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Effect of Project Infrastructure Capabilities on the Performance of it Projects; A Case of Rwanda Online Project in Bugesera District

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Abstract: ***Information technology (IT) management capabilities have been noted in prior research as having a significant impact on firm performance. However, it is not clear how these capabilities impact firm performance. This research focuses in particular on one salient IT management capability, viz., IT infrastructure capability, and develops a conceptual model linking IT infrastructure capability with IT project performance. The study was anchored on the following objectives: to determine the effect of Network Connectivity on the performance of IT projects in Rwanda; to determine the effect of Network Access on the performance of IT projects in Rwanda; and to determine the effect of IT Applications and Utilities on the performance of IT projects in Rwanda. The study employed a descriptive survey design. A sample size of 398 respondents was drawn from a population of 85,369 using Yamane formula. Stratified random sampling was employed to sample the survey respondents from the target population. Data were collected using structured questionnaires. The reliability and validity of the data collection instruments was tested using Cronbach's Alpha coefficient at an index of 0.70 and based on a 5-point Likert Scale for multiple items obtained from a pilot survey. The content validity of the questionnaires was done by supervisors from the University. Multiple regression analysis and content analysis was used to establish the effect of project infrastructure capabilities on the performance of IT projects in Rwanda. The study findings indicated that IT infrastructure capabilities (IT Networks Connectivity, IT Network Access and IT Applications & Utilities) had statistically significant effect on project performance in Rwanda. The study recommends that IT project stakeholders should configure their synergy in enhancing IT infrastructure capabilities in the order of importance to increase their project performance.***

Keywords: Project, Project Infrastructure Capabilities, Performance of IT projects

1. Introduction

Project infrastructure is a term most appropriately used to describe a systematic framework comprised of specific features and expectations. Infrastructure provides a basis of support by means of strategic planning of service execution by administrators and employees within project hierarchy (Townsend et al, 2006).Project growth is directly influenced by the presence or non-presence of a solid, thoroughly planned infrastructure, responsible for incorporating the missions, goals, and expectations for any entity, which stems from the initial phases of development. According to the American Institute of Architects (2007), infrastructure refers to an underlying base of foundation, especially for an organization or a system; and the basic facilities, services and installations needed for the functioning of a community or society, such as transportation and communications systems. Thus, an infrastructure is the foundation or base upon which something else "runs" or "operates." In other words, it is the foundation or base without which something else cannot run or operate. There is general consistency and agreement among researchers on the definition of IT infrastructure (Santhanam et al., 2003).In this study, IT infrastructure is defined as a set of IT resources and organizational capabilities that are shared across the organization and that provide the foundation on which IT applications are developed and business processes are supported. IT infrastructure capability is defined as the integrated set of reliable IT infrastructure services available to support existing applications and new initiatives in firms (Weill et al. 2002). Organizational performance is defined as the extent to which the IS function contributes to the various performance measures at the organization level.

2. Statement of the Problem

The Rwanda telecommunications sector was liberalized in 2001, and the number of companies providing telephone and Internet services increased from one, the state-run Rwandatel, to ten in the year 2012. These IT service providers are majorly private owned, with the exception of Rwandatel. The fast growing population in Rwanda is expected to be over 2 million by 2020 and the increasing business needs puts a lot of pressure on the Rwandan government to quickly improve its infrastructure within short lead times. In 2000, the government of Rwanda established Vision 2020 as an economic blueprint to achieve a knowledge-based economy and become a middle-income country by 2020. However, more than 80 % of the Rwandan population lives in rural areas, and over 77% of the population listens to the radio for news, sports, drama (theatre), announcements and political discussions. The Government of Rwanda has deployed only 62 Service access Points and out of 416 Sectors only 200 small rooms have been equipped with IT equipment to facilitate the implementation of RoL services. The service automation and delivery online has taken a direction and it is now on the smooth move where, the implementation framework with the first 100 services is to be delivered on the platform by the year 2017; which means the manual phase indicating an infrastructural gap. This indicates

that people have the quest to get information: an indication of the people's need of access to information through say, internet.

