

DETERMINANTS OF EXTENSION WORKERS' PERCEPTION OF TECHNOLOGY DELIVERY THROUGH CYBER-EXTENSION MODE IN OYO STATE, NIGERIA

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Abstract

Covid-19 pandemic introduced a paradigm shift in extension service delivery different from conventional methods, which are inadequate to cater for the needs of farmers during a pandemic. Therefore, this study examined the determinants of perception of extension workers on technology delivery through cyber extension mode. A well-structured interview schedule was used to select 208 respondents using three-stage sampling procedure. Descriptive statistics, Product Moment Correlation, and linear regression were used in data analyses. The results revealed that average age of extension worker was 43.50 years. Majority (78.8%) were male, 57.7% were married while 94.2% had tertiary education. The perception of 57.2% extension workers was positive. E-mail and news/ discussion groups (78.8%) were the most utilized cyber extension service delivery modes while radio and social media ranked the highest among sources of information. Regression analysis revealed that education (0.137), computer literacy (0.057) and religion (0.223) significantly influenced the perception of use of cyber extension delivery mode. Electricity ($r=0.429$), mobile data ($r=0.195$) and laptops ($r=-0.151$) significantly promoted perception of cyber extension utilization. Therefore, government should provide adequate infrastructure and facilities for extension agents to ensure effective delivery of services to farmers and safety during pandemic.

Key Words: Perception, Cyber extension, Pandemic, Delivery mode

Introduction

Agricultural extension is a field that engages in communicating modern technology to farmers to enhance their knowledge of production in order to achieve production efficiency (Anderson and Feder, 2004). The cyber extension determines the efficiency and effectiveness

with which communication is delivered to farmers across the world in view of diverse current challenges ranging from food deficit, increasing population, and disease outbreak e.g. Covid-19 pandemic (Anderson and Feder, 2004; Nakasome and Torero, 2016).

Cyber-extension is an e-extension mode of service delivery that provides the mechanism for exchanging agricultural information over cyberspace. It utilizes the power of information and communication technology (ICT), computer networking, and digital interactive multimedia to facilitate the dissemination of agricultural technology (Wijekoon, 2003). The expansion of knowledge resources through e-modification provides excellent means to address the limitations affecting access to public agricultural extension services. Cyber extension is an efficient way of reaching more farmers with better services in rural communities. Rathore *et al.* (2021) identified the various tools used in cyber extension including e-mail, World Wide Web, Expert system of extension, Video conferencing, Call centres, satellite communication networks, News and discussion groups, Telnet, File transfer protocol (FTP), and Web conferences or Webinars. These tools become readily handy in the event of any pandemic. They create the opportunity for agricultural extension workers to learn new communication technologies to build solid advisory systems and expand extension services delivery to rural communities (Baumüller, 2012).

In Nigeria, the revolution to interchange ICTs and agricultural extension came to the fore in 2009. Since then, ICT initiatives have expanded to include private sector extension services providing services including e-crop advisory services and advisory messages (Wanigasundera and Atapattu, 2019). The use of cyber extension becomes more critical in the advent of the recent ravaging Covid-19 pandemic which made it difficult for extension agents to reach farmers physically in their locations due to a series of restrictions (Aday and Aday, 2020).

Access to extension service would be extremely hard where farmers are geographically dispersed, where their information requirements are localized and there is no organizational structure to cater to such large extension service delivery (Nakasone and Torero, 2016). The pandemic halted the normal execution of agricultural extension services (Muvhuringi *et al.*, 2021; Chakraborty and Maity, 2020). But, cyber extension is capable of repositioning public extension services effectively. It is responsive to the plight of farmers in diverse situations (Wanigasundera and Atapattu, 2019).

The desire to adopt the e-extension mode is high now that the use of conventional communication channels e.g. face-to-face for disseminating agricultural information is becoming inadequate. The advancement in info-communication technology is poised to complement the extension effort since ICTs on their own cannot replace agricultural extension workers (Ahuja, 2011). Though, they are very relevant in bridging the access gap between farmers and extension agents. ICTs would enable extension workers to gather, store, retrieve, and disseminate a broad range of information needed by the clients (Meera *et al.*, 2004). The decision to use cyber extension delivery mode is a process commencing from the level of perception of an extension agent because perception plays a significant role in determining individual behaviour.

The perception of the use of cyber extension to deliver services, especially during pandemics will help to ascertain the knowledge of its use by the extension agents and the value they place on the use of information over the internet. This will improve the delivery process by raising delivery speed and effectiveness (Dada and Idowu, 2017). The application of cyber

tools in the delivery of information to farmers will not only broaden the farmer's knowledge, ideas, and skills but it will also ensure that the farmers receive timely and useful information all through production periods (Ighodaro, 2016).

