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Evaluating Factors Affecting Broadband Readiness in Kenya: A Pilot Study

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ABSTRACT

The term "broadband" generally describes a wide range of new Information Technologies that allow high speed high bandwidth data transmission and always-on access to the internet and other real-time services. The World Bank, in a 2010 report entitled "Building broadband: Strategies and policies for the developing world", asserts that for every 10 percentage-point increase in broadband penetration in developing countries, GDP growth can increase by up to 1.38 percent and that this potential growth surpasses that of telephony, mobile phones or narrowband Internet. The actual speed and bandwidth that constitute "broadband internet" is still a subject of international debate and countries have chosen to adopt different definitions for broadband speed. In Kenya, for instance, internet speeds of at least 256 Kb/s in either direction constitute broadband. The World Bank, in the above mentioned report, proposes that broadband be defined beyond the traditional notion of a specific type of network connectivity or minimum transmission speed. Rather, it proposes that broadband be viewed as an ecosystem that includes its networks, the services that the networks carry, the applications they deliver, and users. It is in this context that this study aims to provide an initial understanding of the factors affecting broadband readiness in a developing country, in this instance Kenya. In order to achieve this aim, this study[1] identified and examined various policy, regulatory, access technology, digital literacy, broadband demand and broadband supply side factors and their possible influence upon broadband readiness in Kenya. The data on these variables was collected using an on-line administered questionnaire approach. The findings of this study suggest that availability of a national broadband strategy, improvement in digital literacy, use of private public partnerships in the provision of broadband, provision of broadband connections to government, learning and health institutions, inclusion of broadband in universal service obligations, and improvement in the security of broadband connections are significant factors for improving broadband readiness of Kenya.

Keywords: *Kenya, Developing countries, Broadband, Readiness, Pilot study*

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1. INTRODUCTION

As a basic infrastructure, access to broadband is becoming a necessity that all Individuals, households, businesses and institutions need [1]. Broadband enables new models of communications such as video messaging, chat, peer-to-peer file sharing and on-line gaming. New applications such as E-Government, E-Commerce, E &M Health, home working and interactive media have been facilitated by broadband as well as new ways to share and access information[1][2]. A country's "broadband-readiness" is essentially the degree in which it's qualified to participate in the networked world using broadband internet. This study attempts to determine the factors for evaluating the broadband readiness of developing economies, in this instance, Kenya.

2. THEORETICAL BASIS

A number of models have been developed to study broadband. One such model is the three domain model of penetration, capacity, and price [3]. A second three domain model developed by the Cisco Internet Services Business Group (CISBG) [4] considers the microeconomic benefits of broadband and consists of improvement in broadband, impact and per-capita real GDP growth.

A third model was developed by OECD Working Party on Indicators for the Information Society (WPIIS) to describe indicators for electronic commerce. The model has been adopted to study broadband [5]. It considers three broadband domains namely, readiness, intensity and impact. It should be noted that researchers have previously attempted to study the economic impact of broadband in developed countries [6][1]. A few studies have investigated broadband adoption in developing countries [7][8][9].

As part of the on-going research on the topic "A Framework for GIS Enhanced Broadband Metrics for Developing Countries"[3], the authors pursue a research model consisting of broadband readiness, intensity and adoption. Little published research on broadband exists in the domain of readiness. As a result, the readiness model of this research has been adopted from

previous work on E-readiness [5][10][11][12][13][14]. This current study, based on the readiness domain of the research model, attempts to investigate the factors contributing to the broadband readiness of a developing country, in this instance Kenya, by investigating the policy, regulatory, technology, digital literacy, supply and demand factors that would enhance the broadband readiness of the country.

According to the Organisation for Economic Cooperation and Development [5], readiness metrics are concerned with the technical, commercial and physical infrastructures necessary to support broadband. Since no prior research has investigated broadband readiness in Kenya, the constructs included for investigation herein have been developed based on literature review of previous broadband studies conducted elsewhere in the developed and developing countries.