On data segment, the number of internet subscribers has reached 2,068,179 up from 1,674,053 subscribers to date, and this represents an internet penetration of about 20%, yet this is only concentrated in urban areas not underserved areas. The implementation of Rwanda Online project as an integrated public service platform was meant to exclusively offer government to Business (G2B), and government to citizens (G2C) services in the country accessible via internet and Mobile devices. However, the ICT sector profile report (2013), has pointed out key challenges more especially, the internet penetration, and e-Government services availability in the underserved/Rural areas around the country due to lack of adequate infrastructure. This study thus seeks to establish the effect of project infrastructure capabilities on the performance of IT projects in Rwanda, with a specific attention on Rwanda Online Project in Bugesera District of Western Province.

3. Objectives of the Study

The general objective of this study was to assess the effect of enhancing IT infrastructure capabilities on performance of IT projects in Rwanda. The study was anchored 3 specific objectives:

1) To determine the effect of Network Access on performance of IT projects in Rwanda.
2) To assess how Network Connectivity affects performance of IT projects in Rwanda.
3) To evaluate the effect of IT Applications and Utilities on performance of IT projects in Rwanda.

4. Conceptual Framework of the Study

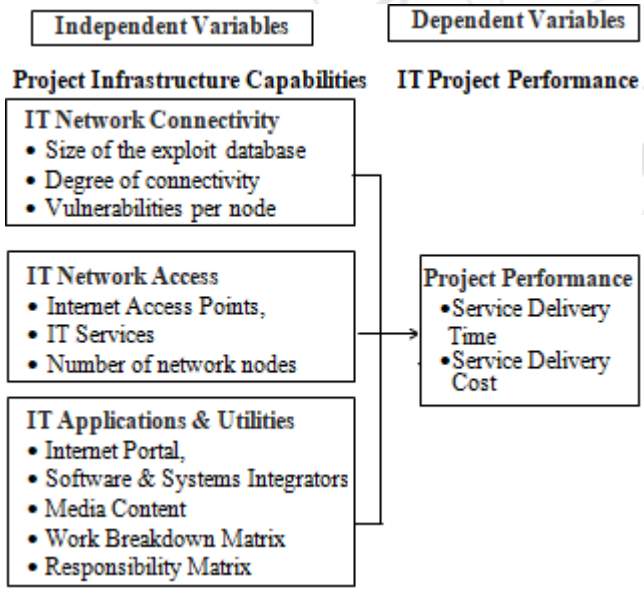

Figure 1: Conceptual Framework
Source: *Researcher compilation (2017)*

5. Methodology

- **Research Design**: To undertake the study, a descriptive survey research design was used
- **Target Population**: The study comprises of a target population of 85,369 households in Bugesera District
- **Sample Size:**A sample size of 398 respondents was used within an error limit of 0.05 using the formula of Yamane Yaro (1967).
- **Data Collection Instruments:** Structured questionnaires were used due to the fact that they are relatively faster to collect standardized data and the researcher personally administered the questionnaires with the help of research assistants to collect needed data.

6. Research Findings

6.1 Profile of Respondents by Gender

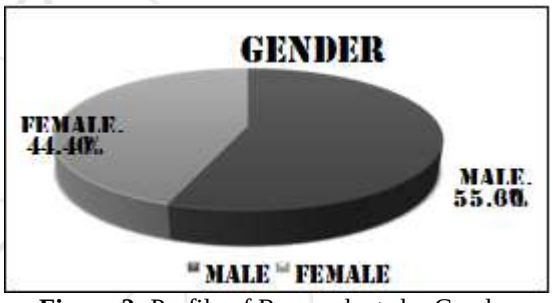

Figure 2: Profile of Respondents by Gender

The results showed that majority of the respondents (55.6 %) were males, while 44.4 % were female. This implies that the sector is male dominated although the female percentage was equally representative enough since it surpassed the World Bank's Millennium Development Goal target of 30% female representation in all organizations.

