

Influence of Mobile Technology Usage on Productivity Efficiency of Rural Households in Nasarawa State

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Abstract

This study determined the influence of mobile technology usage on productivity efficiency of rural household of the Nasarawa state. The study identified the level of access to the various forms of mobile technology, the indices for effect of mobile technology usage on the productivity efficiency of rural household and the level of awareness of rural households about the services provided by various forms of mobile technology in Nasarawa state. The population for this study consists of the entire 621,081 rural households in Nasarawa state, Nigeria from which 400 heads of rural households were selected as the sample. The instrument for data collection was a structured questionnaire. The instrument was validated three experts while the validated instrument was trial tested in Benue state and the result obtained was subjected to reliability analysis using Cronbach Alpha which yielded a reliability coefficient of 0.78. Data was analyzed using simple percentages, frequency mean and chi-square statistics. The findings of the study revealed that; cell phones were the major type of information technology used by rural household, they were highly accessed while reduction in frequent travels among others were found to be the effect of mobile technology usage on production efficiency. General awareness about the services that can be provided by mobile technology revealed that rural households were more aware of services related to cell phone mobile technology. It was further revealed that mobile technology usage has significant effect on productivity efficiency of rural household of the Nasarawa state. Based on the findings of the study, it was recommended amongst others that awareness should be created about the functions/usefulness of all other forms of mobile technology and should be made accessible.

Key Words: Technology, Mobile, Mobile Technology, Productivity efficiency, Rural Households.

Introduction

Technology has several definitions as viewed by different scholars across different fields of studies. According to the view of Psychologists, technology is defined as entities, both material and immaterial, created by the application of mental and physical effort in order to achieve some value (Arthur, 2015). In sociology, technology is viewed as an activity that forms or changes culture (Brookings Experts, 2016). Additionally, technology is the application of mathematics, science and the arts for the benefit of life. In philosophy, technology is defined as the knowledge of the manipulation of nature for human purposes. Technology depends on a base in the natural world (science) but extends to natural world through the phenomenon of manipulation (Engineering) (Arthur, 2015). In humanities generally, technology refers to a collection of techniques. In this study, technology is the current state of humanity's knowledge of how to combine resources to produce desired products to solve problems, fulfill needs or satisfy wants of rural households. It includes the application of technical methods, skills, processes, techniques, tools and raw materials to produce desired products for human use (Gazi, 2017). One of the most recent technological advancement which formed the basis for increased productivity

and efficiency in developing countries including Nigeria, is the discovery and use of mobile technology among citizens.

Mobile technology is the technology used for cellular communication (Oluniyi, 2017). It is a technology which involves the mobile code division multiple access (CDMA) where a standard mobile device is not just a simple two-way pager but is a mobile phone, Global positioning system (GPS) navigation device, an embedded web browser and instant messaging client, and a handheld game console (Cosmas and David, 2011).

Mobile technology is exactly what the name implies – technology that is portable and can be taken around as one moves. Examples of mobile information technology (IT) devices include: laptop, tablets and notebook computers; smart phones; global positioning system (GPS) devices; Global system for mobile communication (GSM) phones (Gazi, 2017).

Mobile technology is a device such as personal digital assistant (PDA) or phone that can store, access, create, allow modifying, organizing, or otherwise manipulating data in various forms from a location without being required to be tethered to any particular spot. Such a device could be a simple personal digital assistant (PDA) like a stock handspring visor, palm operating system (POS) devices, which act merely as a vessel for a small amount of static information. It can also be as a complex intermec series 700 pocket personal computer (PC) device that incorporates a fast, new xscale 400MHz processor, barcode scanner, 802.11b, Bluetooth and Global system for mobile communication/General Packet Radio Services(GMS/GPRS) wireless communications, and a rugged case capable of withstanding several 5-foot drops on to a concrete floor. Such devices according to Tyler (as cited in Mala, 2011) can be used to store, access modify, and remote-connect to database ranging from structured query language (SQL) server to oracle. They can also fit in your pocket and typically run on rechargeable batteries.