3. RESEARCH METHODOLOGY

An on-line administered questionnaire was the primary survey instrument for data collection. On-line questionnaires have the advantage of covering a wide area of the target population and offer a standardized form of responses [15]. [15] further asserts that questionnaires are familiar to most people and generally do not make people apprehensive. They also reduce bias and can be completed at the respondent's convenience. The questionnaire reduces differences in the way that the questions are asked, and how they are presented [16]. Because of the time limitations of the pilot study, the questionnaire was sent out via e-mail to a total of 100 respondents drawn from Government and policy makers, the ICT regulator (CCK), Service providers, and ICT experts. Sampling was by purposeful judgment.

The initial understanding from literature review on broadband readiness provided the basis for the development the questionnaire consisting of 43 questions. One of the questions was asked to rate the overall perceived broadband readiness (BR) by the respondents [10]. The proposed conceptual model assumed that the dependent variable 'broadband readiness' is influenced by several independent variables that include the general constructs of Policy, Regulatory, Digital literacy, Access technology and Broadband supply (Push) and Broadband demand (Pull) categories. The 43 questions were based on a five-point likert scale ranging from strongly disagree to strongly agree with a neutral option constructed to capture the readiness constructs under investigation. The likert scale type questions were adapted from [8].

Prior to the dissemination of the final questionnaire, a trial study was conducted in early April 2012 in order to determine the response rate and learn of any discrepancies within the questions, which included determining whether the format of the questionnaire and the questions was suitable. Additionally, the time required for completing the questionnaire was established.

4. DATA ANALYSIS AND RESEARCH FINDINGS

A total of 45 responses were obtained from the 100 questionnaires sent out within the specified duration. Thus, a response rate of 45% was achieved. This response rate is comparable to response rates in recent studies on broadband conducted in developing countries [7][8][9] in Pakistan, Bangladesh, and Malaysia respectively. These studies achieved about the same response rate as the current study, although they mainly investigated broadband adoption as opposed to this current study on broadband readiness, where little research has been carried out in a developing country context.

The data analysis involved classifying the responses and providing a unique identification number to each response. Using SPSS (version17), descriptive statistics were generated and reliability tests and regression analysis conducted in order to analyze and present the research data obtained from the questionnaires.

4.1 Reliability Test

Reliability of constructs was estimated using Cronbach's coefficient (alpha) values to examine the internal consistency of the measure (Table 1).

Table 1: Reliability values N=42

CONSTRUCT	No. OF ITEMS	CRONBACH'S ALPHA α
POL: POLICY	3	0.661
REG: REGULATORY	9	0.829
DL: DIGITAL LITERACY	2	0.815
TECH:ACCESS TECHNOLOGY	8	0.777
SS:SUPPLY	6	0.606
DS:DEMAND SIDE	14	0.837

[17] suggest four ranges for the reliability coefficient α; excellent reliability (α >=0.90), high reliability (0.70 < α < 0.90), moderate reliability (0.50< α< 0.70), and low reliability (α<= 0.50). In general, the higher the Cronbach's α value of a construct, the higher the reliability is of it measuring the same construct.

In this study, Cronbach's α varied between 0.837 for the broadband demand side constructs and 0.606 for the broadband supply side constructs. The demand side (DS) constructs expressed the highest reliability (α =0.837), closely

followed by regulatory constructs (α =0.829), digital literacy (α =0.815), access technologies (α =0.777), policy constructs (α =0.661) and finally supply side constructs (α =0.606). Considering [17], the aforementioned values suggest that of the 6 constructs, 4 possessed high reliability and the remaining two demonstrated moderate reliability. The implication is that all the constructs were internally consistent. Consequently, all items of each construct measured the same content universe (i.e. construct). For example, all items of TECH measured the same content universe of broadband access technology. Similarly, all items of DS measured the content universe of the demand side construct and so on.

