



Evaluating Factors Affecting Broadband Adoption in Kenya

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ABSTRACT

Recent research points to the appalling broadband penetration rates in developing countries, more so in Africa where individual broadband penetration rates are below two per cent. An understanding of the factors affecting broadband adoption in these countries is key to any strategy to improve broadband penetration figures. The deployment and adoption of broadband in Kenya is still in embryonic stage. For example, in its fourth quarter 2011-12 sector statistics report, the ICT regulator, the Communications Commission of Kenya estimates that out of a total of about 7.7 million internet subscriptions, only about 10 per cent were broadband, even with the definition of broadband in Kenya still pegged at a transmission speed of at least 256 Kbps in either direction. This research provides an empirical support for understanding the drivers of consumer adoption of broadband from a developing nation's perspective. The study³ examines the various attitudinal, normative and control factors affecting the adoption of broadband internet in Kenya. The data on these variables was collected using a self-administered questionnaire approach. Regression analysis was conducted to test the role of numerous variables on consumers' behavioral intentions to adopt broadband. The findings of this study suggest that self efficacy, relative advantage, facilitating conditions and perceived knowledge about broadband are very significant in explaining consumers' behavioural intentions to adopt broadband in Kenya. Hedonic outcomes, perceived declining costs of broadband services, and perceived ease of use had moderate impact on the variation of broadband intentions while utilitarian outcomes, referents influence, and social outcomes predictors were found to be less significant. The paper proceeds to outline the research methodology, findings and recommendations to stakeholders in the broadband eco-system.

Keywords: *Adoption, Broadband, Kenya, Developing countries, Regression*

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1. INTRODUCTION

Broadband connectivity is largely considered to have a positive impact on a country's Gross Domestic Product (GDP) with the potential to attract Foreign Direct Investment (FDI) [1]. Further [2], show that broadband internet plays an important role in determining a country's "e-readiness" and hence its global competitiveness.

Literature review on broadband adoption and diffusion shows both macro and micro level [3][4] studies have been conducted to understand broadband deployment and adoption in the developed world. However, only a few studies have investigated broadband diffusion within the developing country context [5][6][7]. Several reasons have been advanced for lack of broadband studies on developing economies ranging from late rollout of broadband services [6], unavailability of broadband infrastructure [7], to the absence of appropriate ICT policies and strategies, including national broadband strategies [8][9].

Considering these limitations that have resulted in developing countries such as Kenya being far behind in terms of broadband adoption and diffusion in comparison to the developed world, it is imperative to instigate research in this area which may help to accelerate consumer adoption of broadband within developing countries [10].

From the aforementioned views, the contributions of this study become eminent. To Government for informed decision making [11], to policy makers as an aid in formulating appropriate strategies, policies and regulations relating to broadband [12], to the service provider in formulating appropriate roll out and revenue strategies, and to the general public for informed decision making while seeking broadband services [9]. Additionally, it contributes to the body of knowledge on broadband research.

As a guideline to the evaluation of the factors affecting broadband adoption in Kenya, the research sought to answer the following research questions.

1. What are the factors that determine consumers' decision in adopting broadband?
2. What relationship exists between the factors and the intention to adopt broadband among Kenyans?
3. Which factors have the greatest impact towards consumers' intention to adopt broadband?

2. THEORETICAL BASIS

This study is based on an on-going research on the topic "A Framework for Broadband Metrics for Developing Countries", in



which the authors pursue a research model consisting of broadband readiness, intensity and adoption [9]. The adoption domain of the research model is adapted from [5].

The researchers adopt the Technology Acceptance Model (TAM) [13] which investigates individual adoption in favour of the Model for the Adoption of Technology in the Household (MATH) model, previously used in broadband studies in developed countries and which investigates adoption at household level. The TAM model is more appropriate to developing countries studies due to the increasing access to broadband in developing countries via mobile and nomadic devices[1][9][14]. The Diffusion of Innovations (DOI) theory [15], which explains the pattern of adoption in predicting the success of new technology invention was also utilised in the study.

This study postulates that behavioral intention (BI) to adopt broadband is influenced by several independent variables which can be categorized into three broad groups [2][5][16][17]. These are:

- i. **Attitudinal factors**, which describe the individual’s perception towards broadband technologies (RA, UO,HO,SO)
- ii. **Normative factors**, which describe the social influences that may affect the intention to adopt broadband (RI), and
- iii. **Control factors**, which control or influence the ability to initiate and maintain a broadband subscription (PK, PE, PD, SE, FC).

