Volume 22 Issue 37
Originally issued as E6



Global Journal of HUMAN-SOCIAL SCIENCE: E
Economics
Volume 22 Issue 6 Version 1.0 Year 2022
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-460x & Print ISSN: 0975-587X

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By Mengue Charly & Fomba Kamga Benjamin
University of Yaoundé 2

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Keywords: *internet, use, individuals, activities, logit.*

GJHSS-E Classification: *JEL Code: C25, O31, O33*



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Internet use in a Central African Country: An Evidence of Cameroon

Mengue Charly [α] & Fomba Kamga Benjamin [σ]

Abstract- The objective of this study is to identify the different activities that motivate individuals to use the Internet in Cameroon. Specifically, this is to show that activities related to the search for information online, academic activities online, activities on digital social media, listening and downloading music online, online watching and movie download, online purchases and sales, online administrative services and online sports activities motivate the use of the Internet by individuals in Cameroon. The methodology implemented uses data from the survey of the practice of new digital media in Cameroon (PRANOME) carried out in 2021 in the cities of Yaoundé, Douala, Mfou, and Soa under the supervision of the Center of Research in Economic and Management (CEREG) of the University of Yaoundé 2-Soa in Cameroon. The results of the estimates made on the basis of the binary Logit model show that Internet use has a positive and significant effect at the 1% level on the activities of listening and downloading online music, watching and for downloading movies online; searching for information online and on digital social media. This Internet use also has a positive and significant effect at the 5% level on online academic activities, and a positive and significant effect at the 10% level on activities related to online administrative services, purchasing and online sales; and online sports activities.

Keywords: internet, use, individuals, activities, logit.

I. Introduction

The Internet was the result of vast military and scientific research projects in the sixties in the United States, and one of the most important revolutions in the modern history of mankind, sometimes assimilated today to the third industrial revolution (Pénard and Rallet, 2014; Rifkin, 2012). Internet can be defined as a global network which itself is englobed by a multitude of computer networks of local, regional, national or continental dimension linked to each other (Balle, 2006). This medium which is in fact a dynamic interconnection of multiple computer subnets from around the world, has undeniably brought a touch in the reduction of time and distances between people, the whole earth would have become a global village in short because all the economic agents (households, businesses, administrations, individuals, ...) who can be able to connect anywhere in the world. Control of Internet service is nowadays and will remain for a long time to come a symbol of the power of States, an important engine of growth and a lever of economic and social development (Niebel, 2018). The Internet is the bedrock of the information society in which we live today in the world, so we must not stay away from this vast planetary movement which is fatal for those regions of the world that have deliberately chosen to marginalize themselves. Internet access and even its practice remains today a real equation to be resolved in several countries of the planet and especially for those of Central Africa located south of the Sahara.

Over the past two decades Africans have become more interested in the Internet, this can be seen through their daily connection time which continues to grow on the continent. This connection is made through several means, namely browsing on phones, computers, using the connection speed in Internet cafe, workplaces and also from homes. This Internet penetration in Africa is increasing by around 27% per year on average according to the estimates of the International Telecommunications Union, which adds that nevertheless Africa remains the least connected continent with only 16% of the population with Internet access is half that of the Asia-Pacific zone between 2009 and 2017.

Internet made its appearance in Cameroon in April 1997 with Cameroon Telecommunication (CAMTEL) as the main access provider. But it was not until two years later in April 1999 with the opening of a node in the city of Douala, the economic metropolis, that the Internet began to be disseminated and spread throughout the national territory. Although access to broadband (2Mbits) has been easier since 2005 with the use of optical fiber and docking with the SAT-3 / WASC cable, the development of the sector is hampered by the state of infrastructure and the slow deployment of optical fiber. In order to improve the quality of the network, an optical fiber line with a 6,000 kilometer long submarine cable was built connecting the towns of Kribi in Cameroon and Fortaleza in Brazil (connecting Africa and the Americas), which has been operational since September 4, 2018. Note that this fiber optic submarine cable becomes the fourth fiber optic submarine cable to land in Cameroon after the SAT-3, the Wacs and the NCNCS (Nigeria and Cameroon Net Work Cable System).