4.2 Descriptive Statistics

Table 2 presents the means and standard deviations of the items related to the six constructs included in the study for the purpose of measuring factors affecting broadband readiness in Kenya. The means and standard deviations of aggregated measures for the six constructs are also illustrated in Table 2. A strong agreement was made for the digital literacy construct with highest average score of aggregate measure (M = 9.511, SD = 1.111) with the two individual items for measuring Availability of technical expertise ATE (M = 9.600, SD = 0.915) and Digital literacy of masses DLM (M = 9.420, SD = 1.117). The respondents also agreed strongly for all of the items of the Policy (POL) construct (average score of aggregate measure (M = 8.607, SD = 1.282), where item NBS (availability of National Broadband Strategy) scored the maximum (M = 9.330, SD =0.953), followed by the revision of the definition of broadband BSD (M = 8.890, SD =1.449), and BES (view of broadband as an ecosystem) (M = 7.60, SD =0.915).

4.3 Regression Analysis: Influence of Independent Variables on Broadband Readiness (BR)

Ordinary Least Squares Regression was employed to fit a linear probability model (Table 3). The regression analysis was performed with broadband readiness (BR) as the dependent variable and a total of six constructs i.e, Policy (POL), Regulatory (REG), Digital literacy (DL), Access technology (TECH), Demand side (DS) and Supply side (SS) factors. The adjusted R square of the emerging model (Table 4) was 0.892 ($F(6,43)=61.418$, p <0.001). Two of the predictor variables included in the analysis were found to be very significant (Table 5). These are DS (β = 0.379, p =0.003) and POL (β = 0.259, p = 0.003). These were closely followed by DL (β = 0.205, p = 0.018), REG (β = 0.127, p =0.042 and SS (β = 0.119, p =0.186). However, the access technology (TECH) predictor was not found to be significant TECH (β = 0.020, p =0.779).

The size of β suggests that the demand side construct had the largest impact in the explanation of variations of broadband readiness. This was followed by the policy and then digital literacy constructs. The Regulatory and supply side constructs had slight impact on the variation on BR while access technology construct had the least impact on the variation of broadband readiness.

Table 2: Descriptive statistics

Factors	Detailed Factors	Mean	Std. Dev	Rank
BR(BROADBAND READINESS)	**Scale-BR**	**8.580**	**1.574**	**3**
DL(DIGITAL LITERACY)	**Scale-DL**	**9.511**	**1.111**	**1**
	ATE	9.600	0.915	
	DLM	9.420	1.177	
SS (SUPPLY SIDE)	**Scale-SS**	**7.978**	**2.496**	**5**
	GCI	5.910	1.807	
	GSN	7.600	1.629	
	GLO	6.800	1.673	
	GPF	9.020	1.574	
	PPP	9.510	0.968	
	UFB	9.020	1.685	
DS (DEMAND SIDE)	**Scale-DS**	**8.549**	**1.613**	**4**
	GSC	6.440	1.902	
	GIC	9.110	1.005	
	GLE	7.200	1.375	
	TEI	9.110	1.005	
	DVC	9.070	1.009	
	LCD	9.290	1.058	
	AOS	7.560	1.341	
	BUG	9.240	0.981	
	BUS	9.020	1.097	
	ACC	8.840	1.566	
	EHW	7.380	1.749	
	BPO	8.890	1.172	
	EGA	9.200	1.079	
	SIB	9.330	0.953	
POL(POLICY)	**Scale-POL**	**8.607**	**1.282**	**2**
	BSD	8.890	1.449	
	BES	7.600	0.915	
	NBS	9.330	0.953	
REG (REGULATORY)	**Scale-REG**	**7.877**	**2.501**	**6**
	BSC	8.490	1.604	
	APC	7.640	1.300	
	BDR	7.160	1.930	
	FUB	6.440	1.589	
	ICD	6.980	1.840	
	BDC	7.560	1.853	
	USA	8.980	1.252	
	USI	8.760	1.433	

	IUS	8.890	1.247	
TECH (ACCESS TECHNOLOGY)	**Scale-TECH**	**7.617**	**2.260**	**7**
	CMC	6.220	1.869	
	DSL	6.890	1.735	
	FTT	7.870	1.160	
	BPL	6.220	2.099	
	3GB	9.780	0.636	
	WIF	9.200	0.991	
	WIM	8.930	1.629	
	SAT	5.820	1.336	

