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Implementation of Digital Village Projects in Developing Countries - Case of Kenya

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Authors' contributions

This work was carried out in collaboration between both authors. Author LVA designed the study, did literature review, collected and analyzed data and wrote the first draft of the manuscript. Author CAM managed the literature review, analyses of the study and manuscript writing. All authors read and approved the final manuscript.

Original Research Article

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ABSTRACT

This paper looked at the implementation of Digital Village Projects (DVPs) in Kenya and the constraints that hinder the successful implementation of these projects. DVPs like any other Information and Communication Technology for Development (ICT4D) are projects that were initiated with the objective of economically empowering the community. The success of these projects is therefore paramount if the objective is to be achieved. An existing ICT4D assessment framework was adopted and its elements used to assess the implementation of these projects. The elements were tested using data collected through questionnaires, interview and observation. Several factors came out strongly as major hindrances to successful implementation of these projects. These include low level of information literacy, awareness, branding of DVPs, cost of services, and unavailability of affordable bandwidth. The study showed that the projects, even though still young, have contributed significantly to the lives of the beneficiaries. It is also evident that more could be achieved by adopting the adapted framework when implementing the projects.

Keywords: Assessment framework; digital village; digital village project; successful implementation.

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1. INTRODUCTION

The Government of Kenya recognizes that the provision of Information and Communication Technology (ICT) goods and services is important for enabling economic and social development by improving communication and facilitating information flow. In order to address the wide disparity between ICT in urban centres and other regions, the Government, through the Kenya ICT Authority, in 2010, rolled out new electronic centres commonly referred to as 'Digital Villages'. A Digital Village is an e-centre that provides a suite of services to the public via computers connected to the internet, digital cameras, printers, fax machines and other communication infrastructure. The services include e-government, banking, e-learning and communication services among others. A core requirement for this project is to set up and manage a digital village revolving fund that will advance loans to entrepreneurs to enable them establish more such centres. There centres are therefore required to provide entrepreneurship training and offer technical support [1].

The Digital Village Projects (DVPs) are part of a number of Government of Kenya projects of Digital Inclusion to ensure citizens and disadvantaged groups have access to ICT. Digital Inclusion is the promotion of digital literacy and provision of access to ICTs for the improvement of the quality of life of the people. Other initiates in Kenya include the Kenya Open Data – an open government data portal, the first of its kind in a developing country; Business Process Outsourcing Enabled Services; Kenya Education Network – a national research and education network that promotes the use of ICT in teaching, learning and research in higher education institutions in Kenya; Local Content Development Programmes; the Wezesha Initiative that provides financial incentives towards purchasing laptops for registered university students; and the most ambitious Konza Technology Park, a proposed technology park which is part of the Vision 2030 government blueprint for development [2].

DVPs are part of ICT4D which refers to the use of ICT in the fields of socioeconomic development, international development and human rights. The theory behind this is that more and better information and communication furthers the development of a society. Surveys have shown that even though the DVPs were started with a noble cause, most if not all, have not realized their impact fully. This is evident from the findings by the IBM Team, 2010 [3,4] that shows the DVPs, called the *Pasha* Centres [5], are not currently operating as a true extension of government services. Existing *Pasha* Centre owners have a strong desire to offer e-government services, but require the means to deliver these services. A communication plan is required to inform citizens, particularly in rural areas, about e-government services and the direct benefits consumers will gain by utilizing these services.

As the government rolls out the funded DVPs in different parts of the country, with the first phase comprising 37 Centres, there is need to account for such implementations and assess the need, process, outcome and impact of these ICT projects on the community. Most evaluations in ICT4D tend to focus on impact assessment and yet assessing the impact of a project relies on interdependent assessments that should be conducted throughout the life of a project [6]. This is done especially to gauge the actual contribution of an ICT project to specified impact in a rural community. Therefore there is need for a viable framework that can be used to assess the successful implementation of the *Pasha* Centres on the community if the desired impact is to be achieved.

The overall objective of the research was to establish the cause of DVPs failure and develop a framework for assessing the successful implementation of future DVPs hence avoiding project failure. The research therefore identified the services provided by the Centres and

are tailored to meet the community's needs and those that are required but are not being offered; constraints that affect the implementation of the projects and strategies to overcome them; established the impact of the projects on the community; and validated the adapted framework for assessing the successful implementation of these Centres at the community level.

