EFFECT OF ICT INFRASTRUCTURE INVESTMENT ON THE PERFORMANCE OF PUBLIC SECTOR: A CASE OF NGORONGORO CONSERVATION AREA AUTHORITY

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Abstract
This study sought to determine the effect of ICT infrastructure investment on the performance of public sector with special focus to Ngorongoro Conservation Area Authority as case study. This research was guided by Barney's Resource Based View theory. A descriptive research design was used by the researcher. Population of this study included employees of NCAA. Due to the time constraints of this study, the sample size of 110 respondents was selected using a simple random sampling method. Questionnaire was used to obtain primary data while secondary data on the effectiveness of ICT investment in the public sector was utilized in the documentary review. The researcher used the SPSS to evaluate data from questionnaires using both descriptive and inferential statistics. Study findings indicated a positive correlation between ICT Infrastructure and public sector performance The study recommends that studies should be done on the challenges hindering the ICT investment in public entities in Tanzania. Further, the effectives of other ICT investments variables such as ICT policy and regulations and its effect public sectors performance should be researched.

Keywords: ICT Infrastructure, Investment, Public Sector, Performance

1.0 Introduction

With the changing work environment in the era of technological advancements, ICT's function in boosting firms' competitiveness in their sectors has grown more essential (Allison 2016). As a result, firms are expanding their ICT investments, and, as the economy continues to deteriorate, management requires ICT not just to save money but also to influence business outcomes. Given this pressure, several initiatives have been undertaken to assess IT expenditure from a commercial standpoint (Noor 2022).

Globally, significant investments in ICT over the last two decades have inspired numerous scholars to study its economic consequences, particularly the role of ICT in enhancing productivity, supporting economic growth, and decreasing poverty (Abiye 2019; Kontoh 2020). Most studies in the sector have suggested that information and communications technology is a major aspect in the economic and social development of the countries since it has beneficial impacts on economic growth, productivity, and employment (Baldwin et al. 2018; Bethapudi 2019). (Baldwin et al. 2018; Bethapudi 2019). Furthermore, international institutions such as the United Nations, the International Telecommunications Union, the OECD, and the World Bank contend that the ICT sector is a critical driver of long-term growth. According to a World Economic Forum (2017) research, a 10% rise in a country's digitalization would result in a 0.75 percent boost in GDP per capita and a 1.02 percent decline in the unemployment rate. According to the OECD (2020), information and communication technology has a significant role in poverty reduction by generating new sources of income and jobs. However, it is also possible to reduce the cost of impoverished people's access to health and education services.

In Africa, ICT investments are critical for economic growth due to the following reasons: the use of this technology allows many actors in economic and social life to have rapid and simple access to information and knowledge (Sepehrdoust2018); ICT investments help African governments and businesses to interact more quickly and effectively, lowering manufacturing costs and increasing output. ICT investments also allows access to new markets, lower capital costs as a result of increasing the efficiency of the functioning of financial markets, reduces regional discrepancies in incomes and productivity, allows access to human capital through tele-networking (Pradhan et al. 2018); the use of ICT, in particular,

Internet access, can promote the sustainable development of entrepreneurship and small and micro businesses because it reduces the difficulty of financing them by mitigating information asymmetry and reducing agency cost (Chen et al. 2018). According to Roller and Waverman (2019) ICT investments influence economic growth through several significant channels, namely: the production of goods and services within the ICT sector directly contributes to the creation of value-added goods and services in the economy. The use of ICT goods and services as inputs in the production of other goods and services; increased productivity in the ICT sector leads to increased overall productivity of the economy; and the use of ICT in other sectors of the economy adds to improved efficiency and productivity (World Bank 2020).

In East Africa, investment in ICTs has provided governments with a strategic edge that has boosted their competitiveness. East African nations benefit from ICT investments in terms of useful information, more knowledge, improved performance, improved e-relations, and increased production (Bethapudi 2019; Jose-Moyano 2017). East African countries have used ICT to gain an advantage over their competitors. There is substantial evidence that ICT is a driver of economic growth by lowering manufacturing and transaction costs and assisting in market expansion through e-advertising, which saves time (Moslavo 2017).