Table 3. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.952[a]	.907	.892	.518

a. Predictors: (Constant), DS, REG, TECH, POL, DL, SS

Table 4. ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	98.791	6	16.465	61.418	.000[a]
	Residual	10.187	38	.268		
	Total	108.978	44			

a. Predictors: (Constant), DS, REG, TECH, POL, DL, SS

b. Dependent Variable: BR

Table 5. Regression analysis: Coefficients (Dependent variable: Broadband readiness)

Coefficients[a]

Model		Unstd. Coef		Std.Coef	T	Sig.
		B	Std.Error	Beta		
1	(Constant)	-1.365	.647		-2.108	.042
	SS	.157	.117	.119	1.346	.186
	DL	.222	.090	.205	2.463	.018
	POL	.324	.103	.259	3.138	.003
	TECH	.022	.080	.020	.282	.779
	REG	.171	.081	.127	2.103	.042
	DS	.405	.125	.379	3.225	.003

a. Dependent Variable: BR

5. DISCUSSION

The internal consistency of measures was assessed using Cronbach's α reliability test. For a pilot study, reliability should be equal to or be above 0.60 [17][18]. Reliability or the Cronbach's α value of various constructs in this research ranged from 0.606 to 0.837 and therefore none of the constructs possessed reliability below the recommended level of 0.60 (Table 1). This suggests that the measures employed demonstrated an appropriate level of internal consistency and measured the same content universe.

The predictive power of the regression model of this research, with adjusted R^2 of 0.892 (Table 3), suggests the appropriate level of explained variance. This means that the independent variables considered in this study are important for understanding broadband readiness in Kenya.

According to [5], readiness metrics are concerned with the technical, commercial and physical infrastructures necessary to support broadband. The findings of this research therefore, generate a number of issues that may assist policy makers, ICT regulators, broadband service providers, researchers, ICT experts and the general public in assessing the broadband readiness of Kenya.

Considering the research findings, it emerges that in order to improve the broadband readiness of Kenya , emphasis should be laid on improving broadband demand (DS), policy (POL), digital Literacy (DL), regulatory (REG), and broadband supply (SS) factors respectively. The low impact of the access technology construct (TECH), can be explained to be due to the fact that generally, broadband access in the developing world is envisaged to be via mobile and nomadic devices [2][19], and hence what is needed are the "facilitating conditions" for adoption of these wireless technologies to be facilitated by the above constructs. The implication of the research findings on each of these constructs is now considered below.

5.1 Policy

The policy construct (POL (β = 0.259, p = 0.003)) is seen to have a high implication on the variation of broadband readiness in Kenya. Considering the three items that were used to measure this construct, a strong agreement was made for the national broadband strategy item with the highest average score of aggregate measure NBS (M = 9.330, SD = 0.953) followed by the review upwards of the definition of broadband speed from the

current 256 Kb/s [20] BSD (M = 8.890, SD = 1.449). The view of broadband as an ecosystem BES (M = 7.600, SD = 0.915) is a new concept that was recently proposed by the World Bank [2]. It is yet to be widely accepted even in developed nations ranked highly in broadband readiness and adoption. This may explain why it ranked lower than the other items for this construct. In this regard, recent efforts by the Government to engage the USAID in the development of the national broadband strategy is a positive step to improve broadband readiness in Kenya. It is yet to be seen which approach the development of the strategy will take, although public private partnerships (PPP) have been known to be effective in the development of national broadband strategies from around the world [21].

In general, the strategy may be required to provide an analysis of the most effective and efficient mechanisms for ensuring broadband access by all people of Kenya, and to come up with a detailed strategy for achieving affordability of such service and maximum utilization of broadband infrastructure and service by the public. While there is a general agreement on the need to revise the definition of what constitutes broadband upwards, it has to be determined what the appropriate definition would be and the strategies that would be put in place to achieve it.

5.2 Demand Side Factors

The demand side construct (DS ($\beta = 0.379$, $p = 0.003$)) had the highest impact on explaining the variance in broadband readiness in Kenya. This concurs with the World Bank [2] assertion that Governments have to move away from the traditional push efforts and embrace the pull or demand efforts in enhancing broadband readiness, intensity, and adoption. Considering the items that were employed to measure this construct, security of broadband connections, development of local content, E-Government applications, adoption of broadband by businesses, establishment of digital villages (for community broadband access), tax exemption on all ICT products, and Government facilitation of internet connections to Government, Health facilities and Educational institutions were among the items that were highly agreed upon.