2. RELATED WORK

Information Communication and Technology (ICT) has become a fundamental aspect of people's lives. It is therefore important that ICT services are made available to all and at reasonable costs. This has led to a growing number of ICT initiatives in developing countries that are usually undertaken on the basis of their importance on social and economic development [7]. The World Bank, the United Nations and other donor agencies are directly or indirectly implementing ambitious multi-million dollar ICT-supported projects in developing countries aimed at unlocking the potentials of ICT to improve the quality of life of the poor especially in the rural areas. Previously, the initiatives have included a range of pilot projects, such as tele-centres, multipurpose community access centres and information kiosks [8].

In Kenya, the government has embarked on ICT oriented projects that are geared towards bringing services closer to the people. Services provided by such projects include e-governance, e-learning, e-commerce, among many. Even though this initiative is a noble course taken by the government, most of these services are not being utilized fully especially at the community level. Barriers to the efficient utilization of ICT in developing countries, can affect the ability to manipulate and use information effectively [5]. This can lead to failed investments in ICT. Therefore it is important to develop viable projects to avoid project failures.

The IBM Team 1 Sub-Team 1 [3] carried out a research on digital village pilot projects in Kenya. The final report showed that the utilization of the ICT-related services is affected by: low ICT literacy rate, computers are generally viewed by local constituents as tools only for the university educated, basic needs (food/water/shelter) must be met before introducing computers, and national level programs tend to have high awareness rate but complete communication plans reaching to all citizens are lacking.

As the government embarks on the process of creating an information society, it should ensure that, apart from establishing these projects, they are fully utilized to avoid undertaking unsuccessful projects. Therefore the major challenge is to establish if the projects are of any value to the community or the beneficiaries. This is only possible by assessing the importance of these projects to the beneficiaries. The adoption of a conceptual framework is proposed as a guide during implementation of these projects to avoid project failure.

Digital Village Projects were initiated with one major goal in mind and that is to bridge the digital gap that exists between rural and urban areas. Mostly the assessments carried out tend to address only the technology component of economic resources which only affects one part of the access function. In identifying the desirable framework, the ICT4D Value Chain Model [8] was adopted as the preferred model for this research. This framework is shown in Fig. 1 below.

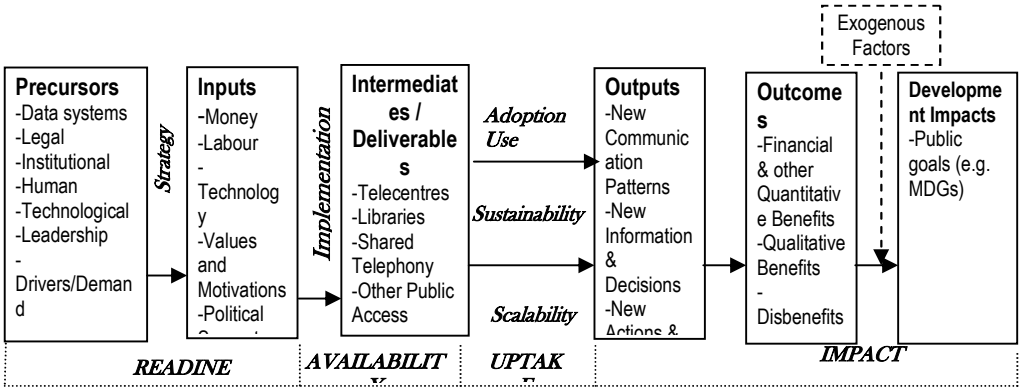

Fig. 1. The ICT4D value chain model (Heeks & Molla [9])

Heeks and Molla's ICT4D value chain [9] gives the basis for understanding the assessment of ICT4D projects and it is build on a standard input-process-output model to create a sequence of linked ICT4D resources and processes. The value chain is divided into four main targets for assessment as shown in Fig. 1.

a) *Readiness:* Measures the systemic prerequisites for any ICT4D initiative, strategy that turns these precursors into project specific inputs, and the presence/absence of those inputs.
b) *Availability:* Implementation of the ICT4D project turns the inputs into a set of tangible ICT deliverables; one can assess the presence and availability of these intermediate resources.
c) *Uptake:* Assessment typically measures the extent to which the project's ICT deliverables are being used by its target population. Broader assessment could look at the sustainability of this use over time, and at the potential or actuality of scaling-up.
d) *Impact:* Assesses the impact of the project and we can divide it into three sub-elements: Outputs are the micro-level behavioral changes associated with the ICT4D project; Outcomes are the specific costs and benefits associated with the ICT4D project, while Development Impacts are the contribution of the ICT4D project to broader development goals.

