

FACTORS INFLUENCING IMPLEMENTATION OF PUBLIC INFORMATION AND COMMUNICATION TECHNOLOGY PROJECTS IN PARASTATALS IN KENYA

James Odongo.

Student, Department of Management Science, Kenyatta University, Kenya, Kenya.

Dr. Paul Sang.

Senior Lecturer, Department of Management Science, Kenyatta University, Kenya, Kenya.

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ABSTRACT

Information and Communication Technology (ICT) projects and their relevance are spreading rapidly in government-owned institutions globally. However, the methods of implementing such projects effectively in low- and middle-income countries have evolved slowly due to several factors, including theoretical inadequacies that have kept ICT at the margins of the established governance system. In Kenya, the ICT facilities, such as computers and internet networks available in government offices, are not fully utilized mainly due to internal and external hurdles, such as outdated infrastructure, inadequate expertise, inadequate funding and unfavorable government policies. The context-specific evidence on how these factors influence the implementation of ICT projects within government parastatals in Kenya is limited. The purpose of this study is to explore the factors influencing the implementation of ICT projects in parastatals in Kenya. Specifically, this study investigates the effect of ICT attributes, funding, training and government policy on the implementation of ICT projects in Kenyan

parastatals. The study was a cross-sectional survey of 99 parastatals selected through purposive sampling. A self-administered questionnaire was used to collect data among personnel involved in the implementation of ICT projects in these parastatals. The results indicated a high agreement level with most items related to ICT, funding, training and government policy factors, suggesting their role in ICT project implementation. However, regression analysis showed that only training was significantly associated with ICT implementation ($\beta = 0.34, p = 0.01$). Two ICT factors, improved work efficiency and productivity and lack of IT infrastructure, also independently had a significant association with ICT implementation, with the former having a negative association. The findings from this study suggest the need for adequate IT infrastructure, funding and favorable government policy to enhance the implementation of ICT projects in public sector organizations.

Key words: ICT, implementation, public sector, parastatals, training, funding, government, Kenya

INTRODUCTION

In recent decades, global attention has been directed towards the adoption of information systems (ISs), including information and communication technology (ICT) and other computer-based systems in organizations (Toader et al., 2018). ISs have significantly influenced how governments provide services to citizens globally. Specifically, ISs have been reported to provide several benefits to organizations, which include but are not limited to reducing the costs of transactions, enabling firms to develop closer relationships with their customers, promoting transparency, altering the nature of operations, and creating new opportunities for development (Bertot et al., 2010; Magutu et al., 2010; Dwivedi et al., 2015). In government agencies, the delivery of public services to business enterprises and citizens has

been enhanced by recent generations of IS that enable online transactions through various platforms (Bwalya et al., 2015). Electronic Customer Focused Government (ECFG) and Virtual Public Enterprises (VPEs) grounded on advanced applications are some new concepts that have promoted the use of IS to provide online services. Due to these roles, ISs are perceived as a means of achieving a competitive edge, and they have become part of government strategy for enhancing service delivery.

The emergence of ICT and the subsequent move to e-Government has led to increased effectiveness and efficiency in internal administration within the government and the relocation of government services from centralized public offices to locations closer to the people (Bhuiyan, 2014; Venkatesh et al., 2014). The use of facilities such as personal computers, telecentres, cybercafé, and office computers allows citizens to seek and get government services from wherever they are and just with a click of a button. Thus, ICT not only improves the ease of access to government services but also enhances efficiency. These benefits have resulted in improved customer satisfaction.

Despite the ICT benefits, multiple concerns regarding the implementation of ICT systems, including strategies and successes, persist in many countries (Ojha & Pande, 2017) and public sector organizations in particular (Otieno & Omwenga, 2015). Nkohkwo and Islam (2013) defined IS implementation as anticipation and strategic management of the potential impacts resulting from a change in technology component until the system becomes fully operational within an organization. Anthopoulos et al. (2016) also defined IS implementation as a complex process that encompasses systems (mobilization for new systems or modification of the existing ones), integration of work, and effective communication with all stakeholders. The authors also argued that it is a learning process that involves the adoption of flexible structures critical for achieving organizational goals. This process of strategizing how a particular IS component will suit the organizational needs and operationalizing the implementation plan continues to present challenges to managers striving to enhance the implementation of ISs in public sector institutions focused on providing user-oriented ICT services. Anthopoulos et al. (2016) noted that IS implementation is a rigorous and tedious process preceded by system scoping, defining user requirements, system design, development, and testing before final implementation. In public sector institutions, the approaches currently applied in managing ISs have not shown satisfactory results as several IS projects are not fully utilized, and a great fraction fails to meet their potential (Kasim, 2011; Kozma & Vota, 2014). The failures have been attributed to the challenges related to ICT implementation, such as planning and operation, as well as the uniquely challenging context of the public sector.