According to the Telecommunications Regulatory Agency (ART), Cameroon has at her

Author α: Ph.D Student in Economics, Faculty of Economics and Management, University of Yaoundé 2-Soa-Cameroon.
e-mail: charlymengue@yahoo.fr
Author σ: Professor of Economics, Faculty of Economics and Management, University of Yaoundé 2-Soa-Cameroon.
e-mail: fomba1@yahoo.fr

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disposal more than 25,000 kilometers of fiber optic lines internally, for connection speeds ranging from 56 Kilobits / s to 2048 Kilobits / s on average; the country has more than 50 internet service providers. The number of Internet subscribers continues to increase in Cameroon; we have gone from 3,547 subscribers in 2006 to more than 10 million in 2021 according to the Ministry of Posts and Telecommunications. Thus, 6 million Internet users are regularly active on the Internet today, ie more than 26% of the population, estimated at more than 25 million. This increase in the number of subscribers proves that the Internet has become an essential consumer good in the world today, its importance appears unequivocal because many Internet users can no longer do without this network (Bourreau and Perrot, 2020; Beuve et al., 2020).

In Cameroon, studies on Internet access have mostly focused on the various first and second order digital divides (Bakehe et al., 2017; Fambeu and Bakehe, 2015; Tamakwe, 2013; Mukoko, 2012). Thus the originality of our study to outline is to be able to study what exactly individuals do on the Internet in Cameroon when they are connected, hence the importance of our study. We rely on this work on a theoretical literature of innovation and the economics of networks (Pénard and al., 2015; Vega-Redondo, 2007; Cohendet and al, 2003; Bandura 2003; 1997; Pénard, 2003; Buskens, 2002; Rauch and Casella, 2001; Slikker and Van den Nouweland, 2001; Arrow, 1998; Gallegati and Kirman, 1999; Rogers, 1995; Mallein and Toussaint, 1994; Ram, 1987; Katz and Shapiro, 1985). And on an empirical literature that shows how Internet use can be motivated by the practice of certain online activities (VanHoose, 2021; Poulet and Ruffo de Calabre, 2021; Routabi and Bennami,2021; Daniel, 2020, Zhao, 2020; Kretschmer and Peukert, 2020; Schweitzer, 2019; Aguiar and Martens, 2016; Penard and al., 2015; Zolkepli and Kamarulzaman, 2015; 2011; Lee and Ma, 2012; Bekkers and al., 2012; Cheung and al., 2010; Diddi and LaRose, 2006).

The objective of this study is to identify the different activities that motivate individuals to access the Internet in Cameroon. As a hypothesis, it is a question of showing that the use of the Internet has a positive effect on the search for information online, academic activities online, digital social media, listening and downloading of music online, online watching and downloading of movies, online shopping and sales, online government services and online sporting activities. To carry out our study, the research methodology is focused on an empirical study which consists in identifying the activities of individuals on the Internet in Cameroon. We are using data from the survey of the practice of new digital media in Cameroon (PRANOME) carried out in 2021 in the cities of Yaoundé, Douala, Mfou, and Soa under the supervision of the Center of Research in Economic and Management (CEREG) from the University of Yaoundé 2-Soa in Cameroon. The influence of Internet use on the activities of individuals is analyzed using a dichotomous Logit model. In the rest of our work, we show in turn the review of the literature, the methodology used, the descriptive statistics, the results of the estimations and the analysis and interpretations.

II. Literature Review

In this part, we will bring out on the one hand, the theoretical literature which revolves around the theory of the diffusion of an innovation and the economic theory of networks contributing to the use of the internet, and on the other hand, the empirical literature which presents the activities of individuals on the Internet which motivates them to use it more and more.

a) Theoretical Literature

Several theories have been developed regarding the adoption of an innovation in general and regarding Internet access in particular. We have among others the theory of diffusion of Rogers (1995), the theory of resistance to an innovation of Ram (1987), the theory of the social acceptability of an innovation of Mallein and Toussaint (1994), the theory Bandura's social learning and self-efficacy (1997; 2003). Beyond the theories related to adoption, a capital theory that explains the adoption of the Internet which is a network good is the theory of network economics (Vega-Redondo, 2007; Cohendet and al, 2003; Buskens, 2002; Rauch and Casella, 2001; Slikker and Van den Nouweland, 2001; Arrow, 1998; Gallegati and Kirman, 1999).