The constructs used in this study for the above factors are explained in Table. 1

Table 1: Definition of Constructs for Broadband Adoption

| Construct | Definition |
|---------------------------|--|
| Relative Advantage (RA) | The extent to which broadband is perceived as better or more advanced than narrowband internet. [15][16] |
| Utilitarian Outcomes (UO) | The enhancement factors contributed by the use of broadband. [5][13][17] |
| Hedonic Outcomes (HO) | Pleasurable gains due to the use of a technology i.e broadband for entertainment etc. [5][16][18][19] |
| Referents Influence | The influence perceived from friends, family, workmates, social media, |

| | |
|-------------------------------|---|
| (RI) | campaigns and advertisements. [5][13][15][17] |
| Perceived declining cost (PD) | The extent to which declining cost to subscribe to broadband influences broadband intentions. [5][13][18][19] |
| Facilitating Conditions (FC) | The perceived level of resources available to subscribe to broadband. [5][13][15][19] |
| Perceived Knowledge (PK) | The level of knowledge that one perceives to have on broadband including benefits and risks. [13][16][18] |
| Self Efficacy (SE) | The extent to which one can successfully operate new technology i.e broadband access devices. [5][13][17][19] |
| Perceived Ease of Use (PE) | The extent to which the use of the new technology is free from effort. [5][13][15][16] |
| Social Outcomes (SO) | The increase in prestige or social status due to the use of the new technology. [5][15][18][19] |

To make the study as inclusive as possible, it was decided that all the above constructs from previous studies be included in this research on broadband adoption in Kenya.

3. RESEARCH METHODOLOGY

The primary survey instrument for data collection was a self administered questionnaire. Questionnaires have the advantage of covering a wide area of the target population and offer standardized form of responses [20]. [21] 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 standardizes the way questions are asked, and how they are presented [22]. Due to the uncertainty regarding the identity of consumers currently using the broadband facility and the nomadic nature of access, the snowballing sampling technique [5][6] was employed. Initial respondents from academia, the private sector, Government, students and the general public within Nairobi city were first identified. These in turn referenced their friends and colleagues who utilized broadband. This progressively increased the sample size [7][10]. This strategy led to the questionnaire being administered to a total of 400 broadband users during the periods of June and July 2012.

The initial understanding from literature review on broadband adoption provided the basis for the development of the

questionnaire consisting of 51 questions. All the 51 questions were of five-point likert scale type in nature, ranging from strongly disagree to strongly agree with a neutral option constructed to capture the adoption constructs under investigation. They were adopted from [16][17]. One of the questions was asked to rate the overall intention by respondents to maintain a broadband subscription or make a new broadband subscription in the next twelve months [23]. The proposed conceptual model assumed that the dependent variable 'broadband intention' (BI) is influenced by several independent variables that include the general constructs of Relative advantage (RA), Utilitarian outcomes (UO), Hedonic outcomes (HO), Referents influence (RI), Perceived declining cost (PD), Facilitating conditions (FC), Perceived knowledge (PK), Self efficacy (SE), Perceived ease of use (PE), and Social outcomes (SO).

Prior to the dissemination of the final questionnaire, a trial study was conducted in 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 162 responses were obtained from the 400 questionnaires sent out within the specified duration. Thus, a response rate of 40.5% was achieved. This response rate is comparable to response rates in recent studies on broadband adoption conducted in developing countries [5][6][7][10] in Pakistan, Bangladesh, Malaysia, and India respectively, and on broadband readiness in Kenya [9].

The data analysis involved classifying and uniquely identifying the responses [20][21]. 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 [24][26].

4.1 Reliability Test

Reliability of constructs was estimated using Cronbach's coefficient (alpha) (Table 2).