Other frameworks and models were also studied and the important elements summarized as shown in Table 1 below.

Table 1. Summary of the reviewed models and frameworks

Model/framework	Key dimensions/elements	Author(s)
The Information Chain Model	Data, Economic Resources, Social Resources, Action Resources	Heeks [10]
The Three – Stage Information Society Model	ICT Readiness, ICT Intensity, ICT Impact	ITU [11]
The Key Boundary Partners Framework	Pasha Project, Partners	KICTA [12]
Framework to Investigate ICT Led Development at the Community Level	Input, Approaches, Social Constraints, Output, Desired Impact	Ashraf et al [13]
Empowerment Through ICTs Framework	Context, Livelihood Resources, Institutional Processes, Capabilities, Livelihood Outcome	Gigler [14]

Heeks and Molla's ICT4D value chain model [9] was adapted to produce the framework in Fig. 2. The model is built on a standard input-process-output model to create a sequence of linked ICT4D resources and processes. In the adapted framework, the components, input, process and output have been substituted by inception, implementation and post-implementation, which are the key stages in the project development. The *Pasha* Projects have not developed enough for full assessment on the four stages to be carried out. Therefore the adapted framework was used to carry out assessment up to the uptake stage.

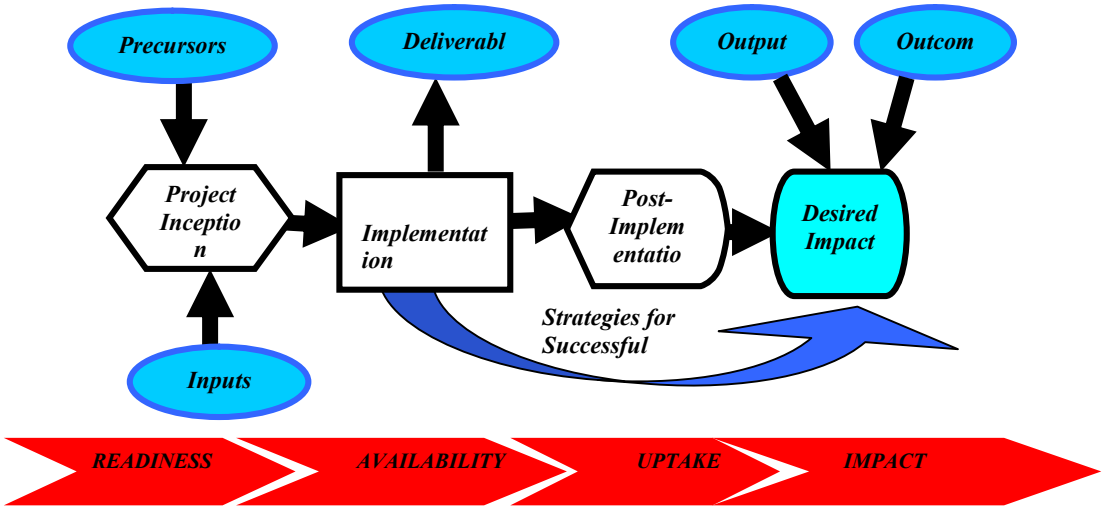

Fig. 2. Adapted Heeks and Molla's ICT4D framework

3. METHODOLOGY

3.1 Research Design

The target population for this study was the Kenya ICT Authority staff in charge of the DVPs, *Pasha* Centre Managers and their Clients. The Authority is mandated, among others, to coordinate and implement Kenya Government ICT projects. Since only 37 applicants qualified for the first round allocation of funds, the research intended to cover all the Centres. This is because only a few Centres had been rolled out and therefore taking a sample would not have given a fair representation of the total population. Out of the 37, only 25 Centres were in existence or could be located and the survey covered all them as shown in Table 2. The survey targeted the 3 staff members in charge of DVPs, the 25 Service Providers, and the 3 Clients from each Centre, bringing the total of the respondents to 103 (Table 3). General survey method was used in this research and data was collected using mainly questionnaires. Both closed and open-ended questions were used. The key elements of the questionnaires targeting service providers were: the contribution of various stakeholders towards the success of the centre, rating of the contribution of various resources towards the success of the centre, important things to consider when choosing the location of the centre and services offered, constraints and challenges of running of the centre, frequency and factors to consider when carrying out assessment of the centres, benefits of the centres to the service providers and the community. The key elements of the questionnaires targeting clients were: their information literacy level, services frequently accessed constraints that

affect services accessed, and rating of benefits realized.To supplement the questionnaire, interviews and observation were also used where possible.

Table 2. Location of the DVPs

County	Frequency
Kajiado	1
Busia	1
Nyandarua	1
Kisumu	3
Bomet	1
Meru	3
Nithi	1
Kilifi	2
Makueni	1
Kiambu	4
Baringo	1
Homa- Bay	1
Mombasa	1
Kakamega	1
Garissa	1
Kericho	1
Murang'a	1
Total	25

Table 3. Respondents

Respondents	Target	%	Received	%
No. of Respondents interviewed	3	3%	1	33%