Thus the theory of the three layers of the network economy affirms that for a network good like the Internet to be able to gain notoriety by reducing digital divides it is essential that these three layers be highlighted. Network services and Internet applications correspond to the upper layer of the network (Third layer), the lower layer corresponds to the physical infrastructure (first layer) and the intermediate layer to the info-structure or to the control or control networks. Infrastructure management (second layer). These different layers characterize in a way a network good (Internet) comprising both a physical infrastructure (link, switches, etc.) and the services provided on this infrastructure. Network economics theory shows that network services develop economies of scale among consumers (Internet users) and producers (online service providers). These economies of scale are at the origin of positive feedback phenomena between supply and demand for services and generate original diffusion dynamics (Penard and al., 2015; Penard, 2003; Katz and Shapiro, 1985).

b) Empirical literature

The empirical literature shows that individuals connect to the Internet for searching online information,

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for online academic activities of which there is a positive effect of Internet use on the practice of academic activities (Allen and al., 2020; Daniel, 2020, Zhao, 2020; Kaplan and Haenlein, 2016) and searching for information online (Penard and al., 2015; Lee and Ma, 2012; Cheung and al., 2009; Cheung and al., 2008; Diddi and LaRose, 2006). Similarly, studies have shown a strong influence of Internet use on activities linked to social networks (Zolkepli and Kamarulzaman, 2015; 2011; Pai and Arnott, 2013; Boyd and Ellison, 2013; Cardon, 2011; Kaplan and Haenlein, 2011; Sledgianowski and Kulviwat, 2009). Thus the use of the Internet has a positive effect on the activities of individuals related to listening and downloading music and movies online (Kretschmer and Peukert, 2020; Schweitzer, 2019; Aguiar and Martens, 2016; Crane, 2014; Sonnac, 2013).

The administrative services have not been left out since the advent of the corona virus (Covid-19) pandemic in the world, the first case of which was declared on March 06, 2020 in Cameroon, the use of e-administration continues to increase in the country because of the application of barrier measures taken by the government. This as well as that there is a positive effect of the use of Internet on the activities related to the administrative services (Routabi and Bennami, 2021; Satry and Belkadi, 2019; Bekkers and al., 2011; Homburg, 2008; Bekkers and Homburg, 2005; Wimmer and al., 2005). Internet adoption also has a positive effect on online shopping and sales (VanHoose, 2021; Bloomenhal, 2021; Le Guel and al., 2005; Ziaul Hoq and al., 2005; Manchanda and al., 2002; Johnson and Whang, 2002) and on online sports activities (Naraine and Parent, 2017).

III. Methodological Framework

In this part, we will present the data of our study from a statistical survey, the variables of our study and the presentation of the study model.

a) Study data

To carry out our study, we used data from the survey of the practice of new digital media in Cameroon (PRANOME) carried out in 2021 in the cities of Yaoundé, Douala, Mfou, and Soa under the supervision of the Center of Research in Economic and Management (CEREG) from the University of Yaoundé 2-Soa in Cameroon. Our unit of analysis is the individual, so 1057 observations were retained in the sample after purification of the PRANOME database.

b) Study variables

The variables that we have retained to show the effect of Internet use on the activities of individuals online are the dependent variable and the explanatory variables. The dependent variable Y represents the use of the Internet by individuals which is presented in our database by the access of individuals to the Internet. The PRANOME survey shows that an individual who accesses the Internet actually uses it. The independent variables can be listed in two categories the first represent the variables related to the activities of individuals on the Internet which are the search for information, academic activities, digital social networks, listening and downloading of music online, watching and downloading movies online, buying and selling online, administrative services and online sports activities. The second control the first and are made up of socioeconomic and sociodemographic variables such as sex, age, marital status, having a diploma, having a job, place of residence, income, access to a mobile phone and/or to a computer.