These challenges can be viewed from three levels of implementation, namely organizational, system and user factors. At the organizational or institutional level, parastatals often encounter the burden of complex procedures, inflexible procurement rules, and operating in inflexible institutional frameworks, among other challenges (Kozma & Vota, 2014). The implementation process also requires massive resources, including funds, personnel, technical expertise, and complex ICT infrastructure in order to fully exploit IS opportunities (Nkohkwo & Islam, 2013). Similarly, the complexity and amount of resources required for the development of computer-

based systems that often lead to budget overruns and extended timelines are some of the system factors for consideration in the implementation of ICT projects. For example, the system development life cycle involves complex methodologies such as waterfall, joint application development and rapid application development. Lastly, the users' perspectives about the systems and the implementation process, such as perceived system benefits and perceived quality of support from ICT departments, also affect the implementation of public ICT projects. This set of organizational, system and user factors contributes to unique issues concerning the implementation of ISs. Therefore, there is a need for effective strategies for implementing ICTs in the public sector to realize their full benefits in line with the institutional IS strategy. An investigation of distinct factors affecting the implementation of ICT projects in parastatals in Kenya is necessary.

Statement of the Problem

ICT use is associated with several benefits, such as improved quality, operational efficiency and customer satisfaction. This has led various organizations, including parastatals in Kenya, to adopt and implement ICT at different levels of operations as a major initiative for promoting service delivery. However, the rate of ICT implementation in parastatals has been relatively slow, and the implemented strategies have remained largely underutilized. Parastatals in Kenya have also failed to effectively deal with the challenges of ISs implementation, resulting in the non-realization of the intended strategies and benefits despite numerous proposed methodologies (Sukantet, 2015). These have been attributed to several factors acting as barriers to ICT implementation initiatives and processes. For example, ICT factors such as poor information technology (IT) systems could present significant user challenges, resulting in low satisfaction and adoption. Using the case of the Kenya Revenue Authority (KRA), Saina (2013) reported a low public satisfaction level with the low quality of services provided through the organization's (KRA) portal due to low system performance. Inadequate resources, such as IT infrastructure, IT personnel and funding, as well as rigid institutional frameworks and government policies, also hinder technology penetration into the organizations' structure and culture. Moreover, the implementation of IT in parastatals is significantly influenced by socio-cultural and political factors, with these organizations usually faced with political pressures and power struggles (Lowry, 2013). Thus, government agencies in Kenya have not been able to effectively implement and use ICT due to internal and external factors.

Moreover, the influencing factors of implementation of ICT projects, especially in the public sector, have not been adequately addressed in the literature. The available few studies have not yielded sufficient results as they have only involved a few institutions, making generalizations of the findings difficult. This knowledge gap is even wider in Kenya, where there is limited evidence, with only a few studies conducted in parastatals. This set of circumstances justifies the need for further studies exploring the factors that affect the implementation of ICTs in the public sector, specifically in parastatals in Kenya. Al-Rashidi (2010) also noted that there is limited guidance for the management on the ongoing implementation efforts. Thus, this study fills these research gaps by contributing knowledge on the effects of selected factors on the implementation of ICT projects in parastatals in Kenya.

General Objective

The general objective of this study was to evaluate factors influencing the implementation of public ICT projects in Kenyan parastatals.

Specific Objectives

1. To find out the effects of IT factors on ICT projects implementation in Kenyan Parastatals.
2. To investigate the effect of funding on ICT projects implementation in Kenyan parastatals.
3. To determine the influence of training on ICT projects implementation in Kenyan parastatals.
4. To find out the effect of government policy on ICT projects implementation in Kenyan parastatals.

LITERATURE REVIEW

IT Factors and Implementation of Public ICT Projects

The aim of integrating ICT in the public sector is to enhance the delivery of services to the citizens. In order to achieve this goal, the implemented IS should guarantee the desired benefits, such as efficient performance and high-quality services to improve user satisfaction. The deployed ICT systems should also be able to address the potential challenges, such as ease of use and data security risks. Moreover, adequate IT infrastructure, including hardware and software components, is critical to the successful implementation of public ICT projects (Too & Weaver, 2014) and the facilitation of the provision of e-government services (Ika et al., 2012). Cordella and Iannacci (2010) identified the lack of IT infrastructure, such as computers and enough storage hard disks, as impediments to implementing IT projects. The lack of appropriate software to support the functioning of computers has also been found to affect the implementation of ICT successfully (Too & Weaver, 2014).

The availability of the internet is also critical to the implementation of ICT projects. However, Tarus et al. (2015) noted that inadequate connection to the internet remains the greatest challenge facing most public sectors in Africa despite many African countries today having increased access to the internet, with South Africa in the lead. Cheremshynskyi and Byamugisha (2014) also identified low mobile network coverage as a major challenge for the government of Ghana in implementing ICT projects in some areas. The internet challenges are attributed to a lack of support for physical infrastructure, such as poor roads and electricity. For example, Sapru and Sapru (2014) found that ICT projects in India were affected by the unavailability of power in some areas, necessitating the use of generators, which increases the cost of implementation. In Kenya, the operationalization of most IT-dependent projects is hampered by the lack of these critical and IT-specific infrastructures. In general, it could be concluded that IT factors, including the availability of infrastructure such as computers and the internet affect the implementation of public ICT projects in Kenya and globally.

Funding and Implementation of Public ICT Projects

Financial resources are also required to implement ICT projects successfully. Akkucuk (2015) defines financial resources as the available amount of money for spending by a particular business in cash, credit lines, and liquid securities. Before embarking on business, any entrepreneur ought to secure enough funds for them to be able to run their operations sufficiently and efficiently for them to succeed. Similarly, organizations must acquire computers and other related IT infrastructure important for the long-term achievements in effective and efficient management, administration, and planning processes of ICT projects. This requires adequate financial resources. Chebet (2013) noted that the total amount of money spent on IT worldwide in 2013 alone was approximately USD 3.5 trillion. This expenditure is growing at a constant rate of 5% per annum, and estimations suggest that the cost will likely double every fifteen years. Moreover, the skyrocketing cost of IT to 50% since 2002 has strained its total budget, being a percentage of corporate revenue. Indeed, today companies spend three-quarters of the IT budget as recurrent budget and lighting the IT department, with the remaining quarter being the costs of new initiatives for developing technology in the department.