Mobile technology provides tools and connecting that enhance the lives of those who have this access. With the introduction of mobile phones, there has been a sea change in the way people access and share information (Brookings, 2016). The GSM family of technologies has provided the world with mobile communications since 1991. In over twenty years of development, GSM has been continually enhanced to provide platforms that deliver an increasingly broad range of mobile services as demand grows (Global System for Communication Association, 2016).

With mobile devices becoming cheaper and network coverage growing stronger, the uptake of mobile technology is still on an upward swing. Given the ambiguity of mobile phones and their uses among a broad cross-section of the global population, many creative thinkers are harnessing the potential of mobile technology to bridge knowledge gaps, alleviate poverty and help our environment (Repair and Engineering Support Equipment Technology (RESET) Corporation, 2015).

The mobile technology which is an integral part of information and communication technology (ICT) has become one of the most important media of information communication of our time. The recent deregulation of mobile phone market in Nigeria has led to the introduction of the system for mobile communication (GSM) network provider operating on the 900/1800MHz spectrum, including MTN Nigeria, Airtel, Globacom, Etisalat, Multilinks among others for all individuals including rural households. In recent times rural households consist of people from other areas who migrate to certain villages for various activities. On arrival to new communities, they are embedded into community set-up and form a rural network (Ugwu, 2009).

Rural households connote people living in the rural villages in Nigeria with a population of usually less than 150 people per hectare (Coyle, 2005). They are normally people living outside areas considered to be non-urban areas. In Nigeria, rural households are usually members of a community related by family lineage (Gazi, 2011). Their productivity efficiency is a function of their connectivity to the digital world through appropriate technologies.

Productivity efficiency is a measure of the ratio of output to the input (Ajibatun, 2000). In the rural households, production efficiency entails a measure of the effective level of outcomes with respect to unique inputs. It is expected that every inputs should yield an output; thus, the output (which is the product) is expected to be more than the input for the household production to be efficient (Kebede, 2003). Productivity efficiency in rural household is measured in the following perspectives:

- High yield of crops and animals from farming activities at costs usually less than the outcome.
- Efficient communication between other members without having to journey about.
- Poverty reduction in the household
- Access to good education
- Profitable commercial activities
- Regular meetings to discuss community affairs
- Adequate food security
- Access to good farm inputs and agricultural techniques
- Lower wages and lower cost of living
- Access to health care, schools and security agencies.

Assessment of the current situation of mobile technology as it affects the productivity efficiency of rural households therefore becomes a thought provoking area of research that needs urgent attention. Thus, the basis for this research was to determine the influence of mobile technology usage on the productivity efficiency of rural households in Nasarawa state, Nigeria.

Statement of the Problem

So many resources in the rural set-up of Nigeria are wasted on daily basis as a result of poor efficiency of the rural households. Products cannot be processed or stored through appropriate technologies. Again, the people do not have access to good and efficient marketing channels of their products which are usually perishable Agricultural products.

Rural telecommunication density in Nigeria is quite low and this has been attributed to the scarcity of communication infrastructure in most parts of rural areas in Nigeria (Coyle, 2005). This situation has demonstrated the need for extension of ICT infrastructure especially mobile phones to many rural areas in developing countries including Nigeria with a view to enhancing rural populace access to the benefits of telecommunication infrastructure.

Many developing countries government and development agencies are focusing on extending ICT infrastructure into rural areas, as they seek to encourage growth, alleviate poverty and overcome the perceived “*digital divide*” (Samuel, Shah and Hadingham, 2005). This diffusion has brought communication to new groups of users, who hitherto were excluded from the telecommunications system.

However, despite this diffusion, there is no guarantee that the technology will be used to create and share the knowledge that could cause a change in the productivity efficiency of the rural households, thus the need to undertake a research on a study of mobile technology usage on the productivity efficiency of rural households in Nasarawa state.

Objectives of the Study

The objectives of the study were to:

- i. determine the level of access to various types of mobile technology among rural households in Nasarawa state;
- ii. ascertain the indices for effect of mobile technology on the productivity efficiency of rural households in Nasarawa state; and
- iii. determine the level of awareness of rural households on the services provided by mobile technology.