c) The binary Logit model

We construct a binary variable Yi which is equal to 1 if the individual uses the Internet and 0 if the individual does not use the Internet. We can then associate with this variable Yi, a value Yi^* which corresponds to the usefulness of the individual when he chooses to connect. This variable Yi^* depends on the activities of individuals on the Internet and on the socioeconomic and socio-demographic characteristics noted (Xi) and on an error term (Ui), namely

$$Yi^* = Xi\beta + Ui.$$

This utility is random due to the presence of the error term Ui. We can then define a selection criterion for the individual. If the utility he gets from using the Internet is greater than a certain value (C), he will choose to connect to the Internet, but if his utility is less than this value, he will choose not to connect of which not to use the Internet.

We thus have:

$$\begin{cases} Yi = 1 \text{ if } Yi^* > C \\ \text{With } Yi = 1 \text{ if the individual uses the Internet and } Yi = 0 \text{ otherwise} \\ Yi = 0 \text{ if } Yi^* \leq C \end{cases} \quad (1)$$

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The realization of Yi (observable) comes from an underlying model, expressed by the latent (unobservable) variables Yi*.

The decision rule then becomes:

$$\begin{cases} P(Yi = 1) = P(Xi\beta + Ui > C) = 1 - P(Ui \leq C - Xi\beta) \\ P(Yi = 0) = P(Xi\beta + Ui \leq C) = P(Ui \leq C - Xi\beta) \end{cases} \quad (2)$$

P (Yi = 1) denotes the probability that the individual will use the Internet and P (Yi = 0) the probability that he will not use the Internet. In order to calculate these probabilities, it is necessary to specify a statistical distribution for the error terms (Ui). Two possibilities are generally used. It is assumed that the error term follows a normal distribution (Probit model) or that they follow the logistic distribution (Logit model). So in our work, we choose to use the binary Logit model because of its fluidity in handling. The Logit model has the following properties:

→ The error term U follows the logistic law Λ with mean 0 and standard deviation ∏2/3 or U~Λ (0; ∏2/3).

→ The distribution function is $\Lambda(X\beta) = \frac{\exp(X\beta)}{1+\exp(X\beta)}$ (3)

As the threshold value (C) can be normalized to 0 (Thomas, 2000), and given the logistic distribution, we can write the possibilities of Internet use as follows:

$$\begin{cases} P(Yi = 1) = \frac{\exp(Xi\beta)}{1+\exp(Xi\beta)} \\ P(Yi = 0) = \frac{\exp(-Xi\beta)}{1+\exp(-Xi\beta)} \end{cases} \quad (4)$$

P (Yi = 1) denotes the probability that the individual uses the Internet and P (Yi = 0) represents the probability that the individual does not use the Internet. The estimation of the Logit model is based on the maximization of the log-likelihood. Hence we have the likelihood function which is written as follows:

$$L(y, x, \beta) = \prod_{i=1}^{N} \left[\frac{1}{1+\exp(Xi\beta)}\right]^{1-yi} \left[\frac{\exp(Xi\beta)}{1+\exp(Xi\beta)}\right]^{yi} \quad (5)$$

By linearizing the likelihood function, we obtain the log-likelihood function as follows:

$$lnL(y, x, \beta) = -\sum_{i=1}^{N} \{ln[1+\exp(Xi\beta)] - Yi.Xi.\beta\} \quad (6)$$

IV. Results

We present in this part results, descriptive statistics, the results of the logistic regression and the marginal effects of the binary Logit model.

a) Descriptive statistics results

The results of the descriptive statistics in Table 1 show that on average 90.5% of the individuals surveyed have access to the Internet, 96% have at least one mobile phone, 21.8% have at least one computer, 52.6% are male (the female sex being the reference category), 56.4% are single (the couple being the reference category), 70.5% live in an urban area (the semi-urban area being the reference category), 99.1% have at least the first diploma of schools studies, 56.6% have at least one job in the formal or informal sector. 76.7% and 54.6% of individuals say they connect to the Internet for the activities of listening and downloading

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music online and watching and downloading movies online respectively. On average 59.7% of individuals go online for digital social media activities, 75.5% for the search of information, 22.2% for administrative services, 21% for sports activities, 20,1% for online purchases and sales(e-commerce).