Sandeep and Ravishankar (2014) noted that the growth and adoption of ICT, especially in low-income countries, is largely influenced by the cost hence the need for support mechanisms to ensure training and gradual integration of the new technology is achieved. It is suggested that ICT implementation in settings with constrained budgets, such as Kenya, should take into consideration the ICT systems' full expenditure alongside addressing the challenges of providing ICT on an equitable basis (Ohemeng & Ofosu-Adarkwa, 2014). In particular, those charged with the implementation of ICT projects need to evaluate the total cost related to ICT to address the issues relating to systems efficacy, effectiveness and sustainability. Sandeep and Ravishankar (2014) noted that financial resourcing was an important part of consideration in the implementation of ICT in the lands sector in sub-Saharan African countries such as Nigeria and Ghana. In Kenya, Chebet (2013) found the planning and deployment of ICT in government ministries face significant challenges with the current budget only considering the short-term requirements with little regard to the long-term costs involving the purchase, deployment and maintenance of ICTs. Equally, the cost of technical support and training is usually overlooked. Nabeel et al. (2010) also reported that the combined costs of the ICT equipment and maintenance cost are too high, hence a major challenge for the government funding of ICT projects in all the parastatals in Kenya. The costs also include monthly rates for internet connection and satellite television charges. Therefore, funding can affect the implementation of ICT projects in Kenyan parastatals.

Training and Implementation of Public ICT Projects

Government services were traditionally provided manually using paper-based methods. However, most have gone digital with electronic systems currently used in government institutions for various purposes. This transformation implies that people working in these institutions should have the basic knowledge of ICT to remain relevant. Nabeel et al. (2010)

noted that, unlike advanced economies such as the US and the UK, African nations still lag in the integration of computers in the system of education, which widens the knowledge and digital divide between students in the regions. According to Van Volkom et al. (2014), training could help to reduce these gaps. This can be achieved through hybrids aware of the local needs and capacities to improve success rates. Nevertheless, Ponelis and Holmner (2015) lamented that there are no schemes for developing hybrids during ICT training, thus hampering improvisation.

Besides, participative approaches to implementation, such as end-user involvement and group working, must be carefully considered since most available systems have been designed for developed nations. The case of an end-user development initiative for health IS in South Africa and Mexico's General Hospital are notable examples of a lack of training in ICT techniques and failure to implement public projects. There were significant gaps between the design assumptions, requirements, and actual ICT needs of the organizations. Therefore, it was concluded that these implementations failed due to the abovementioned factors and not necessarily because of wrong participative design. Mose et al. (2013) also noted that the project team must be trained on applying and using the hardware and the software as the low human capacity to manage public IT projects can derail the project's success. Thus, training is a critical factor in ICT project implementation.

Government Policy and Implementation of Public ICT Projects

As in other sectors controlled by the government, the implementation of ICT projects is governed by government policies. By definition, a policy is a commitment statement by a government or organization to undertake a particular program directed towards achieving specific goals. Usually, the policies governing ICT implementation in public bodies are formulated in different stages. Some of the goals of such policies include but are not limited to making an individual develop an intellectual, emotional, physical, and spiritual domain; providing opportunities for government employees to develop their special abilities and strengths; demonstrating learning to give equal access for employees to learn with computers and to involve all stakeholders in the ICT implementation process, such as the community and private sector; and to produce thinking working team, which is technically literate.

Tarus et al. (2015) noted that there is no enthusiasm when it comes to decision-making during policy implementation. The policymakers tend to be less enthusiastic, especially when embarking on ICT projects in the public sector in Kenya. In addition, there is a low investment in technology with corporate restructuring, corporate integration, and technological innovation policies in the private and public sectors. Therefore, inadequate policy negatively influences the implementation of ICT government projects such as land demarcation and registry.

Moreover, policies governing ICT are still lacking in many low-income countries, particularly in the sub-Saharan region. Appropriate strategies are being undertaken to address these deficiencies, including inculcating ICT within the education curricula. For example, the government of South Africa adopted a policy of introducing ICT into the educational system

of South Africa to address the several socio-economic and educational problems facing the country and enhance the adoption of ICT projects in public institutions (Matavire et al., 2010). Kenya has also made outstanding progress in the promulgation of the ICT policy framework and the implementation of the strategic plan, which has been reported to be complete with measurable time frames and outcomes. However, the existing policies play a dismal role in project implementation due to bureaucracy, stringent standard operating procedures, and inadequate ICT capacity in the institutions. Further, the government lacks the enthusiasm to advance policies that promote quality assurance and accountability, reducing checks and balances on corruption and misappropriation of government resources. Sandeep and Ravishankar (2014) also noted that politics influences the introduction of new technology. Due to the significant role played by the government in shaping the policy environment that influences the performance of ICT, its evaluation within the context of ICT projects is warranted.