Table 2: Reliability values N=162

| CONSTRUCT | No. OF ITEMS | CRONBACH'S ALPHA α |
|------------------------|--------------|---------------------------|
| RA: RELATIVE ADVANTAGE | 5 | 0.869 |
| UO: UTILITARIAN | 2 | 0.628 |

| OUTCOMES | | |
|---------------------------------------|----|-------|
| HO: HEDONIC OUTCOME | 3 | 0.719 |
| SO: SOCIAL OUTCOME | 7 | 0.664 |
| RI: REFERENTS INFLUENCE | 6 | 0.608 |
| PK: PERCEIVED KNOWLEDGE | 3 | 0.978 |
| SE: SELF EFFICACY | 3 | 0.965 |
| PE: PERCEIVED EASE OF USE | 2 | 0.822 |
| PD: PERCEIVED DECLINING COST | 5 | 0.742 |
| FC: PERCEIVED FACILITATING CONDITIONS | 15 | 0.885 |

[24] suggest four ranges for the reliability coefficient α ; excellent reliability ($\alpha \geq 0.90$), high reliability ($0.70 < \alpha < 0.90$), moderate reliability ($0.50 < \alpha < 0.70$), and low reliability ($\alpha \leq 0.50$). 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 0.978 for the perceived knowledge (PK) constructs and 0.608 for the referents influence (RI) constructs. The perceived knowledge (PK) constructs expressed the highest reliability ($\alpha = 0.978$), closely followed by self efficacy constructs ($\alpha = 0.965$), facilitating conditions ($\alpha = 0.885$), relative advantage ($\alpha = 0.869$), perceived ease of use ($\alpha = 0.822$), perceived declining cost ($\alpha = 0.742$), hedonic outcomes ($\alpha = 0.719$), social outcomes ($\alpha = 0.664$), utilitarian outcomes ($\alpha = 0.628$), and finally referents influence construct ($\alpha = 0.608$). Considering [24], the aforementioned values suggest that of the 10 constructs, two possessed excellent reliability, five constructs possessed high reliability and the remaining three 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 PK measured the same content universe of perceived knowledge. Similarly, all items of SE measured the content universe of the self efficacy construct and so on.

4.2 Descriptive Statistics

The means and standard deviations of the dependent variable, broadband intentions (BI) and the items related to the 10 constructs included in the study for the purpose of measuring factors affecting the adoption of broadband in Kenya are now described.



4.2.1 Descriptive Statistics for Broadband Intention (BI)

Table 3: Descriptive statistics for Broadband Intention N=162

| Factors | Detailed Factors | Mean | Std. Dev |
|--------------------------------|------------------|--------------|--------------|
| BI(BROADBAND INTENTION) | Scale-BI | 3.630 | 0.566 |

One question was used to measure the overall intention to continue to subscribe to broadband or make a new subscription in the next twelve months (BI) [23]. Table 3 shows that BI was fairly agreed upon with a mean of 3.630 and standard deviation 0.566.

4.2.2 Descriptive Statistics for Attitudinal Factors

The means and standard deviations of aggregated measures for the four constructs used to measure attitudinal factors are illustrated in Table 4. A strong agreement was made for the social outcomes (SO) construct with highest average score of aggregate measure (M = 3.817, SD = 0.512) with the respondents agreeing highly to the use of broadband for pursuing personal interests (SOP; M = 4.200, SD = 0.850), engagement in social activity (SOS; M = 4.130, SD = 0.773), and use of broadband for betterment of life (SOB; M = 4.060, SD = 0.934). The use of broadband to achieve equality item was the least agreed upon in the social outcomes category (SOE; M = 2.300, SD = 0.567).

The SO construct was followed by the utilitarian outcome (UO) construct which was highly agreed upon with both constructs for measuring UO, information search (UOI), and social networking (UOS) being rated highly. Next in order was the relative advantage (RA) construct with the items on higher reliability (RAR), better quality of service (RAS) and better quality of experience (RAE) for broadband service compared to narrowband internet being highly agreed upon. The least ranked in the attitudinal constructs segment was the hedonic outcome construct (HO). The individual items in this construct included streaming audio/video (HOS) and on-line gaming (HOO), Table 4.

Table 4: Descriptive Statistics for Attitudinal Constructs N=162

| Factors | Detailed Factors | Mean | Std. Dev | Rank |
|--------------------------------|------------------|--------------|--------------|----------|
| UO(UTILITARIAN OUTCOME) | Scale-UO | 3.630 | 0.820 | 2 |
| | UOI | 4.040 | 1.021 | |