Table 1: Descriptive statistics

Variables	Definitions	Observations	Means
Internet access	1 = Yes 0 = No	1057	0.905 (0.122)
Watching / downloading movies	1 = Yes 0 = No	1057	0.546 (0.498)
Listen / download music	1 = Yes 0 = No	1057	0.767 (0.423)
Digital social media	1 = Yes 0 = No	1057	0.597 (0.491)
Information search	1 = Yes 0 = No	1057	0.755 (0.431)
Academic activities	1 = Yes 0 = No	1057	0.562 (0.496)
Administrative services	1 = Yes 0 = No	1057	0.222 (0.416)
Sports activities	1 = Yes 0 = No	1057	0.210 (0.408)
Purchases / sales activities	1 = Yes 0 = No	1057	0.201 (0.401)
Mobile phone access	1 = Yes 0 = No	1057	0.960 (0.197)
Computer Access	1 = Yes 0 = No	1057	0.218 (0.500)
Sex	1 = Male 0 = Female (Ref)	1057	0.526 (0.500)
Age	Quantitative	1057	30.48 (10.66)
Marital status	1 = Single 0 = Couple (Ref)	1057	0.564 (0.496)
Place of residence	1 = Urban 0 = Semi Urban (Ref)	1057	0.705 (0.456)
Monthly income	Quantitative	1057	10.57 (0.684)
Diploma	1 = Yes 0 = No	1057	0.991 (0.097)
Job	1 = Yes 0 = No	1057	0.566 (0.496)

Source: Author based on PRANOME data. Values in parentheses are standards deviations. Ref: reference category.

b) Logistic Regression Results: Analysis and interpretations

Table 2 of the results of the model estimates highlights the coefficients and the marginal effects. The numerical value of the coefficients of the dichotomous Logit model not having a direct interpretation, the effect of the variables on the probability of individuals to use the Internet is assessed through the calculation of the marginal effects. Table 2 below indicates that the model is globally significant, because the limited probability associated with this estimate is less than 1% (Prob> chi2 = 0.0001). The model's goodness-of-fit indicator (R^2) to Mc Fadden data (Pseudo-R^2 = 0.4725) is quite significant. This shows that the model estimate is valid. It should be noted that the multiple coefficient of determination of Mc Fadden (Pseudo-R^2) is between 0 and 1 and measures the proportion of the variability of the dependent variable which is explained by the independent variables contained in the model, it indicates the quality of the model.

In view of the results of the estimations obtained and presented in Table 2, we observe a positive and significant relationship on Internet use and the practice of online music listening and downloading, online movie downloading and watching activities, information search, academic activities, administrative services, sports activities, online shopping and sales, digital social media. Indeed, the coefficient associated with the digital social media variable is positive and significant at the 1% level, so the calculation of marginal effects shows that the probability of an individual using the Internet increases by 9.9% when activities on social media digital numbers of this individual grows by 1%. Ceteris paribus, the coefficient associated with the variable listening to and downloading music online is positive and significant at the 1% level, thus the calculation of the marginal effects shows that the probability of an individual using the Internet increases by 8.4% when online music listening and downloading by the individual grows by 1%. The coefficient associated with the variable watching and downloading movies online is positive and significant at the 1% level, therefore the analysis of the marginal effects shows that the probability of an individual using the Internet increases by 6.8% when watching and this individual's online movie download grows by 1%.

The coefficient associated with the online information search variable is positive and significant at the 1% level, so the calculation of the marginal effects shows that the probability of an individual using the Internet increases by 5.1% when the online information search of this individual's line grows by 1%. The coefficient associated with the online academic activities variable is positive and significant at the 5% level, so the results of the marginal effects show that the probability of an individual using the Internet increases by 1.9% when the online academic activities of this individual grows by 1%. The coefficients associated with the variables online administrative services, online purchases and sales and online sports activities are positive and significant at the 10% level. Thus the calculation of the marginal effects shows that the probability of an individual to use the Internet increases by 0.3% when the online administrative services of the

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individual increases by 1%, this probability increases by 0.9% when the purchases and the individual's online sales increases by 1% and by 1.1% when the individual's online sports activities increase by 1%.