RESEARCH METHODOLOGY

Research Design

This quantitative study utilized a cross-sectional design to explore the factors influencing the implementation of ICT projects in parastatals in Kenya. Cross-sectional designs allow data collection and examination of relationships between the study variables at one point in time, and they are relatively cheap and faster compared with prospective studies when used in surveys (Sedgwick, 2014). Moreover, the findings from cross-sectional surveys could be used to make inferences useful in policymaking, planning, monitoring, and evaluation purposes or research to generate a new hypothesis for investigation (Paradis et al., 2016). These benefits of cross-sectional surveys justify the design selection for this study.

Population of the Study

This study included Kenyan parastatals with ongoing or recently completed ICT projects. In total, there are 198 parastatals distributed across the 21 ministries of the Kenyan government and the Office of the Attorney General (The National Treasury & Planning, 2019). The parastatals are broadly grouped into eight groups based on their core functions: regulatory, financial, commercial/manufacturing, service, public universities, training and research, tertiary education and training, and regional development authorities (Inspectorate of State Corporations, *n.d.*). The IT personnel from these parastatals were selected to participate in the study due to their expertise and involvement in the planning and implementation of public ICT projects; hence they have a better understanding of the subject. To obtain better insights into the factors affecting the ICT implementation process, the personnel must have worked within the concerned parastatal for at least one year.

Sampling Procedures and Sample Size

According to Rahi (2017), sampling is critical in quantitative research because it promotes the collection, processing, and analysis of sufficient data from a representative sample of the

targeted population to make statistical conclusions. Sampling is usually desirable when the population of interest is too large, rendering it impractical to survey the whole population (Lohr, 2019). As such, Patten and Newhart (2017) defined sampling as selecting study units (samples) from a population of interest. These units may include people or organizations that are studied, and the findings generalized to the population. This process of participants' selection can be done using probability or non-probability techniques. This study utilized purposive sampling to select 50% of the total population, i.e., 99 parastatals, because some parastatals had not implemented ICT projects while others had been newly created. Only one respondent (IT officer or manager) in each parastatal was selected; hence the total sample size was 99.

Data Collection Instrument

The data for the study were collected using a structured survey questionnaire. The questionnaire approach was employed for three main reasons. First, questionnaires allow the collection of quantitative data that can be easily analyzed to draw statistical inferences (Jones et al., 2013). Second, they could be used to collect data from a relatively large number of respondents cost-effectively. Third, they promote the anonymity of data, which is an important ethical consideration in research.

The questionnaire was developed in line with the research aim and objectives to evaluate the factors influencing the implementation of public ICT projects in parastatals in Kenya. It consisted of three sections beginning with the consent form requiring the participants to provide consent to participate in the study. The next section had nine questions on respondents' demographic characteristics, including age, gender, level of education, job position, parastatal name, length of time in years working in the parastatal, and level of computer training. In the final section, 34 items were included to measure the five constructs, namely IT, funding, training, government policy and ICT implementation. Each measurement item was rated on a 5-Likert scale of 1 – strongly disagree to 5 – strongly agree.

Validity and Reliability of the Instrument

Zohrabi (2013) cautioned that care should be taken when questionnaires are used to collect data because their validity and reliability could be affected by several factors, such as the technique employed in data collection and the contextual nature of the questions. Validity refers to how a research test represents the reality it is supposed to measure. On the other hand, reliability is the ability of a research tool to produce stable and consistent results. In this study, the validity of the questionnaire was determined by seeking experienced researchers' opinions on the wording and order of the questions to minimize ambiguity and bias. The pilot study with respondents from two randomly selected parastatals was used to test the reliability of the research tool. This helped to address the issues of clarity and suitability of questions by checking that the respondents could understand and answer them appropriately and establishing the internal consistency of the subscales using Cronbach's alpha.

Data Collection Procedures

The data were collected using a web-based approach and “drop and pick” method. In the first approach, the questionnaire was uploaded to google forms and sent to respondents for filling and returning. The second approach involved distributing the questionnaires and picking them up later from the respondents. This was applied to respondents who could not complete the questionnaire via the first method. Due to the COVID-19 pandemic restrictions when the study was conducted, the data collection period was prolonged to five months (June – November 2021) to provide enough time to reach out to all participants. Prior to data collection, the necessary approvals, including ethics approval from the Kenyatta University Review Ethics Committee, National Commission for Science, Technology & Innovation (NACOSTI) and the relevant heads within the parastatals surveyed, were obtained. Written informed consent was also obtained from the participants to protect their rights and autonomy. The participants were also apprised of the study’s purpose, importance, and associated risks and benefits of participation. The voluntary nature of the participation and freedom of withdrawal at any point of the study without any consequences was also communicated to the participants. The data were collected anonymously and stored in a secure place only accessible to the researcher to ensure the protection of data confidentiality and security.