Effort is underway by the Kenya ICT board to fund development of local content and use of private public partnerships in the development of digital villages (Pasha centres). The high ranking of security of broadband connections would be in response to the envisaged use of broadband for on-line real time transactions including E-Commerce, E-Health, E-Education, E-Governance (i.e E-Voting) and Video conferencing among others.

Two recent developments in Kenya underscore the importance developing countries place on security of internet connections in general. These are:

i. The Kenya Communications (Amendment) Bill, 2008, which recognises electronic transactions and mandates the Communications Commission of Kenya to among other functions, " develop sound frameworks to minimize the incidence of forged electronic records and fraud in electronic commerce and other electronic transactions", and

ii. The recent formation of the National Computer Incident response team KE-CIRT by the Government. Among the major functions, the response team is to gather and disseminate technical information on computer security incidents and vulnerabilities, and to coordinate computer security incident responses at the national level.

These efforts are seen as positive steps in improving the broadband readiness of the country.

Business process outsourcing (BPO), a major pillar of the Vision 2030, and the adoption of cloud computing in Government and learning institutions were also highly agreed upon as items that could help improve the broadband readiness of Kenya.

Government subsidies on broadband subscription costs, Government loans to employees and SMEs to purchase ICT equipment, broadband utilization in social networking and encouragement of home working were moderately agreed upon as facilitators of broadband readiness in Kenya.

5.3 Digital Literacy

The digital literacy construct (DL ($\beta = 0.205$, $p = 0.018$)) had a large impact on explaining the variance in broadband readiness in Kenya and is in agreement with the World Bank [2] on the pull effect on broadband readiness. Both items used to measure the digital literacy construct i.e, availability of technical expertise and the digital literacy of the masses were highly agreed upon (ATE (M = 9.600, SD = 0.915) and DLM (M = 9.420, SD = 1.177)).

This suggests that there is a need to stimulate interest in ICT related courses in institutions of higher learning, and equip citizens with the skills to use computers and the internet in general. With reference to the digital literacy of the masses, it is important to take a segmental approach to identifying and providing relevant skill-oriented courses to the population that do not have regular opportunities to learn and use the computer, internet and other related emerging technologies and applications such as e-government and e-commerce.

The Kenya ICT board supports private public partnerships in the development of digital villages (Pasha centres) which are meant to improve the digital literacy of the masses. However, comprehensive strategy is required to improve ICT expertise and further catalyse the digital literacy of the masses. Availability of diverse content in the local languages is just one of the efforts that may bear fruit.

5.4 Regulatory

The regulatory construct (REG ($\beta = 0.127$, $p = 0.042$)) had a fair impact on explaining the variance in broadband readiness in Kenya, but was lower than the impact of policy. This can partly be explained by the fact that the regulatory initiative largely depends on the success of the policy initiatives such as the national broadband strategy and was therefore not viewed as being critical at the time of the study.

Some of the items highly agreed upon for the regulatory construct were the universal service fund administration by an independent body, inclusion of broadband in universal access funding, and facilitation of service and platform competition in the provision of broadband (Table. 2). An important item highly agreed upon was the involvement of Government in ensuring universal internet access, with a view that users with narrowband internet use experience would be more willing to adopt broadband than those who never had any type of internet connection before [8][9].

The regulatory aspect of the provision of spectrum for wireless and nomadic access to broadband will be treated under the access technology construct.

5.5 Supply Side Factors

The supply side construct (SS ($\beta = 0.119$, $p = 0.186$)) had a fair impact on explaining the variance in broadband readiness in Kenya, but the impact was lower than that of the policy construct. This can partly be explained by the fact that already much has been done to increase international internet bandwidth in Kenya via the submarine fibre optic cables of TEAMS, EASSy and SEACOM respectively that connect the Kenyan coast to international destinations. Recently, the Government of Kenya embarked on the development of the national backbone network, a project that involves establishment of a national telecommunication backbone network using fibre optic cable connecting all County headquarters.