No. of respondents reached through questionnaire	100	97%	88	88%

3.2 Data Analysis

The following processes took place: editing of data to detect errors, corrections done where possible, coding of close-ended questions for efficient analysis, classification of data in order to come up with meaning relationship, and tabulation of the data to facilitate the analysis. Qualitative method was to analyze data that could not be quantified. This included data collected using open-ended questions and interviews. This assisted in analyzing data collected from different respondents in a systematic way in order to arrive at useful conclusions and recommendations. Phrases or words from different respondents were studied to identify similarities and differences. Quantitative method of data analysis was to analyze close-ended questions that had predefined responses and could be assigned numerical values using A Likert Scale.

4. RESULTS AND DISCUSSION

4.1 Results

The analyzed data was grouped to reflect the key elements of the adapted framework as follows:

a) *Precursors:* Different prerequisites for the DVPs initiatives were looked at and prerequisites such as project awareness and branding, stakeholders' contributions came out strongly.
b) *Inputs:* Several inputs facilitated the success of these Centres and inputs such as equipment, infrastructure, skills, technology, and information availability were seen as the major contributors.
c) *Deliverables:* Services offered by these Centres were looked at especially those tailored to meet the needs of the community and those required but not offered.
d) *Strategies for Successful Implementation of the DVPs:* The service providers had several strategies for the successful implementation of the DVPs and they included outsourcing for alternative ISP, awareness creation, and putting alternative electricity supply in place.
e) *Outputs:* Factors that hindered the achievement of the desired success of these Centres were grouped together as constraints and the major ones included: information literacy, funding, cost of services, reliable electricity supply, adequate bandwidth, and project awareness and branding.
f) *Outcomes:* The specific costs and benefits associated with the projects were looked at.

4.2 Services Offered

The findings showed that most of the Centres represented by 48% of the total targeted population that were operational, are offering extra services that were tailored to meet the community needs. Among the extra services offered, money transfer services took the lead with 32% (Table 4). This confirmed the findings from other teams such Deloitte & Touche [15]. This could be attributed to the location of the Centres being situated in the rural areas where banking services do not exist.

Table 4. Services offered to suit the needs of the community

Services	Frequency	%
Awareness Creation Program For The Youth	1	7%
Certified Training	1	7%
KRA PIN, Police Abstract	3	20%
Mobile Money Transfer Services	5	32%
Photography	3	20%
Post Office Box Services	1	7%
Sale Of Safe Drinks	1	7%
Total	15	100%

Various information can be generated at the Centres with 17% of those sampled being able to sending/receive messages using mobile phones, and an equivalent proportion being able to send/receive messages using computers on email, create documents and search for other information on the internet (Table 5). This accounts for 68% of the population fully informed. However, only 10% are able to carry out research with an equivalent proportion being able to send or receive money.