Tanzania's government has made a number of efforts to diversify the economy in order to ensure long-term prosperity, one of which is to turn Tanzania into a digital society. Tanzania's economy benefits significantly from ICT investment (Caldeira and Ward 2020). ICT investments have improved the dependability, interoperability, and interconnection of numerous terminals and applications. ICTs are a significant tool for promoting economic progress (Sarmiento 2019). Despite the fact that technology has assisted in lowering costs, improving operational efficiency, and improving services and customer experience. The effectiveness of ICT investment on the performance on Ngorongoro Conservation Area Authority is not known. As a result, it was critical to assess the relationships between ICT investment and payout in order to identify ICT's contribution to the Ngorongoro Conservation Area Authority's performance.

Since governments spend so much money on ICT, researchers and practitioners are doing studies to better understand the link between ICT investments and performance. Despite the fact that scholars have been studying the influence of ICT investments on corporate performance for over a decade, results are inconsistent (Chevers 2019). Some research discovered a favorable association between IT investments and performance, while others discovered a negative relationship, while several other studies found no relationship (Chron et al. 2020). To address this complex scenario, several ICT researchers have employed a more rigorous and scientific study framework; small sample datasets, integrating extra aspects such as a time lag, the industry's information intensity, new technique, and new theories (Lucchetti and Sterlacchini 2020). Reduced costs, enhanced quality, increased flexibility, improved customer happiness, higher productivity, and, eventually, higher financial performance is among the anticipated advantages of technology investments. Despite the NCCA's significant spending in ICT, a direct correlation between technology investment and advances in productivity and performance has remained elusive. The NCAA's performance is ineffective, as the trend of tourists has declined to 272,099 from 549,795 in the same quarter in 2019. (Statista, 2021). Therefore, the primary purpose of this study was to evaluate the effectiveness of ICT investment on the performance of public sector particularly Ngorongoro Conservation Area Authority.

2.0 Literature Review

2.1 Resource Based View Theory

This research was guided by Barney's Resource Based View theory (1991). According to Barney (1991), a business is a combination of physical capital resources, human capital resources, intellectual capital resources (skills and knowledge), and organizational resources. The key premise of the resource-based perspective is that organizational resources and competencies can differ greatly between organizations and that these disparities can be durable. The most extensively utilized theoretical perspective in the link between ICT investment and corporate success is the Resource Based View hypothesis (Abdelkader & Abed, 2016; Breznik, 2012). According to the RBV, firm performance results from the development and use of distinctive, valuable, inimitable, and non-substitutable resources (Barney 1991; Wernerfelt, 2011). A corporation may earn an above-average return by identifying and purchasing technological resources that are vital to markets and therefore strategic, and such strategic resources, according to the RBV, are critical components of long-term competitive advantage. The RBV evolved into a valuable instrument for investigating the value of ICT investment and its link to company performance, and as a result, many researchers have acknowledged the importance of RBV in IT research (Wernerfelt, 2016). Using RBV theory in NCAA, it was possible to establish whether an ICT investment is a source of firm performance.

2.2 Empirical Literature Review

Due to the role that IT plays in increasing the value of services offered and the increased involvement of IT in the development and implementation of service industry firms' strategy, services-based industries were shown to have a higher payoff from IT investment than firms in the manufacturing industry (Amiy 2021). Toader (2018) examines the impact of ICT infrastructure on economic development in European Union (EU) nations during an 18-year period (2000–2017). We analyze experimentally, using panel-data estimate approaches, how various measures of ICT infrastructure impact economic growth, as proxied in our study by GDP per capita. We have incorporated certain macroeconomic control factors in the estimates. The results show that utilising ICT infrastructure has a positive and large influence on market expansion and economic growth in EU member countries, although the amount of the benefit varies depending on the type of technology studied. In terms of the influence of macroeconomic determinants, our estimations show that the inflation rate, unemployment rate, trade openness, government spending, and foreign direct investments would all have a considerable impact on GDP per capita at the EU level. The findings are largely consistent with the theoretical expectations, as well as with the findings of certain pertinent empirical research. According to findings, ICT infrastructure, together with other macroeconomic determinants, is a significant driver of economic development in EU nations.

