefore, the respondents had a chance to clarify their queries on the spot and the researcher had an opportunity to motivate respondents to respond to questions. The interview dates

were pre-arranged, and it used interview guides. Follow up calls and emails were made to book appointments to seek permission from respondents who took part on the interviews. The researcher engaged research assistants whereby some were residents of the underserved counties. The questionnaires were collected back for analysis with the assistance of the research assistants. The research assistants were inducted on the research ethics and on the research instruments and its administration, interview skills and data recording. An introductory letter for research assistant to collect data on the researcher's behalf was given to the research assistants.

4.7 Data Analysis Techniques

This study produced both quantitative and qualitative data to explain the influence of project service outsourcing strategy exhaustively. Once data collection activity was over, the researcher edited and also tackled the issue of blank responses, coded, categorized and keyed in the data into Statistical Package for Social Sciences (SPSS) program for actual analysis to be done. This exercise was done to check for completeness of that data was collected using the questionnaire. Data analysis techniques employed were simple and multiple regression which resulted to useful information.

The researcher further performed descriptive analysis to measure central and dispersion tendencies of variables using mean, standard deviation, frequencies and percentages which portrayed the relationship that existed between two study variables. Study variables were also tested through inferential analysis which was used to test the hypotheses which was further used to generalize the findings from the sample studied. F-test was carried out to assess the significance of the whole equation or to test best of fit. R^2 which refers to coefficient of multiple determinations was also used to show how successful the best of fit was in explaining the variation of the data. In addition to the R^2 test, the test of the slope using t statistic was performed to assess the significance level of the individual regression coefficient of each study variable.

Data triangulation was done so as to strengthen the validity and reliability of the data collected. Data was therefore collected from different participants and different sites of the setting. Data obtained was therefore cross-checked for consistency of specific and factual data items s recorded in the data collection instruments. In the current study, data was analyzed through comparison of qualitative data received from structured questionnaires for clients with qualitative in-depth interviews for site engineers and observation guide by the researcher. Further data obtained from the structured questionnaire was analyzed both descriptively and inferentially. The results were then corroborated with those from the structured in-depth interviews and observation guide.

5. Findings, Discussions and Analysis

The main goal of the article was to establish the extent to which project service outsourcing influence the implementation of rural energy access projects in underserved counties in Kenya. Questionnaires were administered to 373 respondents. Out of these 302 of them came back filled while 71 were either incomplete or not at all filled. This represented a response rate of 81% which is generally representative enough for analysis and generalization of findings to the population. The findings are in tandem with studies by Babbie (2003) that states that a return rate of 50% is sufficient to rely on the questionnaire for purposes of analysis. Further he stated that a return rate of 60% was considered to be good and 70% was assumed to be excellent for data analysis.

5.1 Overall Descriptive Analysis on Project Service Outsourcing

Project service outsourcing was considered in terms of scope of project activities, technology customization and innovation and development of business models. The mean and standard deviation of these factors as manifested in rural energy access projects is as shown in Table 2:

Table 2: Mean and Standard Deviation of Project Service Outsourcing

Project service Outsourcing	N	Mean (M)	Standard Deviation
Scope of Project activities	302	3.96	0.779
Technology Customization and Innovation	302	3.27	0.769
Development of Business Models	302	3.33	0.798
Composite mean		**3.52**	

Table 2 show that Scope of Project activities contribute to implementation of energy access projects to a great extent (M = 3.96, SD=0.779), Technology Customization and Innovation to a neutral extent (M = 3.27, SD = 0.769) and Development of Business Models to a neutral extent (M = 3.33, SD = 0.798). This implies Scope of Project activities is vital when implementing energy access projects in rural areas of Kenya. The overall composite mean shows project service outsourcing is an important explanatory variable for implementation of the rural energy projects.

5.2 Correlation between Implementation of Energy Access Projects and Project Service Outsourcing

A correlation analysis was conducted to establish the direction and magnitude of the relationship between implementation of energy access projects and project service outsourcing. Project service outsourcing is a composite of three indicators; scope of project activities, technology customization and innovation and development of business models. The results of the correlation analysis are presented in Table 3:

Table 3: Correlation between Implementation of Energy Access Projects and Project Service Outsourcing

		Scope of Project activities	Technology customization and innovation	Development of business models
Implementation of Energy Access Projects	Pearson Correlation	0.054	.209*	.214*
	Sig. (2-tailed)	0.348	0.000	0.000
	N	302	302	302
Correlation is significant at the 0.05 level (2-tailed)				

From the findings of Table 3, two indicators of project service outsourcing are significantly positively correlated with implementation of energy access projects. The two are Technology customization and innovation and development of business models. In terms of magnitude, development of business models is the highest with r = 0.214 followed by technology customization and innovation at r = 0. 209. Notably however, all the correlations are weak. As correlation does not mean causality, a regression analysis was conducted to verify if there is a statistical relationship between the indicators of project service outsourcing and implementation of energy access projects.