Data Analysis Techniques

The collected data from both the google forms and “drop and pick” methods were exported/entered into Microsoft Excel, cleaned, and analyzed using STATA version 16. Data were analyzed using both descriptive and inferential statistics. The descriptive analysis was used to present the sample’s socio-demographic factors. This was followed by multivariable linear regression analysis to determine the relationship between the variables. Before fitting the multivariable models, a mean level of agreement score was calculated from the implementation factors scores of the five variables that assessed the implementation of ICT projects, that is, timeliness of implementation, system functionality, intended benefits achieved, implementation within budget, ICT improves service quality and the overall satisfaction with implementation. This variable was used as the dependent variable in all the models. Then, four multivariable linear regression models were fitted. Model 1 included age and gender as the socio-demographic variables and the other factors as distinct scores for each question. Model 2 excluded age and gender from Model 1. For Models 3 and 4, the scores for ICT, funding, government policy, and training factors were also aggregated to produce the mean score for each factor. Then, Model 3 included age and gender, whereas Model 4 excluded age and gender. Adding factor-level variables in the model helps control for more specific effects within the model for appropriate deductions of estimates. Failure to account for such factors could lead to the deduction of biased estimates (Yan et al., 2020). These models were fitted to identify the effect of the factors separately and as aggregates for making conclusions about the effect of ICT, funding, government policy and training factors. The regression analysis values, including the number of observations and log-likelihood, p-values, odds ratios and 95% confidence intervals, were presented to help understand the relationship between dependent and independent variables. This was based on the following model:

$$Y = \beta + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + e \text{ where;}$$

Y = ICT implementation,

β = constant,

b_1, b_2, b_3 and b_4 = regression co-efficient,

X_1 = information technology,

X_2 = funding,

X_3 = training,

X_4 =government policy factors,

e = error term

The significance of the value was set at $p < 0.05$.

The confounding variables, including age and gender, were included in the regression model and excluded to comparatively evaluate the effects of each of the models on the outcome. Subsequently, these models were defined to yield more robust relationships between the dependent and the outcome variables.

RESEARCH FINDINGS

Socio-demographic Characteristics

Of the 99 questionnaires distributed, 85 were completed and returned by the respondents, resulting in a response rate of 86%. The majority of the respondents were males (69%), had at least an undergraduate degree (78.2%) and had worked at their parastatal for 1-5 years (62.1%). Additionally, the majority of the respondents (92%) were from the parastatals in Nairobi County. Most respondents were aged 31-40 years (47.1%) and were ICT managers (48.3%). Moreover, the respondents reported that 93.4% (n = 84) of ICT projects were recently completed, and no ICT project was at the inception stage. Table 1 shows the socio-demographic characteristics of the participants.

Table 1. Socio-demographic characteristics

Socio-demographic characteristics		Frequency (N)	Percent (%)
Age (years)	20 to 30	33	37.9%
	31 to 40	41	47.1%
	41 to 50	11	12.6%
	>50 years	2	2.3%
Gender	Male	60	69.0%
	Female	27	31.0%
Level of education	Certificate	3	3.4%
	Undergraduate degree	68	78.2%
	Postgraduate degree	16	18.4%
	Kisumu	5	5.7%

Socio-demographic characteristics		Frequency (N)	Percent (%)
County location of the parastatal	Machakos	1	1.1%
	Mombasa	1	1.1%
	Nairobi	80	92.0%
	Eldoret	0	0.0%
Job position/role	Database Manager	14	16.1%
	ICT Officer	31	35.6%
	ICT Manager	42	48.3%
Length of experience	1 to 5 years	54	62.1%
	6 to 10 years	22	25.3%
	11 to 15 years	9	10.3%
	16 to 20 years	0	0.0%
	>20 years	2	2.3%
Training in computer	Yes	87	100.0%
	No	0	0.0%
ICT implementation in the parastatal	Yes	87	100.0%
	No	0	0.0%
Stage of ICT project in the parastatal	Ongoing	5	5.7%
	Completed	82	94.3%

4.2 IT Factors Influencing the Implementation of Public ICT Projects

Regarding IT factors influencing the implementation of ICT in parastatals in Kenya, there was a high agreement level with various items. The majority of the respondents agreed with the statements that the ICT systems ‘improve personnel work efficiency and productivity’ (97.7%), ‘improve communication and effectiveness of work’ (97.7%), ‘provide quality in terms of reliability, availability, flexibility, integration, and response time’ (77.02%), and ‘are easy to use’ (63.22%). At the same time, the majority of the respondents indicated an agreement that the ICT systems ‘need regular maintenance’ (98.85%), ‘are affected by poor power reliability, internet access and networking’ (83.91%), and ‘pose security challenges to institutional data’ (57.47%). However, less than half of the respondents (41.38%) indicated that the parastatals lacked sufficient ICT infrastructure. Table 2 shows the results for ICT factors influencing implementation.

Table 2. ICT factors influencing implementation

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
ICT systems improve personnel work efficiency and productivity	1 (1.15 %)	0 (0 %)	1 (1.15 %)	21 (24.14 %)	64 (73.56 %)
ICT systems improve	1 (1.15%)	1 (1.15%)	0 (0%)	24 (27.59%)	61 (70.11%)

communication and effectiveness of work					
ICT systems are easy to use	6 (6.9%)	12 (13.79%)	14 (16.09%)	23 (26.44%)	32 (36.78%)
ICT systems provide quality in terms of reliability, availability, flexibility, integration, and response time	1 (1.15%)	1 (1.15%)	18 (20.69%)	24 (27.59%)	43 (49.43%)
ICT systems are affected by poor power reliability, internet access and networking	0 (0%)	4 (4.6%)	10 (11.49%)	35 (40.23%)	38 (43.68%)
There is lack of IT infrastructure (including hardware and software) in our parastatal	7 (8.05%)	17 (19.54%)	27 (31.03%)	24 (27.59%)	12 (13.79%)
ICT systems need regular maintenance	0 (0%)	0 (0%)	1 (1.15%)	13 (14.94%)	73 (83.91%)
ICT systems pose security challenges to institutional data	3 (3.45%)	13 (14.94%)	21 (24.14%)	31 (35.63%)	19 (21.84%)