Table 5. Services accessed

Services	Frequency	%
Sending/receiving messages	54	17%
Sending/receiving email	57	17%
Sending/receiving money	32	10%
Creating documents	55	17%
Searching for info over the internet	55	17%
Training/Education	39	12%
Research	34	10%
Total	326	100%

It was also evident that even though the Centres were offering extra services, there were services that were required by the community and were not being offered. Certified training and money transfer service were the services required most with 50% and 40% respectively confirming the service providers' concern.

4.3 Constraints

Five factors came out as the major constraints hindering the enhancement of this success. These are channeling of funds, branding of the DVPs, awareness creation, cost of services, and level of information literacy (Table 6, Fig. 3 and Fig. 4).

a) *Channeling of the Funds:* There was a major concern on how the funds were being channeled. Process of accessing the funds was taking long. Being a loan that needs to be paid back, the service providers were left with little or no grace period to prepare for repayment. This has led to the services being charged higher than the expected prices as was expressed by the clients as their biggest constraint with 37%.
b) *Branding of the DVPs:* Most of the Centres confirmed they were not branded and the setup was different at each Centre. The service providers felt that the Centres are being seen by community as any other cyber café despite the special services they are offering.
c) *Awareness Creation:* The findings confirmed the results in the IBM Team 1 Sub-Team 1 report [3], which shows that there is awareness of ICT initiatives at the national level but the same is lacking at the community level. The Service Providers believe that lack of awareness is one of the major factors that are hindering the success of the Centres. Branding and awareness, which were considered under other factors, constituted a bigger chunk of the 22%.
d) *Cost of Services:* The major constraint the Clients were facing is cost of services which stood at 37%. The cost of the services prohibited the Clients from utilizing the services fully. This constraint according to the Service Providers was attributed to the cost of adequate bandwidth and inadequate way of channeling funds.
e) Level of Information Literacy: Major constraint the Clients were facing apart from cost of services was lack of information literacy to be able to utilize the services to the fullest which was rated at 31%. Majority of the Clients' knowledge on the use of computer/mobile phone and capability to use them to generate information was rated good with 41% and 43% respectively. When probed further, most of the Clients expressed their desire to know more in order to be able to use the more advanced services.