5.3Inferential Analysis of Influence of Project Service Outsourcing on Implementation of Rural Energy Access Projects in Underserved Counties in Kenya.

Further the researcher went ahead to establish the strength of relationship between project service outsourcing and implementation of energy access projects in underserved counties in Kenya and thus the following hypothesis which was in line with the objective of the study was tested:

Hypothesis for the Article

$H_{0:}$ Project service outsourcing does not significantly influence the implementation of rural energy access projects in underserved counties in Kenya.

The hypotheses were tested using the functional specification and simple linear regression analytical model as follows:

Functional specification: $y = f(X_{1,} \varepsilon)$ where$X_{1,}$ are the independent variables and ε the error term

Analytical model: $y = \beta_o + \beta_1 X_1 + \boldsymbol{\varepsilon}$ where y = Implementation of rural energy access projects
X_2= Project service outsourcing
β_o = Constant term of regression of y on X_1
β_1= Beta Coefficient of X_1
ε = Error term
Data was analyzed using the ordinary least square method and the results of the regression model are as presented in Table 4:

Table 4: Implementation of Energy Access Projects and Project Service Outsourcing

Model Summary				
Model	R	R square	Adjusted R Square	Std. Error of the Estimate
	0.254	0.064	0.055	3.694
a. Predictors: (Constant) SP, TC, DB				

ANOVA					
Model	Sum of squares	Df	Mean Square	F	
Regression	280.2	3	93.39	6.842	0.05
Residual	4067.3	298	13.649		
Total	4347.5	301			
a. Dependent Variable: Implementation of Energy Access Projects b. Predictors: (Constant) SP, TC, DB					

Coefficients					
Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	22.403	1.925		11.638	0
Scope of project activities	-0.103	0.144	-0.043	-0.712	0.477
Technology customization and innovation	0.344	0.141	0.157	2.441	0.015
Development of business models	0.297	0.117	0.159	2.535	0.012
Dependent Variable: Implementation of Energy Access Projects					

The results in Table 4were further analyzed for goodness of fit and tests of coefficient of determination and test of the slope (β) were performed on the model. The outcome was that the test of coefficient of determination $R^2 = 0.064$ and r = 0.254, an indicator that generally project service outsourcing is weakly correlated with implementation of energy access projects. The $R^2 = 0.064$ was the coefficient of determination for this model and it depicted that project service outsourcing explained 6.4 % of variations in implementation of energy access projects in underserved counties in Kenya. The remaining 93.6% of variations in implementation of energy access projects in underserved counties remained unexplained and were explained by other variables other than project service outsourcing that were not captured in this model. In terms of individual indicators of project service outsourcing, both technology customization and innovation and development of business models are statistically significant at 5% level of significance, since for technology customization and innovation p = 0.015<0.05 and for development of business models p = 0.012<0.05.

The β coefficient test of best of fit on the significance of every individual predictor variable on the independent variable was carried out. The results as per Table 4depicted that all the indicators apart from scope of project activities -0.043, is not statistically significant at 10% (p=0.477) level of significance or less. Technology customization and innovation Beta coefficient of 0.157 is statistically significant at 10% (p=0.015) level of significance implying there was a positive significant relationship between technology customization and innovation and implementation of energy access projects. The coefficient of development of business models 0.159 is also statistically significant at 10% (p=0.012) level of significance implying also that development of business models had a positive statistically significant influence on implementation of energy access projects. In terms of the comparison the

variable development of business models seems to influence implementation of access projects more than technology customization and innovation.

In terms of the composite indicator of project service outsourcing, the overall F statistic of F = 6.842($p < 0.05$) was statistically significant since P = 0.000<0.05. This was an indication that there was a statistical relationship between project service outsourcing and implementation of rural energy access projects in underserved counties in Kenya. Therefore, the article rejected the second null hypothesis which states that: 2.H_0: *Project service outsourcing does not significantly influence the implementation of rural energy access projects in underserved counties in Kenya.* This decision made implied that project service outsourcing had a significant influence on the implementation of rural energy access projects in underserved counties in Kenya.

Using the statistical results in Table 4, the regression model developed to represent such an expression was indicated as:
Y = 22.403 - 0.103SP + 0.344TC + 0.297DB
Where;
Y = Implementation of Energy Access Projects
SP = Scope of Project activities
TC = Technology customization and innovation
DB = Development of business models