Funding Factors Influencing the Implementation of Public ICT Projects

The majority of the respondents indicated that it was expensive to implement ICT projects within their parastatals (79.31%). However, only a few of the respondents stated that there was an adequate budget to support the implementation of the projects (24.14%), as most of the respondents (40.23%) disagreed that the ICT projects implemented in their parastatal were completed within the set budget with only 29.89% agreeing with the statement. Few respondents also agreed that there were adequate funds for ICT project implementation in the parastatals (37.93%), and the amounts allocated for ICT projects were disbursed within the required time (22.99%). Moreover, less than half of respondents (47.12%) reported adequate financial assistance from the government and donors to implement ICT projects in the parastatals fully. More than half of the respondents were unaware whether their parastatal had adequate cost-benefit analysis tools (51.72%). Table 3 shows the results for funding factors influencing implementation.

Table 3. Funding factors influencing implementation

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
It is expensive to implement ICT projects in our parastatal	2 (2.3 %)	7 (8.05 %)	9 (10.34 %)	36 (41.38 %)	33 (37.93 %)
We have adequate budget for ICT projects implementation in our parastatal	9 (10.34%)	21 (24.14%)	36 (41.38%)	17 (19.54%)	4 (4.6%)
My parastatal has adequate cost benefits analysis tools	0 (0%)	16 (18.39%)	45 (51.72%)	25 (28.74%)	1 (1.15%)
We have adequate funds for ICT projects implementation in our parastatal	6 (6.9%)	18 (20.69%)	30 (34.48%)	21 (24.14%)	12 (13.79%)
There is adequate financial assistance from the government and donors to fully implement ICT projects in our parastatal	6 (6.9%)	10 (11.49%)	30 (34.48%)	29 (33.33%)	12 (13.79%)
Amounts allocated for ICT projects in our parastatal are disbursed within the required time	4 (4.6%)	20 (22.99%)	43 (49.43%)	16 (18.39%)	4 (4.6%)
The ICT projects implemented in our parastatal were completed within the set budget	4 (4.6%)	31 (35.63%)	26 (29.89%)	24 (27.59%)	2 (2.3%)

4.4 Training Factors Influencing the Implementation of Public ICT Projects

The majority of the respondents agreed that their staff were adequately trained on ICT use (80.46%) and could apply the ICT knowledge gained after training (86.20%). Moreover, the staff were involved in the ICT implementation process (90.81%), and they received adequate management and technical support during the ICT project implementation process (66.67%).

Established IT support departments were also reported (94.25%), and ICT user manuals were available to the staff for reference (90.8%). However, less than half of the respondents (41.38%) agreed that the institutions had sufficient staffers with ICT-specific training. Table 4 shows the results for training factors influencing implementation.

Table 4. Training factors influencing implementation

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Our staff are properly trained on ICT use	2 (2.3 %)	2 (2.3 %)	13 (14.94 %)	34 (39.08 %)	36 (41.38 %)
Our staff are involved in the ICT implementation process	1 (1.15%)	2 (2.3%)	5 (5.75%)	40 (45.98%)	39 (44.83%)
ICT user manuals are availed to our staff for reference	0 (0%)	3 (3.45%)	5 (5.75%)	50 (57.47%)	29 (33.33%)
Our staff are able to apply the ICT knowledge gained after training	1 (1.15%)	0 (0%)	11 (12.64%)	46 (52.87%)	29 (33.33%)
We have IT support department	0 (0%)	1 (1.15%)	4 (4.6%)	15 (17.24%)	67 (77.01%)
We have adequate number of trained personnel on ICT issues	4 (4.6%)	20 (22.99%)	27 (31.03%)	29 (33.33%)	7 (8.05%)
We receive adequate management and technical support during the ICT project implementation process	1 (1.15%)	6 (6.9%)	22 (25.29%)	36 (41.38%)	22 (25.29%)

Government Policy Factors Influencing the Implementation of Public ICT Projects

Most respondents (52.87%) reported adequate ICT policies for ICT use and the use of the government institutional frameworks for ICT project implementation in their parastatals (56.32%). However, less than half reported that there was a favorable government policy for the implementation process (44.83%). Only 13.79% of the respondents agreed that they did not have appropriate tools for quality assurance, with more than half remaining neutral (58.62%). Moreover, most respondents remained neutral when asked whether the procurement rules and regulations for ICT projects implementation were inflexible and difficult to follow (42.53%), with 40.25% disagreeing with this statement and 17.24% agreeing. Similarly, only 13.8% of the respondents agreed that there were a lot of government bureaucracies in the implementation of ICT projects, as more than half (51.72%) remained neutral. Table 5 shows the results for government policy factors influencing implementation.