Ji, Yan and Yu (2020) sought to investigate the impact of information technology (IT) investment on overall firm financial performance in a developing nation, China. This research uses a sample of 229 IT investment announcement data from Chinese listed businesses between 2011 and 2015 to analyze the influence of IT investment on company financial performance using the approach described by Barber and Lyon to create the control group. The financial advantages of various IT projects are uneven, according to the report. The findings indicate that companies investing in IT can significantly enhance customer service, organizational management and improve profitability during both the implementation and post-implementation periods for the entire sample, improve solvency

only during the implementation phase, improve growth ability after implementation time, but cannot reduce business costs in all periods. Simultaneously, the authors discover that, when compared to non-innovative IT investment. Furthermore, with the exception of the profitability financial indicator, the novel samples do not achieve higher financial performance.

Kwon (2017) discovered a direct positive relationship between IT investment and firm performance (firm growth, market completeness, customer relationships, provider partnerships, operational efficiency), after controlling for the role of the chief information officer (CIO), mobile technology adoption, IT support and maintenance, and IT outsourcing.

3.0 Methodology

Research design is essential because it allows for the smooth navigation of the many research activities, making research as efficient as possible and producing optimal knowledge with little effort, time, and resources. A descriptive research design was used by the researcher. This study was conducted at Ngorongoro Conservation Area Authority in Tanzania which is amongst public sector. Furthermore, the Ngorongoro Conservation Area Authority is chosen because the researcher wants to make recommendations that would assist the organization in determining ICT investments that are beneficial to its development and performance while attaining millennium goals such as Vision 2030.

The researcher picked 150 employees of NCAA to satisfy the study's objectives because he felt they have significant expertise that can be used to tackle the problem under inquiry. Responders were chosen using a simple random sampling method. Due to the time constraints of this study, the sample size of 110 respondents was used so that the questionnaire may be administered simply. Hereunder is the formula used to compute this sample:

$$n = \frac{N}{1+N.e^2} = n = \frac{150}{1+150.e^2} = 110$$

Where n = number of samples, N = total population; e = standard error of sampling (5%) is tolerated.

A questionnaire was used to obtain primary data. The questionnaire contained an assessment of predictors. The constructs of ICT infrastructure was drawn from previous literature studies and was adjusted to match the context of ICT investment. Secondary data on the effectiveness of ICT investment in the public sector was utilized in the documentary review. After the data collection is completed, the researcher used the Statistical Package for Social Sciences to evaluate data from questionnaires using both descriptive and inferential statistics. To describe the data, descriptive statistics such as frequencies, percentages, mean, and standard deviation was employed. In addition, inferential statistics such as multiple regression and Pearson correlations analysis was used in the study.

4.0 Findings

The respondents were given 110 questionnaires, and all 110 of them were returned and analysed, reflecting a 100% response rate. This response rate was deemed excellent and representative, allowing the findings to be generalized.

4.1 ICT infrastructure investment

Based on the mean values, the five-point scale ranges are as follows: mean scores of less than 1.5 = no extent; 1.5 - 2.5 = little extent; 2.5 - 3.5 = moderate extent; 3.5 - 4.5 = large extent; 4.5 - 5 = very large extent. The study intended to determine the effect of ICT infrastructure investment on the performance of public sector. The results are presented in the table 1 below;

Table 1: ICT infrastructure investment

	N	Mean	Std. Deviation
ICT Infrastructure improve customer service	110	4.3	1.3
ICT Infrastructure improve the storage of organizational data	110	4.2	1.3
ICT Infrastructure improve mechanisms for managing organizational innovations	110	3.6	1.3
High speed internet network increases the organization performance	110	4.1	1.2
ICT Infrastructure improve safety of internet security	110	3.9	1.3
ICT Infrastructure improve organizational marketing process	110	4.1	1.2
ICT Infrastructure improve sharing of information and communication	110	3.9	1.4
COMPOSITE MEAN		**4.01**	