| | | | | |
|--------------------------------|-----------------|--------------|--------------|----------|
| | UOS | 3.220 | 0.899 | |
| RA (RELATIVE ADVANTAGE) | Scale-RA | 3.570 | 0.784 | 3 |
| | RAD | 3.800 | 1.196 | |
| | RAU | 1.810 | 0.750 | |
| | RAR | 4.040 | 0.965 | |
| | RAE | 4.000 | 1.040 | |
| | RAS | 4.200 | 0.800 | |
| SO (SOCIAL OUTCOME) | Scale-SO | 3.817 | 0.512 | 1 |
| | SOR | 3.870 | 1.040 | |
| | SOE | 2.300 | 0.567 | |
| | SOB | 4.060 | 0.934 | |
| | SOT | 4.020 | 0.994 | |
| | SOP | 4.200 | 0.850 | |
| | SOS | 4.130 | 0.773 | |
| | SOC | 4.130 | 0.906 | |
| HO(HEDONIC OUTCOME) | Scale-HO | 2.907 | 0.694 | 4 |
| | HOS | 3.370 | 0.870 | |
| | HON | 3.130 | 0.947 | |
| | HOO | 2.200 | 0.805 | |

4.2.3 Descriptive Statistics for Control Factors

The means and standard deviations of aggregated measures for the five constructs used to measure control factors are illustrated in Table 5. All constructs in this category were strongly agreed upon with the perceived ease of use (PE) construct scoring the highest average aggregate measure (M = 3.852, SD = 0.805). The respondents highly agreed to both items used to measure this construct, namely, perceived less effort required to use broadband (PEE; M = 4.110, SD = 0.811) and perceived time saving when using broadband (PET; M = 3.590, SD = 0.936).

The PE construct was followed by the perceived knowledge (PK) construct which was highly agreed upon with the three constructs for measuring PK, awareness of the internet (PKI), awareness of broadband, (PKB), and awareness of the advantages of broadband (PKA) being rated highly. Next in the order was the perceived declining cost of broadband services (PD) construct with the items on declining initial cost of broadband subscription (PDI), declining monthly subscription costs, (PDM), and lower maintenance costs (PDR) for broadband service compared to narrowband internet being highly agreed upon. The self efficacy (SE) construct was fairly agreed upon with the three constructs for measuring self efficacy, namely previous internet skills (SEI), the ability to operate computers (SEC), and the ability to operate handheld smart devices (SES) fairly agreed upon.



The least ranked in the control constructs segment was the facilitating conditions (FC), but was fairly agreed upon by respondents as well with the average score of aggregate measure (M = 3.643, SD = 0.581). The individual items in this construct that were highly agreed upon included, availability of electricity supply (FCE), reliability of broadband connections (FCR), availability of diverse access technologies (FCT), and choice of different service providers (FCC), among others, Table 5.

**Table 5: Descriptive Statistics for Control Constructs
N=162**

| Factors | Detailed Factors | Mean | Std. Dev | Rank |
|-------------------------------|------------------|-------|----------|------|
| PE(PERCEIVED EASE OF USE) | Scale-PE | 3.852 | 0.805 | 1 |
| | PEE | 4.110 | 0.811 | |
| | PET | 3.590 | 0.936 | |
| PK (PERCEIVED KNOWLEDGE) | Scale-PK | 3.757 | 1.244 | 2 |
| | PKI | 4.060 | 1.165 | |
| | PKB | 3.850 | 1.286 | |
| | PKA | 3.330 | 1.365 | |
| PD (PERCEIVED DECLINING COST) | Scale-PD | 3.707 | 0.645 | 3 |
| | PDC | 4.040 | 1.002 | |
| | PDS | 2.200 | 0.781 | |
| | PDI | 4.060 | 0.934 | |
| | PDM | 4.040 | 0.965 | |
| | PDR | 4.200 | 0.850 | |
| SE(SELF EFFICACY) | Scale-SE | 3.704 | 1.158 | 4 |
| | SEI | 4.170 | 1.105 | |
| | SEC | 3.850 | 1.286 | |
| | SES | 3.060 | 1.165 | |
| (FC)FACILITATING CONDITIONS | Scale-FC | 3.643 | 0.581 | 5 |
| | FCI | 3.800 | 1.196 | |
| | FCF | 1.810 | 0.750 | |
| | FCA | 4.040 | 0.965 | |
| | FCC | 4.000 | 1.040 | |
| | FCT | 4.200 | 0.850 | |
| | FCP | 3.800 | 1.196 | |
| | FCV | 1.810 | 0.750 | |
| | FCL | 4.040 | 0.965 | |
| | FCD | 4.000 | 1.040 | |
| | FCE | 4.200 | 0.850 | |
| | FCS | 3.260 | 0.800 | |
| | FCR | 4.060 | 0.782 | |
| | FCQ | 4.060 | 0.806 | |
| | FCU | 4.150 | 0.707 | |
| | FCB | 3.440 | 0.788 | |