The findings on the influence of project service outsourcing strategy on the implementation of energy access projects were in concurrence with studies by Franz and Bozhil, (2014) who established that that project service outsourcing would help organizations deliver on their mandate by taking advantage of industry best practices that can be accomplished simply by using an outsourcer who follows best practices, outsourcing shoulders the responsibility of investing in the adoption, maintenance and improvement of best practices, taking a significant leverage when negotiating large contracts with outsourcers. The study is further supported by a study by Mills, (2014) who further noted that with proper support and financing, small local enterprises can understand local markets to provide services that meet customers' needs. The current study findings show that on average the respondents agreed that they supported the initiatives of project service outsourcing in ensuring that more remote areas in their counties are covered. The findings from interviews showed that the respondents seem to agree that project service outsourcing is important for implementation of projects in the rural areas, however they are of the view that the technology being used is not easily understood by the locals and as such more training is needed so as to enhance cooperation between these firms and the locals when executing these tasks. The study findings are supported with a study by Murphy and Sharma (2014) on technology customization and standardization who emphasized that it is the technology on which a business model thrives. Optimization of a technology plays a vital role in scaling up of an energy project. This article therefore benefits the practitioners in the energy sector in the underserved counties on the influence of project service outsourcing strategy and implementation of energy access projects in underserved counties in Kenya.

6. Conclusion

Project service outsourcing was measured in terms of scope of project activities, technology customization and innovation and development of business models and were based on literature review and included in the research instrument. Descriptive statistics showed that scope of project activities as the dominant indicator followed by development of business models and then technology customization and innovation. This implies Scope of Project activities is vital when implementing energy access projects in rural areas of Kenya. The overall composite mean shows project service outsourcing is an important explanatory variable for implementation of the rural energy projects.

This could be explained by the reasons noted by the respondents: Familiarity with the models used lacked, technology used was not very familiar hence difficult for locals, to understand, limited capacity to handle projects, technology used in some products was not easy to understand, no participation in determining the model suitable for us and lack of understanding, a few people still under power access. The other views on challenges were generally based on costs; lack of business knowledge, risks relating to occupational health and safety, technology being used is not up to date and delays in project implementation. From the challenges given, the same respondents were asked to give some recommendations on possible ways to handle the challenges of enforcing project service outsourcing strategy. The responses ranged from education and training of the locals to a suggestion of using easy models that the locals can understand. This implied that the respondents agreed that project service outsourcing is important for implementation of projects in the rural areas, however they are of the view that the technology being used is not easily understood by the locals and as such more training is needed so as to enhance cooperation between these firms and the locals when executing these tasks. It can thus be concluded that the majority of the respondents in rural electrification felt that project service outsourcing influenced the implementation of energy access projects in underserved counties in Kenya.

The findings from inferential statistics indicated that two indicators of project service outsourcing were significantly positively correlated with implementation of energy access projects. The two are technology customization and innovation and development of business models. In terms of magnitude, development of business models is the highest with r = 0.214 followed by Technology customization and innovation at r = 0. 209. In terms of the composite indicator of project service outsourcing, the overall F statistic of F=6.842 is statistically significant since P=0.000<0.05. This is an indication that there is a statistical relationship between project service outsourcing and implementation of rural energy access projects in the Kenya. Due to this, the null hypothesis that was being tested can be rejected and conclude that project service outsourcing has a significant influence on the implementation of rural energy access projects in underserved counties in Kenya.

6.1 Recommendations

The article recommends that entrepreneurs and energy access companies to innovate technologies that are more user-friendly.

6.2 Significance of the Study

The study focused on project service outsourcing and the extent to which they influenced the implementation of energy access projects with a view to establishing the best practices and strategies that would work for the energy sector. The findings would be of great relevance to all energy stakeholders in enhancing efficiency and effectiveness through best practices.

6.3 Limitations of the Study

The study faced some limitations. Since the geographical locations are vast and households widely spread out, there was a challenge of traversing those geographical areas within the available research time. Data was collected from rural households and commercial centers located in the vast region of underserved counties in Kenya which required a lot of time and financial resources to be accomplished. The engagement of trained research assistants was of much help for it was possible to cover all targeted counties within a shorter period of time at lower cost and further the study area was divided into six service centers for ease of traversing the study area and collect the information. The sample was small and posed a challenge to generalize to all counties in Kenya. The study however addressed the limitations by ensuring that stratified sampling method was applied to obtain responses from all the energy players involved in the implementation of energy access projects in those regions. In addition, the questionnaire was structured with several structured questions to exhaustively address all the variables of the study.

Further limitation to the study were cases of unwillingness of some respondents to participate in the research and furnish the required information. To mitigate this, the researcher with the help of the research assistants distributed the questionnaire while trying to create a rapport with the interviewees while at the same time assuring them of their anonymity. Another limitation that was faced was the issue of confidentiality as some respondents were reluctant to give information. To mitigate this, the researcher assured all respondents that the information was for academic purposes only and all given information would be treated confidentially.

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Author Profile

Evans KituziAvedi is a PhD Candidate at the University of Nairobi Kenya pursuing Project Planning and Management. He is an Electrical Engineer with research interests in rural electrification, energy efficiency and project planning design and Implementation. He has a wide experience in consultancy and project management. He is a member of Engineers Board of Kenya.