Research Questions

The following research questions were raised and answered for the study.

- i. What is the level of access to various types of mobile technology among rural households in Nasarawa state?
- ii. What are the indices for effect of mobile technology on the productivity efficiency of rural households in Nasarawa state?
- iii. What is the level of awareness of rural households on the services provided by mobile technology?

Hypotheses

Ho: Mobile technology usage has no significant effect on productivity efficiency of rural households in Nasarawa state.

Methodology

Research Design

The research design adopted in this study was the survey using. This is because the study sought the opinion of sampled respondents across rural households using a structured questionnaire and the result obtained was generalized on the entire population of the respondents in Nasarawa State, Nigeria.

Population

The population for this study is six hundred and twenty one thousand and eighty one (621,081) rural households heads in Nasarawa state Nigeria (National Bureau of Statistics, 2016). Nasarawa State was chosen as a result of the difficulty faced by the rural households in accessing Mobile technology devices.

Sample and Sampling

The sample for the study 400 respondents determined using Taro Yamane's formula. Simple random sampling was used to select the samples since the population was definite; this sampling

technique was the most suitable as it gives all subjects an equal opportunity of being selected to represent the population in the study.

Instrument for Data Collection

The instrument for data collection was a structured questionnaire titled "Mobile Technology Influence on Productivity Efficiency Questionnaire (MTIPEQ)". The questionnaire was developed based on extensive review of related literature. The Questionnaire consisted of items seeking the respondents' views on the research questions. Items were anchored on a four point rating scale of (strongly agree(4), agree(3) disagree(2) and strongly disagree(1) or very high(4), High(3), Low(2), very low(1) or highly aware(4), Aware(3), moderately aware (2) and Not aware(1) respectively.

Validity of the Test Instrument

The instrument was subjected to face and content validation. Three copies of the instrument were given to two experts in Home Science and Management and one expert in Measurement and Evaluation from University of Agriculture Makurdi. They were required to check appropriateness of items, content coverage, and clarity of language and suitability of the items. Based on the recommendations of the experts, necessary modifications were done before proceeding for data collection.

Reliability of the Instrument

To ensure the internal consistency of the Mobile Technology Influence on Productivity Efficiency Questionnaire (MTIPEQ), 15 copies of the questionnaire were administered on rural households in Benue state. The result obtained was subjected to reliability analysis using Cronbach Alpha (α) method. The analysis yielded a reliability coefficient of 0.91 indicating that the instrument is highly internally consistent.

Method of Data Collection

Four hundred (400) copies of the instrument (questionnaire) were administered through personal contact by the researcher and three research assistants who are familiar with the study area. The research assistants were properly given orientation by the researcher on how to administer to and retrieve completed questionnaire from the respondents. This procedure was adopted to ensure a high return rate. The entire 400 copies were retrieved (100%) and used for analysis.

Data Analysis Technique

Arithmetic mean was used to answer the research questions. While Chi-Square statistics (χ^2) was used to test the null hypothesis at 0.05 level of significance. These mean were used to determine the agreement level of the responses based on the four-point scale of 4, 3, 2 and 1. A mean of 2.50 was used as a cut off point for decision making for each item. Any item with a mean up to 2.50 was considered as "agree" while items with means less than 2.50 were considered disagreed for answering research question two while the real limits of numbers was used for decision making regarding research question one and three as follows: Very high/Highly aware= 3.50 – 4.00, High/Aware= 2.50 - 3.49, Low /Moderately aware= 1.50 - 2.49, Very low/Not aware = 1.00 – 1.49

Any item with a mean value of 3.50 to 4.00 was regarded as Very high/Highly aware, 2.50 to 3.49 was regarded as High/Aware, 1.50 to 2.49 was regarded as Low /Moderately aware while any item with a mean value below 1.50 was regarded as Very low/Not aware for research questions one and three respectively.

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The decision rule for rejection or otherwise of hypotheses was based on the chi-square calculated value ($\chi^2\alpha$) and the critical value (χ^2). A hypothesis of no significant effect was rejected for any cluster of items whose chi-square calculated value is greater than the critical value at 0.05 and with the specified degree of freedom while it was not rejected for any cluster of items whose chi-square calculated value is less than the critical value at 0.05 and with the specified degree of freedom.