4.2.4 Descriptive Statistics for Normative Factors

The means and standard deviations of aggregated measures for the construct referents influence (RI; M = 3.650, SD = 0.489) in the normative factors category are illustrated in Table 6. Among the six items used to measure this construct, strong agreement was made for the senior or business referents (RSW) item with the highest score of aggregate measure (M = 4.20, SD = 0.850). Respondents also agreed highly to influence to adopt broadband from campaigns/advertisements by service providers (RAS), close relatives (RCR), and peers/social media (RPS). Interestingly influence from immediate family members (RFM) and Government campaigns (RGV) were the least agreed upon items in this category, Table 6.

**Table 6: Descriptive Statistics for Normative Construct
N=162**

| Factors | Detailed Factors | Mean | Std. Dev |
|--------------------------|------------------|-------|----------|
| RI (REFERENTS INFLUENCE) | Scale-RI | 3.650 | 0.489 |
| | RFM | 2.300 | 0.567 |
| | RCR | 4.060 | 0.934 |
| | RPS | 4.020 | 0.994 |
| | RSW | 4.200 | 0.850 |
| | RAS | 4.130 | 0.773 |
| | RGV | 3.190 | 0.821 |

4.3 Regression Analysis: Influence of Independent Variables on Broadband Intention (BI)

Ordinary Least Squares Regression was employed to fit a linear probability model (Table 7). The regression analysis (Table 9) was performed with broadband intention (BI) as the dependent variable and a total of ten constructs i.e, Relative advantage (RA), Utilitarian outcomes (UO), Hedonic outcomes (HO), Referents influence (RI), Perceived declining cost (PD), Facilitating conditions (FC), Perceived knowledge (PK), Self efficacy (SE), Perceived ease of use (PE), and Social outcomes (SO).

The adjusted R square of the emerging model (Table 8) was 0.820 (F(10,161)=74.365, p <0.001). Four of the predictor variables included in the analysis were found to be very significant (Table 9). These are relative advantage RA (β = 1.008, p < 0.001), self efficacy SE (β = 1.012, p < 0.001), facilitating conditions FC (β = 0.647, p <0.001), and perceived knowledge PK (β = 0.460, p = 0.087). These were closely followed by hedonic outcomes HO (β = 0.220, p <0.001), perceived declining cost PD (β = 0.199, p =0.035), and perceived ease of use PE (β = 0.127, p =0.001), which were moderately significant for explaining the variation in BI. However, the utilitarian outcome



(UO), referents influence (RI), and social outcome (SO) predictors were found to be insignificant, Table 9.

The size of β suggests that the self efficacy construct had the largest impact in the explanation of variations of broadband intention, followed by relative advantage, facilitating conditions, and perceived knowledge about broadband. Hedonic outcomes, perceived declining costs of broadband services, and perceived ease of use had moderate impact on the variation of BI while the utilitarian outcomes, referents influence, and social outcomes predictors were found to be insignificant.

| | | | | | |
|----|-------|------|-------|--------|------|
| HO | .716 | .039 | .220 | 4.479 | .000 |
| PD | .172 | .081 | .199 | 2.125 | .035 |
| PE | .087 | .025 | .127 | 3.487 | .001 |
| PK | .205 | .119 | .460 | 1.725 | .087 |
| RA | .715 | .112 | 1.008 | 5.850 | .000 |
| RI | -.017 | .104 | -.015 | -1.165 | .869 |
| SE | .486 | .129 | 1.012 | 3.763 | .000 |
| SO | .126 | .136 | .116 | .925 | .356 |
| UO | -.069 | .037 | -.102 | -1.871 | .063 |

a. Dependent Variable: BI

Table 7. Model Summary

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|-------|-------------------|----------|-------------------|----------------------------|
| 1 | .912 ^a | .831 | .820 | .236 |

a. Predictors: (Constant), UO, PK, PE, FC, HO, RI, PD,SO,RA,SE

Table 8. ANOVA^b

| Model | | Sum of Squares | Df | Mean Square | F | Sig. |
|-------|------------|----------------|-----|-------------|--------|-------------------|
| 1 | Regression | 41.376 | 10 | 4.138 | 74.365 | .000 ^a |
| | Residual | 8.402 | 151 | .056 | | |
| | Total | 49.778 | 161 | | | |

a. Predictors: (Constant), UO, PK, PE, FC, HO, RI, PD,SO,RA,SE

b. Dependent Variable: BI

Table 9: Regression Analysis: Coefficients (Dependent variable: Broadband Intention)

| Coefficients ^a | | | | | | |
|---------------------------|------------|-------------|-----------|------|-------|------|
| Model | | Unstd. Coef | | Beta | T | Sig. |
| | | B | Std.Error | | | |
| 1 | (Constant) | .651 | .273 | | 2.385 | .018 |
| | FC | .619 | .124 | .647 | 5.009 | .000 |