6.2Age of Respondents

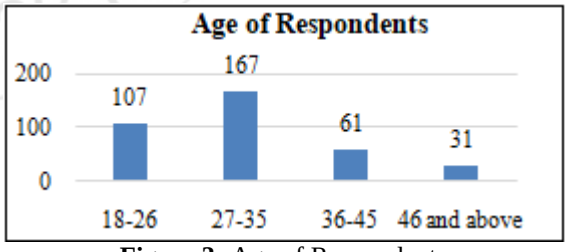

Figure 3: Age of Respondents

On the age bracket of the respondents, majority 45.6% (167) were in the category of 27-35 years followed by 29.2% (107) between 18-26 years and 16.7% (61) at the category of 36 to 45 years while only 8% (31) were 46 years and above. The information indicates that majority of the people in the region are relatively young and vibrant thus would require active online services to conduct their affairs.

6.4 Regression analysis

Given the fact that the correlation between variable can't give the information regarding the model or even can't help in prediction, the regression analysis is very important in this regard.

Table1: Model Summary

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.813[a]	.661	.658	.39192
a. Predictors: (Constant), IT_applications_and_utilities, IT_network_access, IT_network_connectivity				

The Table 1 helped to appreciate how much the independent variables altogether (IT application and utilities, IT network connectivity and IT Network access) contribute to IT project performance (dependent variable). The model has a coefficient of determination (R^2) of 0.661. This means that 66.1% of variation in project performance can be explained by the variation in IT Infrastructure Capabilities with 33.9% of the variation in Project performance not explained by the model. In order to assess if the model is a good fit for the data the prob(F) or p-value given by the analysis of variance (ANOVA) was computed and results are shown in Table 2of Analysis of variance.

Table 2: Analysis of variance (ANOVA)

ANOVA[b]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	108.363	3	36.121	235.156	.000[a]
	Residual	55.605	362	0.154		
	Total	163.967	365			
a. Predictors: (Constant), IT_applications_and_utilities, IT_network_access, IT_network_connectivity						
b. Dependent Variable: IT_project_performance						

The findings in table above revealed that the prob (F) or p-value for the overall regression relationship was (p = 0.000), which was less than the level of significance of 0.05. this means that there is almost zero chances over one thousand that the model as a whole can be removed from predictors without affecting the IT project performance. This indicates that there was a statistically significant effect of IT Infrastructure Capabilities on Project performance in Rwanda. In order to know the contribution of each independent variable to the prediction of IT project performance, the following Table 3 shows the coefficients of the model.

Table 3: Regression coefficients

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.003	0.168		0.02	0.984
	IT_network_connectivity	0.55	0.063	0.46	8.705	0
	IT_network_access	0.303	0.045	0.3	6.662	0
	IT_applications_and_utilities	0.143	0.049	0.134	2.908	0.004
a. Dependent Variable: IT_project_performance						

ultiple regression analysis was conducted to investigate the statistical effect of IT Infrastructure Capabilities (IT Applications & Utilities, IT Network Connectivity and IT Network Access) on the project performance in Rwanda. From table 3, there were positive unstandardized beta coefficients as indicated by the coefficients to IT Network connectivity, IT Network Access and IT Applications & Utilities. The model equation in this relationship was: $P = 0.003+0.550X_1 + 0.303X_2 + 0.143X_3 + 0.392$; where X_1 represents IT Network connectivity, X_2 represents IT Network Access, X_3 represents IT Applications & Utilities and P represents IT project performance.

The regressionmodel further demonstratesthata unit increase in IT Network ConnectivityincreasesIT project performance in Rwanda by 0.550 units, while IT Network Access and IT Applications & Utilitiesremain constant. A unit change in IT Networks Access will increase IT project performance in Rwanda by 0.303 units, while IT Network Access andIT Applications & Utilitiesremain constant. Finally, a unit change in IT Applications & Utilities will increase project performance in Rwanda by 0.143 units, while IT Networks Connectivity andIT Network Accessremain constant. However, the model indicates that improving management of IT Networks Connectivity (β=.550) contributes more, followed by improving IT Networks Access (β=.303) and lastly improving management of IT Applications & Utilities (β=.0.143) respectively in increasing the Project performance. This finding has similar orientation with the findings by Darun (2011) in Malaysia, who sought to examine the effect of IT Infrastructure Capabilities on Project performance focusing on the determinants of the various IT Infrastructure Capabilities employed in managing IT projects. The research was based on multiple case studies of five Malaysian projects. Semi structured interviews were used to collect data from key informants. The research found out that the IT Infrastructure Capabilities employed in various projects had significant statistical effect on Project performance.