To the large extent, respondents proclaimed that ICT Infrastructure improve customer service (Mean = 4.3, SD = 1.3), ICT Infrastructure improve the storage of organizational data (Mean = 4.2, SD = 1.3) and ICT Infrastructure improve mechanisms for managing organizational innovations (Mean = 3.6, SD = 1.3). The Ngorongoro Conservation Area Authority's ICT infrastructure enables them to assist their customer service personnel regardless of their location. The correct technologies are implementable across a number of devices and collaboration platforms, whether staffing a call center or supporting a globally scattered workforce. Eliminating communication barriers improves the overall office environment by allowing internal concerns and inquiries to be handled quickly.

To the large extent, respondents proclaimed that high speed internet network increases the organization performance (Mean = 4.1, SD = 1.2) and ICT Infrastructure improve safety of internet security (Mean = 3.9, SD = 1.3). Slow loading times for the workers' applications while completing their everyday responsibilities will arise from a poor or slow internet connection. A fast and dependable internet connection will also allow employees to multitask on various programs at the same time.

To the large extent, respondents decreed that ICT Infrastructure improve organizational marketing process (Mean = 4.1, SD = 1.2) and ICT Infrastructure improve sharing of information and communication (Mean = 3.9, SD = 1.4). Desktop computers, laptops, and

tablets, fixed and mobile telephone systems, communications networks, and software - even wearables - are examples of ICT infrastructure. The Ngorongoro Conservation Area Authority uses ICT Infrastructure to gain from cost savings, increased efficiency, better decision-making, and increased organizational competitiveness.

Table 2: One Way ANOVA for ICT infrastructure investment

ANOVA					
ICT Infrastructure					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2505.710	11	227.792	9.515	.000
Within Groups	2346.144	98	23.940		
Total	4851.855	109			

A further analysis was conducted to understand the categorical relationship between variables of this study. One Way ANOVA Model was used to test the significance of the relationship between the variables. The study decided to understand whether the ICT infrastructure investment shown relates to the performance of public sector. The analysis revealed that the P-Value is 0.000 ($p<0.05$); therefore, it suggests a significant relationship between the variables. Therefore, ICT infrastructure investment must be prioritized for the sake of improving performance of public sector.

4.2 Correlation Analysis

Person correlation was used to show if the correlation that exists between the dependent variable and independent variables of this study. Table 3 below presents the study. The finding on table 3 indicates a positive correlation ICT Infrastructure and public sector performance ($r = 0.795$).

Table 3: Correlations

		Public Sector Performance	ICT Infrastructure
Public Sector Performance	Pearson Correlation	**1**	
	Sig. (2-tailed)		
	N	**110**	
ICT Infrastructure	Pearson Correlation	**.795**	1
	Sig. (2-tailed)	**.004**	
	N	**110**	110

Source: Field Data (2022).

4.3 Regression Analysis

In this section, the results on model summary results, the analysis of variance (ANOVA) and the model coefficients are presented.

Table 4: Model Summary

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.788[a]	.673	.459	2.56778
a. Predictors: (Constant), ICT Infrastructure				

Table 4 shows R square which is also referred to as the coefficient of determination. It describes the change in dependent variable that is due to variation in independent variables. In the above table, R squared value was found to be 0.673, This depicts that variation of independent variable accounted for 67.3% of variation in public sector performance. Independent variable being: Infrastructure. R is the correlation coefficient and it explains the link between the independent and dependent variables an estimate of 0.78.8% depict a strong linear link among the dependent and independent variable.

Table 5: ANOVA

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	628.508	3	209.503	31.774	.000[b]
	Residual	698.910	106	6.593		
	Total	1327.418	109			
a. Dependent Variable: Public Sector Performance						
b. Predictors: (Constant), ICT Infrastructure						

Source: Field Data (2022).

In the above table the effectiveness of ICT infrastructure investment on the performance of public sector have been shown using regression model. The results show that the ICT infrastructure investment is significant to explain the performance of public sector because the p-value of 0.001 is smaller than significance level value 0.05.