5. DISCUSSION AND RECOMMENDATIONS

The appropriate level of internal consistency of the measures used in this study, and the ability of the constructs to measure the same content universe is demonstrated by the cronbach's α value of the various constructs ranging from 0.608 to 0.978, with nearly all the constructs possessing high and above reliability.

The predictive power of the regression model of this study, with adjusted R^2 of 0.820 (Table 7), suggests the appropriate level of explained variance [24]. This means that the independent variables considered in this study are important for understanding broadband adoption in Kenya.

The findings of this study therefore, generate a number of issues that may assist players in the ICT eco-system [1] i.e policy makers, ICT regulators, broadband service providers, academia, ICT experts and the general public for informed decision making and in assessing broadband adoption in Kenya [8][9].

Considering the study findings, it emerges that in order to improve broadband adoption in Kenya, stakeholders have to, in addition to the traditional “push” scenarios where Government and service providers lay emphasis on building or rolling out broadband services [25] which of course would improve on factors like declining cost and facilitating conditions, consider emerging factors for broadband adoption as well. For example, improving digital literacy [9] would impact both the perceived knowledge about broadband and perceived ease of use, factors which had significant impact on broadband adoption in this study. This also has implications for broadband service providers, both in the fixed and mobile market segments. The service providers have to re- think all-inclusive consumer-centric services and price plans so that all consumers who want to subscribe to broadband



are able to, including individuals within the lower income groups. This may help to increase the number of broadband subscriptions and hence spur up broadband adoption rates.

In this study, self efficacy is found to be a very influential construct towards consumers' intention to adopt broadband in Kenya. The items used to measure this construct included previous internet skills, ability to operate computers and ability to operate handheld "smart" devices. This suggests that there is a need to stimulate interest in ICT related courses in institutions of learning, and equip citizens with the skills to use computers and the internet in general. It would be 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 seen as key in improving the digital literacy of the masses. However, a comprehensive strategy is required to improve ICT expertise and further catalyse the digital literacy of the masses. Availability of diverse digital and on-line content in the local languages is just one of the efforts that will bear fruit [9].

Relative advantage of broadband internet over its predecessor narrowband internet was also very influential in explaining variations in broadband intention. Considering the items used to measure this construct, notably faster download speeds, higher reliability, better quality of service and better quality of experience, policy makers and regulators are called upon to foster an appropriate enabling environment. For example service and platform competition would spur improvement in download speeds, reliability, quality of service and quality of experience. Availability of a national broadband strategy would also serve as blueprint for broadband development and clearly set targets of download and upload speeds, among others. Recognising the role played by nomadic and wireless devices in broadband access in developing economies [1][9][14], achievement of the above requirements would impose a corresponding requirement for additional radio frequency spectrum for service providers to provide mobile broadband. The ITU's World Radio Conference, at its last meeting (WRC 2012), proposed studies on the allocation of extra spectrum resulting from the analogue-to-digital television switch over (digital dividend), to broadband and other advanced mobile telecommunication services.

In the facilitating conditions category, the researchers analysed the impact of a number of factors on the consumers' intention to adopt broadband. Key impact items on broadband adoption include availability of electricity supply, reliability of broadband connections, availability of diverse access technologies, and

choice of different service providers. What emerges here is the multi-stakeholder nature the broadband eco-system [1]. The government, private sector and other partners could foster programmes like the rural electrification or subsidise the cost of electricity to consumers as well as explore alternative energy sources, notably solar systems, given Kenya is located in the tropics with plenty of sunshine. Availability of electricity for charging mobile devices or powering fixed broadband terminals, computers etc is a possible facilitator to broadband adoption. This also calls for re-thinking new programmes inclusion in universal access and service (UAS) efforts. Previously, in most countries UAS efforts covered provision of ICT facilities without much regard to the pre-requisite sustainable source of energy for the installations.