Furthermore, given the prevalence of mobile devices and their declining cost, including 3G enabled phones, supply side factors are increasingly being addressed and were therefore not found to be critical in this study.

With regard to the items used to measure the supply side construct, the involvement of the public-private partnership in the construction of broadband infrastructure item was the most agreed upon PPP ($M = 9.510$, $SD = 0.968$), followed by universal service funding of broadband , and funding of innovative broadband projects respectively UFB ($M = 9.020$, $SD = 1.685$), and GPF ($M = 9.020$, $SD = 1.574$).These were followed by Government subsidies to network builders, Government loans to network builders (service providers), and lastly construction of broadband infrastructure by the Government (Table 2).

5.6 Access Technology

The access technology construct (TECH ($\beta = 0.02$, $p = 0.779$)) had a low impact on explaining the variance in broadband readiness in Kenya. This can partly be explained from previous research [2][19],which asserts that future access to broadband in developing countries will mainly be by use of mobile and nomadic devices. Hence this construct was not found to be critical in this study. Among the items used to measure this construct, the wireless technologies comprising 3G & beyond, Wi-Fi and Wi-Max (Table 2), were the most agreed upon followed by the fibre to the home/premise, (FTTx) classes of digital subscriber line, cable modem and lastly satellite (VSAT). These findings are in agreement with previous research work on the adoption of broadband in developing countries [2][7][8][9], but fails to support VSAT as a last mile broadband access technology solution probably due to high initial set up costs and recurring costs of maintaining a broadband connection via satellite [4].

Given the high acceptance of mobile and nomadic access to broadband in developing countries[2][19], regulatory authorities have to make available new spectrum, enable incentives and mechanisms to repurpose spectrum to more flexible uses, ensure greater transparency of spectrum allocation, assignment and use as well as expand opportunities for innovative spectrum access models by creating new avenues for opportunistic and unlicensed use of spectrum as well as increase research into new spectrum management technologies.

6. CONCLUSION

This study examined the factors affecting broadband readiness in a developing country context, in this instance, Kenya. The following main conclusions are drawn from this research and are based on the theoretical underpinnings in Section 2. A total of 6 constructs (See Tables 1 and 2) were expected to be correlated to the broadband readiness (BR) of Kenya to participate in the broadband economy. Of these 6 constructs, three, including policy, demand side and digital literacy significantly correlated to the BR with the demand side construct having the largest impact in the explanation of variations of BR followed by policy construct and digital literacy.

Specific items that were highly agreed upon are the requirement for the national broadband strategy, review of the definition of what connection speeds constitute broadband, private public partnerships in the provision of broadband, provision of broadband connections to government, learning and health institutions, improvement in the digital literacy of the masses, inclusion of broadband in universal service obligations, and security of broadband connections. The findings are useful for policy makers, broadband service providers and ICT regulators of developing countries. Factors that are reported as

significant require attention in order to improve the broadband readiness of the country.

Although this study has limitations such as the inability to supplement the questionnaire data with interviews or adopt a longitudinal approach to data collection, due to time and resource constraints, such limitations can be overcome in future research of a similar nature by employing a longer data collection period, supplemented by interviews which will subsequently eliminate any variables that may have produced anomalies in the result. As part of planned future work, the authors intend to develop an on-line based broadband user and service provider reporting tool, which will further improve on the broadband data collection methodology.

This study supports among other findings, the development of the national broadband strategy, the revision of the definition of what constitutes broadband, use of private public partnerships in the provision of broadband infrastructure, provision of broadband connections to government, learning and health institutions, improvement in the digital literacy, inclusion of broadband in universal service obligations, independent administration of the universal service fund, and improvement in the security of broadband connections in readiness for participation of developing countries in the broadband economy.

REFERENCES

[1] Lehr, W., Osorio, C., Gillett, S. and Sirbu, M. (2006). Measuring broadband economic impact. A Paper presented at the 33rd Research Conference on Communications, Information and Internet Policy, Arlington, VA, USA.