Table 6: Coefficients

Coefficients[a]								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.041	1.657		2.094	.000		
	ICT Infrastructure	.228	.055	.437	4.116	.000	.442	2.265
a. Dependent Variable: Public Sector Performance								

Source: Field Data (2022).

The regression equation ($Y = \beta O + \beta 1X_1 + \beta 2X_2 + \beta 3X_3 + \alpha$) was;

$$Y = 1.041 + 0.228X_1 + \alpha$$

The coefficient table implies that there is a significant relationship between ICT Infrastructure and public sector performance as it shows value is 0.000. The Tolerance Factor (VIF) was more than 0.1 (10%) while VIF was less than 10. This implies that, multi-collinearity among explanatory variables of this study was found to be no problem.

4.4 Discussion of Findings

ICT encompasses any digital technology that aids individuals, companies, and organizations in their use of information. It includes any electrical items that deal with digital information.

As a result, information and communication technology (ICT) is concerned with digital data storage, retrieval, and transmission. The study findings designated that ICT Infrastructure improve customer service, ICT Infrastructure improve the storage of organizational data and ICT Infrastructure improve mechanisms for managing organizational innovations. These findings correlate with Ji, Yan and Yu (2020) findings that IT investment significantly enhance customer service, organizational management and improve profitability. Customer service quality is a crucial distinction for firms. The Ngorongoro Conservation Area Authority may leverage ICT Infrastructure to provide its clients with faster responses and greater standards of service. This helps them to resolve issues swiftly and efficiently, increasing client satisfaction.

Security measures in information and communication technology are required to safeguard private information against unauthorized use, alteration, loss, or release. Findings showed that high speed internet network increases the organization performance and ICT Infrastructure improve safety of internet security. Similarly, Resource Based View Theory indicated that the technological resources are critical components for organizational long-term competitive advantage. Also, Amiy (2021) indicated that services-based industries were shown to have a higher payoff from IT investment than firms in the manufacturing industry. High-speed broadband internet for business will allow many persons to work online simultaneously. Even a small number of employees utilizing the internet may cause service to be hindered. Faster internet is critical for organizations like the Ngorongoro Conservation Area Authority, which has personnel that use many devices throughout the day.

To the large extent, respondents decreed that ICT Infrastructure improve organizational marketing process and ICT Infrastructure improve sharing of information and communication. Kwon (2017) likewise established a direct positive relationship between IT investment and firm performance (firm growth, market completeness, customer relationships, provider partnerships, operational efficiency). Also, Toader (2018) show that utilising ICT infrastructure has a positive and large influence on market expansion and economic growth in EU member countries. The Ngorongoro Conservation Area Authority benefits from simple access to huge worldwide information resources, as well as significant competitive expertise and consumer information that streamlines decision making. Social media marketing, search engine marketing, content marketing, affiliate marketing, e-mail marketing, and SMS marketing are examples of ICT-powered marketing channels.

5.0 Conclusion and Recommendations

This study concludes that ICT Infrastructure has positive relationship with public sector performance.

Given the continual growth in ICT investments, it is critical to understand what makes IT investment pay off. It is not so much about the ICT as it is about how the ICT is used to produce organizational performance. Ngorongoro Conservation Area Authority must prioritize what ICT investment will provide in terms of business outcomes, as well as discover a strategy to accelerate organizational performance by conquering the ICT contradiction. Ngorongoro Conservation Area Authority must assure the presence and availability of suitable physical infrastructures, qualified staff, and resources in order to get an actual return on ICT infrastructure investment. Aside from this, a public awareness campaign on the usage of ICT services must be organized. The study suggests that more research be conducted on the barriers to ICT investment in Tanzanian public entities. Furthermore, the effectiveness of other ICT investment factors such as ICT policy and regulations, as well as their impact on public sector performance, should be investigated. The

study also suggests that further research be conducted on ICT investments in the business sector and charitable organizations. A comparable research should be conducted, using data collected through interviews and observation. It is consequently advised that a research be done from the perspective of employees' use of information technology in their day-to-day activities.

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