The availability of diverse content item brings to the fore the need for service providers, content developers, content providers and aggregators to re-invent value added services (VAS) and applications (Apps). Value added services (VAS) and Apps are fast becoming a major part of the revenue mix for telecom and media companies with mobile data accounting for up to 40 percent of revenues in some developed economies [11]. Recent research shows that mobile VAS and Apps could help to build stronger relationships between service providers and consumers [1][11]. For the consumer, Mobile VAS and Apps could provide the most affordable method for millions of people to access entertainment, news, information, markets, finance, governance, and other services previously unavailable to them. The more benefits customers receive, the more likely they will make new subscriptions or continue to use the broadband service.

The hedonic outcomes construct was found to moderately explain the variation in broadband intentions. The items used to measure this construct point to the need to encourage audio/video streaming and newer applications like video based social networking and on-line gaming. Key to the achievement of these targets is the availability of the necessary bandwidth, and relevant content. Referents influence thorough peers, workmates, and campaigns/ advertisements by service providers for consumers to take up VAS and Apps services is necessary. Service providers could target campaigns through popular social networking websites, such as Facebook, Twitter, You Tube and others.

In the utilitarian outcomes construct, information search could be enhanced by improving digital literacy, providing broadband services, and relevant content. The Government could take a lead in the provision of broadband services to Government institutions, health institutions and educational facilities and public access points where the use of broadband, both fixed and mobile could be made free or be appropriately subsidised.

The above measures, if appropriately put in place, would support most of the items of the declining cost of broadband services



construct (PD), which was moderately indicated for the variations in broadband intentions. The individual items of these construct that are set to benefit from the above recommendations would include declining cost of computers and mobile devices, declining cost of initial and monthly (or periodic) broadband subscriptions, and lower maintenance costs of broadband services. The Government on its part could consider waiving or appropriately reducing taxation on ICT services, including investment in the sector, costs of computers and mobile devices, further lowering of interconnection rates (both voice and data) between service providers, and removing or lowering taxes on airtime. On overall, this will result in more affordable broadband services and hence spur broadband adoption.

6. LIMITATIONS AND FUTURE WORK

Several limitations in this study are presented. As the research was conducted within Nairobi city, the findings may not be directly applicable in other geographical areas or across other cultural environments. However, since broadband deployment and adoption is still in its embryonic stage in Kenya, Nairobi city still presents the best possible sample space for broadband investigation in Kenya.

The sampling methodology was limited to snowballing technique because of the inability to have adequate advance information on broadband services users, especially due to increasing access through mobile and nomadic devices. Hence the homogeneity of target respondents may not necessarily be suitable to provide a complete picture to generalize for the Kenyan population as a whole. Future research, subject to the diffusion of broadband, could emphasize more on conducting a cross-country survey on the adoption of broadband. Further, this study does not take into consideration cross-construct or item correlation. Therefore, it is recommended that future research moderate constructs in order to examine cross-relationships among the adoption factors.

Another limitation was 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 studies of a similar nature by employing a longer data collection period, supplemented by interviews.

7. CONCLUSION

This study examined the factors affecting broadband adoption in a developing country context, in this instance, Kenya. Based on the findings and discussions above, ten influential constructs were identified to explain consumer's behavioral intention to adopt broadband in Kenya. These are self efficacy (SE), relative

advantage (RA), facilitating conditions (FC), perceived knowledge (PK), hedonic outcomes (HO), perceived declining costs (PD) of broadband services, perceived ease of use (PE), social outcomes (SO), utilitarian outcomes (UO), and referents influence (RI). Thus the first research question presented in the introductory section has been verified. Statistical analysis has showed that only seven constructs are very significant in explaining the consumers' behavioural intention to adopt broadband in Kenya, thus answering research question number two. These are self efficacy (SE), relative advantage (RA), facilitating conditions (FC), perceived knowledge (PK), hedonic outcomes (HO), perceived declining costs (PD) of broadband services, and perceived ease of use (PE). Finally, self efficacy (SE), relative advantage (RA), facilitating conditions (FC), and perceived knowledge (PK) were identified as the major factors influencing consumers' intentions to adopt broadband in Kenya thus verifying the third research question for this study.

Attention of all stake-holders in the broadband eco-system is drawn to the factors that are reported as significant in order to improve the adoption and diffusion of broadband in Kenya.

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