It is the same with regard to socioeconomic and socio-demographic variables we observe a positive and significant effect on variables such as having a mobile phone, a monthly income, a job, a diploma. The coefficient associated with the variable having a cell phone (mobile) is positive and significant at the 1% level, therefore the results of the marginal effects show that the probability of an individual to use the Internet increases by 51.1% when the possession cell phone use by this individual grows by 1%. The coefficient associated with the variable having a monthly income is positive and significant at the 1% level, therefore the results of the marginal effects show that the probability of an individual to use the Internet increases by 16.4% when the possession of a monthly income by this individual grows by 1%. The coefficient associated with the variable having job is positive and significant at 10% level, therefore the results of the marginal effects show that the probability of an individual to use the Internet increases by 1.8% when the possession of a job by this individual grows by 1%. The coefficient associated with the variable having diploma is positive and significant at 10% level, therefore the results of the marginal effects show that the probability of an individual to use the Internet increases by 1.6% when the possession of a diploma by this individual grows by 1%.

Table 2: Regression of the binary Logit model

Variables	Regression	
	Internet access Coefficients	Internet access Marginal effects
Watching/downloading movies	2.762 ***	0.068 ***
	(1.942)	(0.025)
Listen / Download music	1.224 ***	0.084 ***
	(1.683)	(0.012)
Digital social media	1.292 ***	0.099 ***
	(1.855)	(0.087)
Information search	0.215 ***	0.051 ***
	(1.593)	(0.004)
Academic activities	3.634 **	0.019 **
	(1.958)	(0.044)
Administrative services	0.927 *	0.003 *
	(1.587)	(0.009)
Sports activities	1,955 *	0.011 *
	(1.379)	(0.002)
Purchases / sales activities	0.752 *	0.009 *
	(1.620)	(0.007)
Mobile phone access	6.399 ***	0.511 ***
	(2.582)	(0.017)
Computer Access	0.443	0.011
	(1.566)	(0.005)
sex	1,251	0.033
	(1.449)	(0.001)
Age	0.145	0.037
	(0.603)	(0.002)
Age squared	-0.0107	-0.027
	(0.0104)	(0.008)
Single	1,256	0.005
	(1.023)	(0.002)
Place of residence Urban	1.031	0.023
	(1.551)	(0.006)
Monthly income	4.089 ***	0.164 ***
	(1.713)	(0.026)
Diploma	0.249*	0.016*
	(0.360)	(0.002)
Job	1.637 *	0.018 *
	(1.393)	(0.006)
Constant	-42.70 **	
	(21.06)	

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Observations	1057
LR Chi2	29.74
Prob> Chi2	0.0001
Nickname R2	0.4725
Log likelihood	-16,599

Source: Author based on PRANOME data. Values in parentheses are standard deviations.
*Significance: * (1%), ** (5%), *** (10%)*

V. Conclusion

The objective of this study was to identify the different activities that motivate individuals to access the Internet in Cameroon. To achieve this objective, the methodology implemented used data from the survey of the practice of new digital media in Cameroon (PRANOME) carried out in 2021 in the cities of Yaoundé, Douala, Mfou, and Soa under the supervision of the Center of Research in Economic and Management (CEREG) from the University of Yaoundé 2-Soa in Cameroon. The influence of Internet use on the activities of individuals was analyzed using a dichotomous Logit model.

Hence, the results of the estimations carried out on the basis of this binary Logit model show that Internet use has a positive and significant effect at the 1% level on the activities of listening and downloading music online, listening and downloading movies online, searching for information online and on digital social media. This Internet use also has a positive and significant effect at the 5% level on online academic activities, and a positive and significant effect at the 10% level on activities related to online administrative services, purchasing and online sales (e-business), and online sports activities. So the activities that motivate individuals to use the Internet in Cameroon are among others listening and downloading music online, watch and download movies online, search online information, digital social media, online academic activities, online administrative services, online purchases and sales.

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