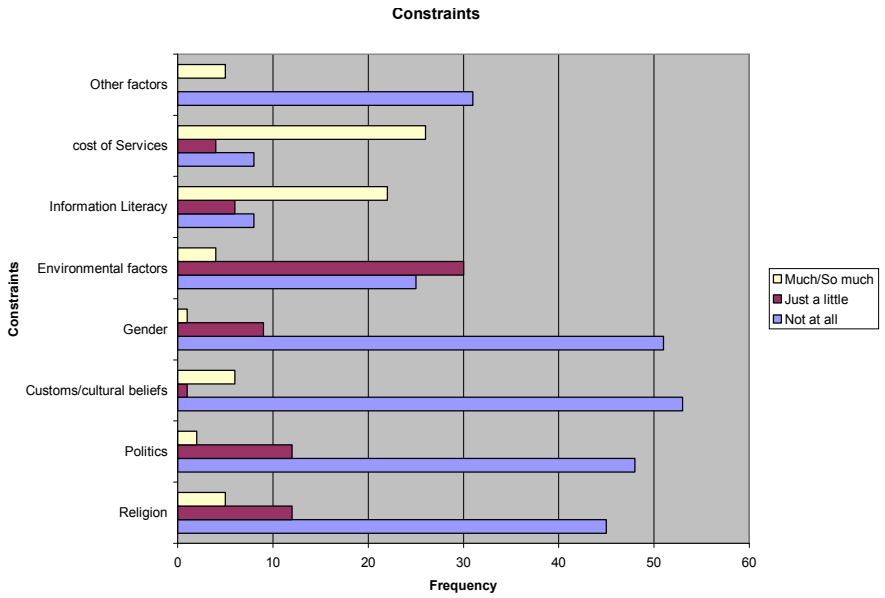

Fig. 3. Constraints from the service providers' point of view

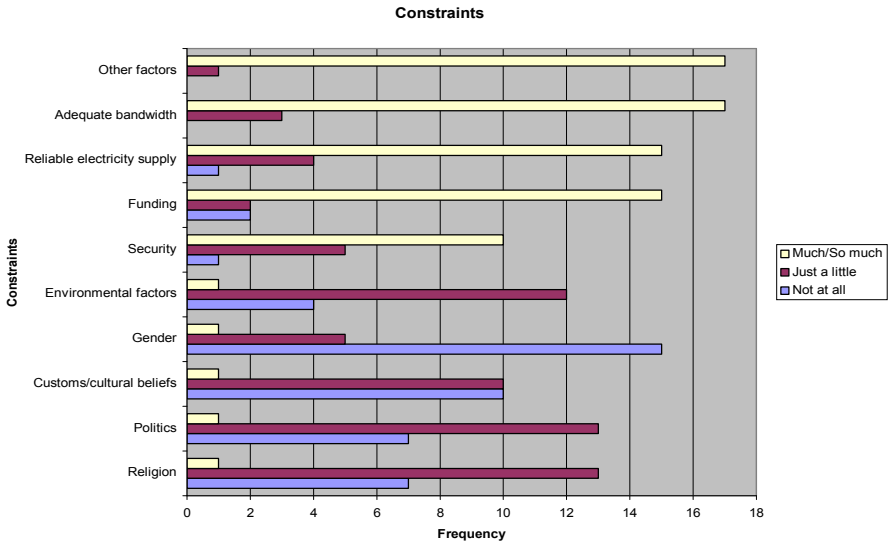

Fig. 4. Constraints from the clients' point of view

On how to deal with the constraints in accessing services at the Centres, the majority of the Clients representing 32% of the target population suggested learning more to improve IT knowledge/skills as the best way to deal them (Table 7). For those with finance related constraints, the best strategy was to minimize the costs related to internet use and this accounted for 22%.

The Service Providers had several ways of dealing with constraints with outsourcing for ISPs being the strategy employed by the majority (Table 8). This was followed by electricity supply backup and creating awareness gunning 22.5% and 17.5% respectively.

Table 6. Constraints

Factors	Service Providers			Clients		
	Not at all	Just a little	Much/ So much	Not at all	Just a little	Much/So much
	%	%	%	%	%	%
Religion	15	19	1	17	16	7
Politics	15	19	1	18	16	3
Customs/cultural beliefs	21	15	1	20	1	8
Gender	32	7	1	19	12	1
Environmental factors	9	18	1	9	41	6
Security	2	7	13	0	0	0
Information Literacy	0	0	0	3	8	31
Funding	4	3	19	0	0	0
Cost of Services	0	0	0	3	5	37
Reliable electricity supply	2	6	19	0	0	0
Adequate bandwidth	0	4	22	0	0	0
Other factors	0	1	22	11	0	7
Total	100%	100%	100%	100%	100%	100%

Table 7. Clients' strategies to deal with the constraints

Strategies	Frequency	%
By not joining any social site in the internet	4	11%
Getting to research	1	3%
Having a positive attitude	3	8%
Learning more to improve IT knowledge	12	32%
Minimizes the costs related to internet use	8	22%
Raising concern to the in charge	3	8%
Resorting to alternatives	3	8%
Saving to avoid information loss	1	3%
Seek assistance from *Pasha* owners	1	3%
Set priorities on urgent services	1	3%
Total	37	100%

Table 8. Service providers' strategies to deal with the constraints

Strategies	Frequency	%
Additional funding	3	7.5%
Create awareness	7	17.5%
Electricity supply backup	9	22.5%
Employment security	1	2.5%
Insuring the business	1	2.5%
Linking with the local churches	1	2.5%
Outsource for ISP	15	37.5%
Acquired modems	1	2.5%
Community mapping	1	2.5%
Variation of products and service	1	2.5%
Total	40	100%

4.3.1 Assessment of Impact

Even though the Centres are still young, the findings showed that majority of the Service Providers (52 were carrying out assessment to check on the progress of their centres. Among those that were carrying out assessment, the majority did it after every three months. The findings showed that the majority considered daily cash flow as one of the factors (Table 9).