[2] World Bank. (2010). Building broadband: Strategies and policies for the developing world, The World Bank, available at www.siteresources.worlbank.org .

[3] Benkler,Y., Faris, R., Gasser, U., Miyakawa, L., & Schultze, S. (2009). Next Generation Connectivity: A review of broadband Internet transitions and policy from around the world, Berkman Research Centre, Harvard University.

[4] Ford, P., Grossman, R. & Handler, D. (2009). Broadband Dynamic Value Assessment: Understanding Possible Macroeconomic Benefits of Broadband in Developing Countries, IBSG Group, Cisco Systems, Inc.

[5] OECD (2009) .Guide to Measuring the Information Society 2009, Organisation for Economic Corporation and Development. www.oecd.org/dataoecd/25/52/43281062.pdf

[6] Neogi , E., Uhrbach, M., Brocca, J. & Veenhof, B. (2010). Canadian Broadband Investments and Metrics: Monitoring Policies, Use and Impact. A paper presented at Beyond Broadband Access: Data-Based Information Policy for a New Administration conference, Washington, D.C, retrieved from http:// comm.psu.edu/about/centers/institute-for-information-policy/02Neogi.pdf

[7] Dwivedi, Y.K, Khoumbati, K.,Williams, M.D., & Lal, B. (2007a). Factors affecting consumers' behavioural intention to adopt broadband in Pakistan. *Transforming Government People, Processes and Policy, 1, (3), 285-297*

[8] Dwivedi, Y.K., Khan, N., & Papazafeiropoulou, A. (2007b). Consumer adoption and usage of broadband in Bangladesh. *Electronic Government: An International Journal, 4, (3), 299–313.*

[9] Ooi, K.-B., Lin, B., King-Tak, Y., & Jia-Jia, S. (2011). Exploring factors influencing consumers' behavioral intention to adopt broadband in Malaysia. *Computers in Human Behavior*, doi:10.1016/j.chb.2010.12.011

[10] Azab, N. A. (2009). Assessing Electronic Government Readiness of Public Organisations – Effect of Internal Factors (Case of Egypt) (Ph.D. thesis, Middlesex University, UK.)

[11] Kurnia, S. (2008). Exploring e-Commerce Readiness in China: The Case of the Grocery Industry. In the Proceedings of the 41st Annual Hawaii International Conference on System Sciences (HICSS 2008), Waikoloa, Big Island, Hawaii, USA.

[12] Bui, T.X., Sankaran, S. and Sebastian, I.M. (2003) A framework for measuring national e-readiness, *International Journal of Electronic Business*, Vol. 1, No. 1, pp.3-22.

[13] Molla, A. & Licker, P.S. (2005b). Perceived e-Readiness Factors in E-Commerce Adoption: An Empirical Investigation in a Developing Country. *International Journal of Electronic Commerce, 10(1), 83-110.*

[14] Kashorda, M. & Mwololo, T. (2009). East African Universities e-readiness assessment, 2008. Kenya Education Network.

[15] Holmström, J., Ketokivi, M., & Hameri, A. (2009). Bridging Practice and Theory: A Design Science Approach. John Wiley & Sons, Inc 2009.

[16] Holliday, A. R. (2007). Doing and Writing Qualitative Research, 2nd Edition. London: Sage Publications

[17] Hinton, P. R., Brownlow, C., McMurray, I., & Cozens, B. (2004). SPSS explained. East Sussex, England: Routledge Inc

[18] Straub, D. W., Boudreau, M-C, & Gefen, D. (2004). Validation guidelines for IS positivist research. *Communications of the Association for Information Systems, 13, 380-427.*

[19] Burkart, P. (2007). Moving targets: Introducing mobility into universal service obligations, Journal of Telecommunications Policy 31, 164-178 retrieved from www.sciencedirect.com/science/journal/03085961

[20] Communications Commission of Kenya (2007). Internet market analysis study (2007) available at www.cck.go.ke

[21] Waverman, L. & Dasgupta , K. (2010) .Canada's Broadband Performance: Relevant Considerations for a "Digital Economy" Strategy, Berkeley Research Group, LLC 2010.