Results

The results of the study are presented in Tables 1 to 4.

Table1: Mean Rating of Respondents on the Level of Access to Mobile Technology by Rural Household in Nasarawa State

S/N	Item Description	VH (4)	H (3)	L (2)	VL (1)	Mean	Remark
1.	Rural household have access to Simple cell phones	398 (99.50)	2 (0.50)	-	-	3.99	Very High
2.	Rural household have access to tablet computers	-	-	378 (94.50)	22 (5.50)	1.95	Low
3.	Rural household have access to mobile internet devices,	-	-	365 (91.25)	35 (8.75)	1.91	Low
4.	Rural household have access to Modular Devices	-	-	350 (87.50)	50 (12.5)	1.88	Low
5.	Rural household have access to smart phones	-	-	341 (85.25)	59 (14.75)	1.85	Low
6.	Rural household have access to mobile web devices	-	-	285 (71.25)	115 (28.75)	1.71	Low
7.	Rural household have access to mobile collaboration,	-	-	280 (70.00)	120 (30)	1.70	Low
8.	Rural household have access to Mobile computers	-	-	20 (5.00)	380 (95.0)	1.05	Low
Overall mean						2.005	

Results in table1 shows that the respondents have access to simple cell phones at a very high level (3.99) while the other forms of mobile technology indicated low access to tablet computers (1.95), internet device (1.91), modular devices (1.88), smart phones (1.85), mobile web device (1.71), mobile collaboration (1.70) and mobile computer (1.05). This result indicates that rural household members had access to less complicated forms of mobile technology. This may be attributed to either lack of awareness about the functions/usefulness of the other forms of mobile technology or lack of economic power to access the other forms of mobile technology.

Table2: Mean Ratings of Respondents on the Indices in Productivity Efficiency that can be attributed to Usage of Mobile Technology

S/N	Item Description	SA (4)	AG (3)	DA (2)	SD (1)	Mean	Remark
1	Reduction in frequent travels.	381 (75.25)	12 (3.00)	5 (1.25)	2 (0.50)	3.93	Agreed
2	Mobile technology has increased the Efficiency of Daily Activities through substitution of travelling for calls which saves time and enhances safety and efficiency.	341 (85.25)	50 (12.50)	7 (1.75)	2 (0.50)	3.83	Agreed
3	Increased opportunities to access resources such as production technology, transportation challenges, slow speed and inaccuracy.	311 (77.75)	69 (17.25)	15 (3.75)	5 (1.25)	3.72	Agreed
4	Information about clothing and textile can now easily get to rural dwellers without hindrance.	305 (76.25)	65 (16.25)	26 (6.50)	4 (1.00)	3.68	Agreed
5	Mobile technology has created rural urban linkages and this serves as source of education on vital issues of resource management.	293 (73.25)	86 (21.50)	11 (2.75)	10 (2.50)	3.66	Agreed
6	Mobile Technology has significantly changed the way rural businesses are being conducted. Farmers can now call to discuss business with multiple buyers.	291 (72.75)	86 (21.50)	13 (3.25)	10 (2.50)	3.65	Agreed
7	Mobile technology has greatly improved the household income of the rural populace by saving energy and time, hence better savings.	285 (71.25)	73 (18.25)	29 (7.25)	13 (3.25)	3.58	Agreed
8	Mobile usage had enhanced the abilities of the rural households in sending and receiving money and other messages.	304 (76.00)	43 (10.75)	20 (5.00)	33 (8.25)	3.55	Agreed
9	Mobile technology has greatly improved child care monitoring and development information about the health and wellbeing of children.	253 (63.25)	102 (25.50)	35 (8.75)	10 (2.50)	3.50	Agreed
10	Improved skills (capabilities) such as storage techniques of crops, planting methods, and packaging through improved access to information.	255 (63.75)	82 (20.50)	61 (15.25)	2 (0.50)	3.48	Agreed
11	Empowerment through information about choices that affect themselves.	227 (56.75)	103 (25.75)	49 (12.25)	21 (5.25)	3.34	Agreed
12	Increased knowledge and access to information on Food production, preservation and safety.	221 (55.25)	106 (26.50)	43 (10.75)	30 (7.50)	3.30	Agreed
	Overall mean					3.64	