7. Discussions

7.1 IT network connectivity and IT project performance

The correlation analysis showed that the Pearson correlation coefficient between the variable IT network connectivity and IT project performance is 0.777. This means that there was a strong positive relationship between IT network connectivity and IT project performance at a significance level of 0.01(Deborah, 2016). The regression analysis helped to appreciate the value of this relationship if other predictors remain constant. The unstandardized coefficient of IT network connectivity was 0.550 which means that if there is an increase of one unit in IT network connectivity, this will cause the IT project performance to increase by 0.550 if other predictors remain constant. In other hand the p-value of IT network connectivity is almost zero (.000) very less than the significance level of 0.05; this implies that there is almost zero chance in 1000 that the term of the regression equation that contains the variable IT network connectivity could be zero or eliminated from the regression equation without affecting the accuracy of the regression.

This finding agree with Sundaresan, et al. (2011), who observed that unlike in more developed countries many users appear to be receiving broadband speeds that are far lower than what their Internet Service Providers are promising them thus reducing their intended performance. They also noted that the mobile providers are typically delivering faster download speeds to users than fixed line ISPs do. However, mobile broadband performance tends to be significantly more variable than the fixed-line performance. Lastly, and perhaps most importantly, Sundaresan, et al. (2011) established that the speeds that an ISP provides is not the only limiting factor on broadband performance.Instead, latency to web sites and services that users actually visit can really affect broadband performance.

7.2 IT network access and IT project performance

At 0.01 level of significance, the Pearson correlation coefficient between IT network access and IT project performance was 0.716. This means that there is a moderate positive (Deborah, 2016) relationship between those two variables. The regression analysis showed that the IT network access had an unstandarized coefficient of 0.303. which means that onepositive unit change in IT Networks Access will increase IT project performance in Rwanda by 0.303 units, while other variables remain constant. The prob(t) or p-value for IT network access was almost equal to zero 0.000 < 0.05. This means that the IT network access is a very important factor of IT project performance and none can eliminate the term of the regression equation that contains this variable without affecting the prediction deeply. This finding is in line with the finding by Ofcom, (2012) who observed that the physical distance of users to specific servers for popular sites (e.g., Facebook) creates a latency of typically several hundred milliseconds, which is far too high to provide consistently good performance.

7.3 IT applications & utilities and IT project performance

The analysis of correlation between IT applications & utilities and IT project performance at 0.01 significance level, showed a Pearson correlation coefficient of 0.660; which means that at that level there is a moderate relationship between IT applications & utilities and IT project performance (Deborah, 2016).Moreover the regression analysis helped to appreciate the contribution of IT application & utilities in predicting the IT project performance. The unstandardized B coefficient for IT applications and utilities was 0.143. This means that an increase of one unit in IT applications and utilities will cause an increase of 0.143 unities in IT project performance if other variables remain constant. The p-value for this variable is 0.004 (<0.05) which means that there is only 4 chances in 1000 that the variable IT applications and utilities could be zero and the acceptable limit is 0.05 or 50 chances in 1000. This means that IT applications and utilities are very important in predicting the IT project performance.This finding is in line with the finding by Lewis, (2005) who noted that the essence of all these IT Applications and Utilities has been conceived to enhance the countries' ability to move up the value chain through quality and efficient service delivery which would translate into creation of high skilled employment, fostering entrepreneurship and international trade, modernizing local manufacturing through IT services, and promoting technology development.

8. Conclusions and Recommendations of the study

This study sought to establish the effect of IT infrastructure capabilities on the Project performance in Rwanda. The study thus concludes that IT infrastructure capabilities has a statistically significant effect on project performance. The three independent variables related to IT infrastructure capabilities count for 66.1% in predicting the outcome of IT project performance, 33.9% remaining are caused by other factors not took into consideration by this research and that may be subjected to further research. In consideration of the findings, the study suggests that IT stakeholders should configure their synergy in enhancing IT infrastructure capabilities in the order of importance to increase their project performance. This study recommendsthatin future, the study scope should be expanded to include more IT projects for effective comparative analysis.

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