Table 5. Government policy factors influencing implementation

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
We have adequate policies in place for ICT use	8 (9.2 %)	17 (19.54 %)	16 (18.39 %)	29 (33.33 %)	17 (19.54 %)
There is a favorable government policy for ICT implementation	5 (5.75%)	20 (22.99%)	23 (26.44%)	33 (37.93%)	6 (6.9%)
We use the government institutional frameworks for ICT projects implementation in our parastatal	0 (0%)	1 (1.15%)	37 (42.53%)	31 (35.63%)	18 (20.69%)
We do not have appropriate tools for quality assurance	7 (8.05%)	17 (19.54%)	51 (58.62%)	10 (11.49%)	2 (2.3%)
The procurement rules and regulations for ICT projects implementation are inflexible and difficult to follow	8 (9.2%)	27 (31.03%)	37 (42.53%)	12 (13.79%)	3 (3.45%)
There is a lot of government bureaucracies in the implementation of ICT projects	11 (12.64%)	19 (21.84%)	45 (51.72%)	8 (9.2%)	4 (4.6%)

4.6 Implementation of Public ICT Projects

In terms of ICT implementation, the majority of the respondents agreed that the implemented ICT project had achieved its intended benefits (83.91%) and that the ICT system had improved the quality of services provided to clients (93.1%). However, less than half of the respondents indicated that the projects were not completed within the planned timeline (22.99%) and within the set budget (27.59%). Additionally, 49.42% of the respondents reported that the system implemented in their parastatals was functioning as it should with minimum problems. The

overall satisfaction with the implementation of ICT projects in the parastatals was 63.21%. Table 6 shows the results for implementation factors influencing implementation.

Table 6. Implementation of ICT projects

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The system implemented in our parastatal is functioning as it should with minimum problems.	4 (4.6 %)	13 (14.94 %)	27 (31.03 %)	33 (37.93 %)	10 (11.49 %)
The ICT project implementation in our parastatal was accomplished within the planned timeline.	3 (3.45%)	29 (33.33%)	35 (40.23%)	17 (19.54%)	3 (3.45%)
The implemented ICT project has achieved its intended benefits	0 (0%)	2 (2.3%)	12 (13.79%)	43 (49.43%)	30 (34.48%)
The project implementation was completed within the set budget.	2 (2.3%)	24 (27.59%)	37 (42.53%)	21 (24.14%)	3 (3.45%)
The ICT system has improved the quality of services we provide to our clients/end-users	0 (0%)	2 (2.3%)	4 (4.6%)	30 (34.48%)	51 (58.62%)
In overall, I am satisfied with the implementation of ICT project in our parastatal	0 (0%)	4 (4.6%)	28 (32.18%)	44 (50.57%)	11 (12.64%)

Regression Analysis

The multivariate linear regression analysis showed that ICT, funding, training and government policy factors were positively associated with the implementation of ICT projects. However, only training factors had a significant relationship with ICT implementation ($\beta = .26, p = 0.01$). Training factors also had the greatest effect on ICT implementation ($\beta = .26$), followed by government policy factors ($\beta = .09$), ICT factors ($\beta = .05$), and finally, funding factors ($\beta = .05$). Two individual ICT factors were also found to be significantly associated with ICT

implementation. They include improved work efficiency and productivity ($\beta = .34, p = 0.00$) and lack of IT infrastructure ($\beta = -.12, p = 0.02$). Table 7 shows the regression results.

Table 7. Multivariate linear regression results

Independent variable	Coefficients	95% CI	p-value
ICT factors	0.05	-0.32 – 0.42	0.78
Funding factors	0.04	-0.27 – 0.36	0.79
Training factors	0.26	0.01 – 0.52	0.04
Government policy factors	0.09	0.12 – 0.30	0.42
Adjusted R-squared = 0.099			
F-ratio = 2.18			
Number of observations = 87			

Discussion

This study examined the factors influencing the implementation of public ICT projects in parastatals in Kenya. The study identified that various aspects related to ICT, funding, training and government policy impact ICT implementation. The ICT factors can be categorized into two main groups: benefits and challenges associated with the ICT systems. Concerning the benefits, there were high agreement levels with statements such as improved personnel efficiency and productivity, which suggests that the expected benefits of ICT systems can facilitate the implementation of ICT projects in parastatals. In contrast, the perceived challenges, such as increased vulnerabilities to data breaches, the need for regular maintenance, and poor power reliability and internet access, can hinder the implementation. For example, regular maintenance may increase maintenance costs, making the sustainability of the implemented projects difficult. However, the high agreement levels with challenges indicate that they are common problems associated with ICT systems, with the need for regular maintenance plausible given the need for continuous updating of software and hardware components. Some challenges, such as poor power reliability and internet access, are unique to the Kenyan context. Previous studies have also shown that connectivity and low internet access are significant challenges to the implementation of ICT projects in public sectors in African countries, including Kenya (Cheremshynskiy & Byamugisha, 2014; Tarus et al., 2015). However, the low agreement level with the lack of adequate IT infrastructure in this study indicates that most Kenyan parastatals have sufficient infrastructure for ICT implementation. The major IT infrastructure that determine the success of public IT projects may include hardware and software, including the number of available computers and appropriate software (Agravāla, 2010). In general, the findings suggest the need to address the challenges to increase the implementation of ICT projects in Kenyan parastatals to fully realize the intended benefits.

The funding factors influencing ICT implementation were related to the cost and budgetary considerations. One of the main findings was that it is expensive to implement ICT projects which could be associated with the cost of IT infrastructure, including equipment and internet.