Result in Table 2 shows twelve indices in the productivity efficiency that are attributed to usage of mobile technology; among which are reduced frequency of travelling (3.93), increased the

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Efficiency of Daily Activities (3.83), increased opportunities to access needed resources (3.72), increase speed of information on new clothing styles and trends (3.68), created linkages which serve as source of education and management (3.66), enhanced business negotiation with multiple buyers (3.65), saves energy and time hence better savings (3.58), enhanced the abilities of the rural households in sending and receiving money and other messages(3.55), improves child care monitoring and information about health and wellbeing of children (3.50), improved skills /capacities /techniques/method for processing, packaging and advertising products and services (3.48), Empowerment through information about choices that affect themselves (3.34) and increase knowledge and access to information production, preservation and safety(3.30). This result implies that further usage of other forms of mobile technology would further improve the productivity efficiency of rural household.

Table 3: Mean Ratings of Respondents on Awareness of Various Services provided by forms of Mobile Technology to Rural Households in Nasarawa State.

S/N	Item description	HA (4)	MA (3)	LA (2)	NA (1)	Mean	Remark
1	Determine sample of needed goods before ordering	286 (71.50)	33 (8.25)	44 (11.00)	37 (9.25)	3.40	Aware
2	Order or buy goods on net	245 (61.25)	60 (15.00)	55 (28.50)	40 (4.00)	3.26	Aware
3	Monitor children's welfare at home while at work	351 (87.75)	23 (5.75)	20 (5.00)	6 (1.50)	3.20	Aware
4	Confirm the availability of needed goods and services before ordering.	304 (76.00)	59 (14.75)	33 (15.00)	4 (1.00)	3.18	Aware
5	Supply goods on ware bill	16 (4.00)	311 (71.75)	10 (2.50)	63 (15.75)	3.08	Aware
6	Make market survey of different towns in the nation before deciding on where to buy.	231 (57.75)	86 (21.60)	53 (13.25)	30 (7.50)	3.06	Aware
7	Contribute in a meeting/conference without being physically present.	286 (71.50)	84 (16.00)	37 (9.25)	13 (3.25)	3.05	Aware
8	Ask and answer questions for clarification on net	20 (5.00)	83 (20.75)	41 (10.25)	256 (64.00)	2.44	Moderately Aware
9	Send and get health tip on net	5 (1.25)	98 (24.50)	20 (5.00)	277 (69.25)	2.33	Moderately Aware
10	Learn new technologies on the net	18 (4.50)	105 (26.25)	60 (15.00)	217 (54.25)	2.30	Moderately Aware
11	Carry out result demonstration on net	33 (8.25)	69 (17.25)	75 (18.75)	223 (55.75)	2.21	Moderately Aware
12	Check lateness to work on net	-	84 (21.00)	205 (51.25)	111 (27.75)	2.17	Moderately Aware
13	Get opinion of a large group of people on the net	7 (1.75)	66 (16.50)	10 (2.50)	317 (79.25)	2.13	Moderately Aware
14	Select dress styles on net	4 (1.00)	113 (28.25)	36 (9.00)	247 (61.75)	2.11	Moderately Aware
15	Vote on net	37 (9.25)	57 (14.25)	103 (25.75)	203 (50.75)	2.07	Moderately Aware
15	Watch happenings of an event life on net	22 (5.50)	33 (8.25)	75 (18.75)	270 (67.50)	2.13	Moderately Aware
16	Advertise goods on social networks like facebook, instagram etc.	-	-	280 (70.00)	120 (30)	1.70	Moderately Aware
Overall Mean						2.42	