Table 9. Factors considered during assessment

Factors	Frequency	%
Clients satisfaction	3	16%
Community needs and knowledge	2	11%
Enquiries from interested people	1	5%
Financial requirement and profit margin	2	11%
Impact of the center on the community	1	5%
Looking at the cash flows-daily	4	21%
Number of students received	1	5%
Challenges involved	1	5%
Looking at the services which bring outcome	1	5%
Performance evaluation and appraisal	2	11%
Traffic	1	5%
Total	19	100%

4.3.2 Benefits

The Managers of the Centres that were operational representing 84% concurred that the Centres had been beneficial to them (Table 10). The remaining 16% had not started operating therefore could not talk of benefits. All the Clients had benefited from the Centres in one way or another. From the Service Providers' point of view, the most benefit is generation of income which constitutes 29%. This is because the Centres are income generating. This is followed by location of the Centres representing 22% which the Clients also concur with 35% of the total target population. The Centres are situated near the people at the community level hence bringing services closer to the people.

Table 10. Benefits of DVPS

Benefits	Service Providers			Clients		
	Not at all %	Just a little %	Much/so Much %	Not at all %	Just a little %	Much/so Much %
E-government services	23%	11%	13%	32%	10%	4%
Generation of Income	0%	0%	29%	28%	14%	5%
Employment	0%	23%	15%	14%	17%	20%
Training	30%	17%	7%	4%	20%	29%
Affordable Services	13%	27%	7%	18%	25%	7%
Location of the Centres	0%	11%	22%	4%	14%	35%
Other Benefits	34%	11%	7%	0%	0%	0%
Total	100%	100%	100%	100%	100%	100%

4.4 Discussion

According to the Kenya ICT Authority [12], the achievement of an information-based society is one of the main priorities of the Government of Kenya towards the realization of national development goals and objectives for wealth and employment creation. Harnessing of ICT will therefore help the Government to realize a number of its key public policy objective. The Digital Village Project was initiated to provide affordable access and use of ICT resources to rural communities in a sustainable way; increase connectivity of the rural areas to other parts of the country; and create economic opportunities that will spur rural economic development. In assessing the successful implementation of the DVPs, the research was set to find out if the projects had been successfully implemented and the above reasons and objectives have been or are being achieved.

The research findings confirmed that connectivity of the rural areas to other parts of the country has been increased. This is evident in the location of the Centres at the community which makes it easier for the people at the community level to get connected. Location of the Centres is one of the major benefits from both the Service Providers and the Clients with 22% and 35% respectively. This has made the community members to be able to access the services provided without having to travel far hence saving on fare and time.

DVPs are one way of creating economic opportunities. This is because the Centres are income generating activities for the service providers and at the same time they give employment opportunities to the community members. Each Centre has created employment opportunity to at least one member of the community. Trainings offered by the Centres also beneficial to the community members.

The Centres are enhancing provision of e-government services. This is evident in 20% of the Centres that are offering provision of police abstracts, submission of tax returns online, and other e-government services. Business skills and knowledge has been enhanced as well as expose them to world news and trends that may positively enhance their lives. This has been made possible through the provision of the internet services and training.

The frameworks adopted showed that constraints were major hindrances to attaining the desired impact of the ICT projects. This is evident in the research findings with availability of affordable bandwidth being the major constraint with 22% from the Service Providers' view and cost of services with 37% from the Clients' view. The factors that came out strongly as being among the major constraints are channeling of the funds, branding of the DVPs, awareness creation, cost of services, level of information literacy.

The opinion of the Service Providers who were not satisfied with success level of their Centres was requested. The contribution of the donor came out prominently. Further probing showed that the donor had not kept its part of the bargain as was signed in the Service Level Agreement. The donor's functions included: timely disbursement of the revolving funds, provision of technical support, provision of quality and affordable bandwidth, and training of the service provider. The donor had only performed one out of the four functions i.e. training the service providers, leaving the other three pending.

The research findings confirmed the importance of the elements considered in the adapted framework. The results were therefore mapped to the elements of the framework. The achievement of two of the objectives and the benefits of the Centres show that their implementation was a success.

4.5 The Refined Framework for Assessing Successful Implementation of Digital Village Projects

The findings showed that apart from the elements that were contained in the selected framework, the following elements added value to the success of the DVPs hence were incorporated in the framework as shown in Fig. 5: DVPs awareness, Service Level Agreement (SLA) implementation (channeling of funds and availability of affordable bandwidth), DVPs branding, and level of information literacy.