The high costs can constrain the rate at which the projects are initiated and implemented. This problem is coupled with inadequate budgets and funds for ICT implementation, as indicated in this study. Although the donors and government also provide finances for the implementation of ICT projects in Kenyan parastatals, donor funding may not be reliable as donors are usually driven by goodwill. Therefore, relying on donor funding for financial assistance may present significant risks to implementing ICT projects. The results also showed delayed disbursements of funds allocated for ICT projects, which may result in project delays and increased costs. Indeed, it was also found that most of the projects were not completed within the set budget. Nebeel et al. (2010) indicated that failure to complete projects within the stipulated timelines could result in budget overruns. Budget overruns could also be linked to corruption that leads to misappropriation of resources and inflated project costs. Therefore, corruption-preventive measures such as monitoring and proper accountability should be instituted to avoid corruption and ensure appropriate utilization of funds. Overall, addressing the challenges of budgetary and time constraints in ICT project implementation requires that funds are adequately mobilized and allocated before commencing the projects. The cost-benefit analysis should also be conducted using appropriate tools, which were reported inadequate in the parastatals.

The study also identified training factors as crucial determinants of the implementation of ICT projects in Kenyan parastatals. These encompass proper training of the staff on ICT use and providing adequate technical and managerial support during the implementation process. Training enhances the staff's IT knowledge and skills essential in the project design, implementation, and monitoring stages. IT support departments are crucial in supporting staff and ICT implementation in the parastatals. The availability of user manuals for reference can also promote implementation. In addition, the implementation of ICT projects in Kenyan parastatals seems to be boosted by staff involvement in the ICT implementation process. However, the lack of adequately trained personnel to spearhead IT projects could present a significant challenge to ICT implementation in Kenyan parastatals. It suggests that the training objectives might be adversely affected and impede the optimal application of the system. In addition, a lack of trained ICT personnel may lead to over-reliance on outsourced personnel, which can substantially increase the implementation costs to the organizations. Therefore, the availability of ICT-trained personnel remains a concern for most parastatals in Kenya. Adequate training is necessary to equip teams with these essential skills and knowledge for ICT project implementation. Indeed, the Kenyan government has identified training as a continuous need for increased adoption of ICT, thus introducing training in the education curriculum.

Finally, the government's role in ICT implementation revolved around the policies on the implementation and procurement of ICT infrastructure. Most respondents reported that there are adequate policies for ICT use and they adopt the government policy frameworks to implement ICT projects. However, only a few of these respondents noted that these policies and frameworks were favorable for the implementation process. This finding suggests that the existing ICT implementation frameworks and policies do not support the implementation process sufficiently. Thus, there is a need for minimal government bureaucracies in the implementation of projects and relatively flexible and easy-to-follow procurement rules and

regulations. Moreover, there should be sufficient and appropriate tools for quality assurance, including guidance for the management on the ongoing implementation efforts to increase accountability (Tarus, 2015).

Of the four factors of ICT implementation, only training was significantly associated with the implementation. This finding suggests that training is a significant determinant of ICT implementation in parastatals. Training can help increase employees' capacity to adopt and use ICT. Cognizant of this role, the Kenyan government has proliferated ICT learning in the school curriculums for future advancement in ICT utilization in its institutions (Volkom et al., 2014). This initiative would help address the lack of sufficient ICT capacity in parastatals in Kenya required to advance institutional goals and performance. However, other factors, including ICT, funding and policy, can also facilitate or hinder the implementation of ICT projects; thus, they should be adequately addressed for successful implementation.

Conclusions

This study has highlighted four critical factors associated with the implementation of ICT projects in Kenyan parastatals. First, ICT-related factors that encompass benefits and challenges such as improved efficiency and quality, data security, maintenance, and internet issues. Second, funding factors mainly include budget constraints that affect the cost and timelines of the implementation of ICT projects. Third, training is critical in advancing employee knowledge and skills to implement and operate ICT systems. It was also noted that ICT-trained personnel must be available to spearhead the projects. Finally, the Kenya government has also implemented various policies to support and regulate ICT adoption in Kenya. However, the existing policies are unfavorable for project implementation due to bureaucracy, inflexible rules, inadequate ICT capacity in the institutions, and lack of accountability. Overall, the related challenges should be adequately addressed to successfully implement ICT projects and realize their full potential in parastatals in Kenya.

Recommendations

This study provides various recommendations for the implementation of ICT projects not only in parastatals in Kenya but also in institutions in similar settings, especially the low-income countries. First, the government should emphasize establishing and revamping ICT infrastructure, starting with internet connectivity and electricity in inaccessible areas, as they are essential for the implementation of ICT projects across parastatals. Second, government and parastatals planning to implement ICT projects should ensure they have all the required funds at the start of ICT projects or a clear plan of fund flow earmarked explicitly for the project to enable completion as one key challenge highlighted in this study was the lack of adequate funds to complete tasks. Additionally, there is a need to invest in training ICT staff before introducing ICT projects. The training will provide the required skills and knowledge for the implementation of new ICT projects in public institutions. Further, due to evolving ICT innovations, project-based training is not sustainable in the long run. There is a need to anticipate the most recent changes and train staff continues to increase efficiency and currency

in the human resource sector. The government should also develop policies that are favorable to the implementation of ICT projects. The study also determined that policies around quality assurance were profoundly lacking among several parastatals. Therefore, the study recommends that policy experts devise robust monitoring and evaluation frameworks that help sustain accountability and value.

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