Table 3 shows mean ratings of respondents on awareness of services provided by mobile technology. The result indicates that respondents are aware of services such as are; order or buy goods on net (3.26), supply goods on ware bill (3.08), determine sample of needed goods before ordering (3.40), make market survey of different towns in the nation before deciding on where to

buy (3.06), confirm the availability of needed goods and services (3.18), monitor children’s welfare at home while at work (3.20), contribute in a meeting/conference without being physically present (3.05). However, the results indicated moderate awareness of such services as: ask and answer questions for clarification on net (2.44), send and get health tip on net (2.33), learn new technologies on the net (2.30), carry out result demonstration on net (2.21), check lateness to work on net (2.17), get opinion of a large group of people on the net (2.13), select dress styles on net (2.11), vote on net (2.07), watch happenings of an event life on net (2.13) and advertise goods on social networks like face book, instagram and so on(1.70).

Table 4: Chi-Square Test of Effect of Mobile Technology Usage on Productivity Efficiency of Rural Households in Nasarawa State

	Df	χ^2	$\chi^2\alpha$	Sig.	Alpha Level	Remark
Pearson Chi-square	33	47.40	841.158	.000	.05	S, R
Number of Valid Cases		400				

Df = degree of freedom, χ^2 = critical value, $\chi^2\alpha$ = chi-square calculated, Sig. = P-value; P < .05, S= Significant, R= rejected

Table 4 shows a chi-square calculated value of 841.158 which is greater than the critical value of 47.40 at .05 level of significance and with 33 degree of freedom (i.e. $\chi^2\alpha = 841.158 > 47.40$). This indicates that mobile technology usage has significant effect on productivity efficiency of rural households in Nasarawa state. Therefore, the hypothesis which states that mobile technology usage has no significant effect on productivity efficiency of rural households in Nasarawa state was rejected.

Discussion of Results

The findings of the study from Table 1 revealed that only Simple cell phones were accessible to the rural households in Nasarawa state. This is in agreement with Fassey (2017) who asserts that, due to the economic situation of the rural populace, the financial and cost implication of acquiring mobile devices has kept some rural household masses away from accessing such devices.

It was also found from the study that twelve indices in the productivity efficiency rural households are attributed to usage of mobile technology. These indices were: increased opportunities to access resources such as production technology, transportation challenges, and increased speed of information flows within the network amongst others. This findings collaborates so many studies by scholars such as; International Telecommunications Union (ITU) (2013) on “Mobile Technology in the 21st Century”; Sridhar and Sridhar (2015 and 2016) on “Mobile Technology and Rural dwellers” and Noll (2017) on “The impact of Mobile Phones on Cost of Production” which collectively found that Mobile Technology has impacted positively on the productivity efficiency and information network of rural households.

The findings of the study in Table 3 showered that rural household in Nasarawa sate were moderately aware of all the benefits of mobile technology usage associated with the internet. This is also in agreement with Benson (2015) who asserted that rural dwellers have limited access to most forms mobile technologies, thus, awareness and extension services on access to the internet using mobile devices should be carried out in rural areas. This would expose members of rural household to the vast benefits of mobile technology as catalyzed by the internet. The authors cited above added validity and credence to the findings of this study.

Conclusion

Based on the findings of the study, it was concluded that mobile technology usage has a positive and significant effect on the productivity efficiency of members of rural households in, Nasarawa state. However, apart from the simple cell phone, all other forms of mobile technology were not in use among the rural households, despite the fact that the other forms of mobile technology had useful services that could be of benefit for productivity efficiency.

Recommendations

In view of the research findings, the following recommendations were made;

1. Gender equality should be maintained in the usage of mobile technology among members of the rural household.
2. Awareness should be created about the functions/usefulness of all other forms of mobile technology
3. Rural household members should be encouraged to make use of other forms of mobile technology due to usefulness in information networks and productivity efficiency.
4. Awareness and extension services on access to the internet using mobile devices should be carried out in rural areas.
5. Service providers such as MTN, 9MOBILE (Formal ETISALAT), AIRTEL, GLO etc should organize rural rallies to advertise their services and capture the interest of the rural household.
6. Service providers should also ensure availability of their network services to remote areas by mounting antennas at relevant locations.

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