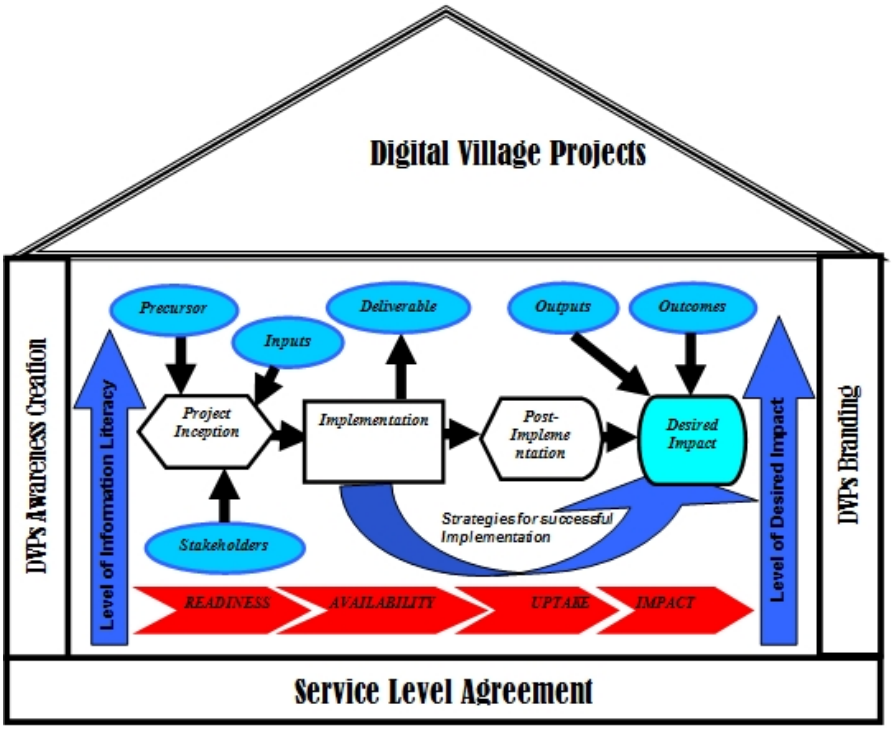

Fig. 5. The refined framework for assessing successful implementation of digital village projects

a) *DVPs Awareness Creation:* The community needs to be made aware of the existence of these Centres and the services they offer. Lack of awareness was evident on the way government offices are still being crowded for services that can easily be accessed through the Centres.
b) *Service Level Agreement (SLA) Implementation:* There should be a proper way of funds channeling to avoid delays which is impacting negatively on the success of the Centres. Also, affordable bandwidth should be made available. Both of these are contained in SLA which needs to be implemented fully for them to be achieved.
c) *DVPs Branding:* The Centres need to be branded so that they can be unique hence easily differentiated from the normal businesses providing ICT services.
d) *Level of Information Literacy:* For the community members to utilize the services provided by the Centres fully, their information literacy level needs to be increased. This can be achieved through training and awareness creation.

5. CONCLUSION

Based on the literature reviewed, many ICT for development initiative have been or are still being undertaken in the developing countries. Even though these projects have been started with a noble cause, most if not all, have not been successfully implemented. The research findings have confirmed this. An ICT project with a difference that is worth emulating is Grameen Foundation AppLab Incubator in Uganda [16]. This innovation lab helps private sector partners build, test and deliver solutions into the hands of users in some of the poorest regions in the world.

In Kenya several ICT4D projects have been started and failed along the way. There is therefore need for proper strategy to be put in place if these projects are to succeed and DVPs are no exception. This strategy will include understanding the characteristics and needs of the community, community awareness creation, proper mechanism for channeling fund, branding and increasing community level of information literacy levels of the community. The refined adapted framework would act as a guide when undertaking such projects. For the projects to be successful, we therefore recommend the adoption of the refined framework.

The research findings evidently show that there is need for an assessment framework if the ICT4D projects in general and DVPs being initiated are to be successful. The research was carried out on projects that were relatively young and a lot might have been missed in the study. Due to the duration the projects had been in existence, very little could be captured as impact. There the research was concentrated on the implementation of the projects. The framework needs to be refined further as the projects grow and new ICT innovations adopted and incorporated in the projects.

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COMPETING INTERESTS

The authors declare that no competing interests exist.

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