Several studies including Meret (2014); Turyahikayo and Kamagara (2016) and Danso-Abbeam *et al.* (2018) have addressed the issue of perception of extension service delivery. But, there is little information on factors that influence the perception of extension workers with specific reference to cyber extension service delivery mode. Therefore, this study examined the determinants of extension workers' perception of technology delivery through cyber extension mode in Oyo State, Nigeria. The specific objectives were to identify the characteristics of the respondents and existing sources of information on cyber extension mode, determine the level of awareness of cyber extension mode amidst Covid 19 pandemic, ascertain the respondents' ability to use the cyber extension mode and assess the factors that promote the use of cyber extension mode among the extension workers in the area. An insight into how extension agent perceives the use of cyber extension service mode can enable the government and stakeholders to provide facilities that meet the needs and desires of the extension agents (Nazarea *et al.*, 1998; Pollnac, 2000).

Study Area

The study was conducted in Oyo State in Southwestern part of Nigeria. Oyo State covers approximately 28,454 square kilometers. The State is located within Latitude 8.1574⁰ N and longitude 3.6147⁰E. It has an estimated total population of 7,976,100 million (NPC, 2022). The Climate is equatorial with dry

season commencing from November to March while wet season starts in April and terminates in October with relatively high humidity. The average daily temperature ranges between 25°C and 35 °C throughout the year (Olayinka *et al.*, 2017). Agriculture is the main occupation of the people with dominant crops such as rice, maize, cassava, cocoa, and oil palm among others. International and Federal agricultural establishments in the State include farm settlements, cattle ranches, dairy farms, and the Oyo State Agricultural Development Programme.

Materials and Method

Sampling Technique

Extension workers were the targeted population in the study area. A three-stage sampling procedure was used to select the respondents. The first stage involved purposive selection of four (4) Local Government Areas (LGA) that actively participated in Oyo State extension programmes. These were Lagelu, Oluyole, Orelope, and Akinyele LGAs which contain twelve (12), fourteen (14), ten (10), and ten (10) wards respectively. The second stage involved the selection of four (4) wards from each of the selected LGAs thereby making a total of sixteen (16) wards. The third stage involved the random selection of thirteen (13) extension workers based on probability not proportional to size. The sample frame estimated for the study was 224 extension workers derived from the list provided for the interview by the Oyo State Agricultural Development Programme (OYSADEP). However, data were collected from 56 respondents in each of the four LGAs. Information was retrieved from respondents through a mailed questionnaire designed for the purpose of a cross-sectional survey research design.

Thus, a total of 208 questionnaires were used in the analysis of the study data.

Measurement of Variables and Analytical Technique

Awareness of and ability to use cyber-extension service delivery tools were measured on a dichotomous scale as yes (1) and no (2). Sources of information on the use of cyber extension mode were ranked based on accessibility. Likert scale of a 5-point rating was used to measure extension workers' perception of technology delivery through cyber-extension mode. This was based on 20 perception statements in terms of the knowledge resource base, information access, extension linkage, and cost-effective extension delivery. The response options include strongly agree (5), agree (4), neutral (3), disagree (2), and strongly disagree (1) for positively framed statements and a reversal of response options for negatively framed statements (Boynton and Greenhalgh, 2004). The perception categories of either positive or negative were derived from the mean of the aggregate score. Factors that promote the use of cyber extension as perceived by respondents were measured on the Likert scale with a response option including very serious (3), serious (2), and not serious (1).

The first null hypothesis of the study was to test the significant relationship between respondents' perception of cyber extension mode and ability to utilize cyber extension. The second null hypothesis was to test the significant relationship between respondents' perception of cyber extension mode and factors that promote the use of cyber extension. The third hypothesis was to test the significant relationship between the perception of cyber extension mode and socio-economic characteristics of the respondents.

The socioeconomic characteristics of the respondents, awareness, and ability to use cyber-extension, and information source, were analysed using descriptive statistics such as frequency, mean, percentage, and ranking while Pearson's Product Moment Correlation (PPMC) were used to analyse the relationship between the socioeconomic characteristics and the extension variables. However, the Ordinary Least Square (OLS) regression mode was used to analyse the factors that determine the respondents' perception of the use of cyber extension mode. The linear form of the regression model is given as;

$$Y = \beta_0 + \beta_1X_1 + \mu_i$$

The estimating equation is specified as;

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \dots + \beta_8X_8 + \mu_i;$$

$$i = 1, 2, 3, \dots, n$$

Where,

Y = Perception of use of cyber extension mode (measured in Likert scale: strongly agree 5, agree 4, neutral=3, disagree =2, strongly disagree =1)

X₁ = Age (years)

X₂ = Sex (1, if male and 0, otherwise)

X₃ = Marital status (1, if married and 0, otherwise)

X₄ = Level of education (years)

X₅ = Computer literacy (years)

X₆ = Years of experience in extension service

X₇ = Salary income (₦)

Result and Discussion

Socioeconomic Characteristics of Respondents

The result revealed that majority (78.8%) of the extension agents was males, 21.2% was female, 41.8% was between 46-55 years old while an average extension worker was 43.50 years old. This implies that the extension agents were

predominantly male, young and active. The study of Adeola and Ayoade (2011) also reported that the extension agents were middle-aged. About 57.7% of the extension agents were married, 42.3 % was single, 57.7% was Christians while 42.3% was Muslims. Majority (94.2%) was

literate and 51.4% had tertiary education. This agrees with the report of Thomas and Laseinde (2015) that extension agents were literate. Majority 58.7% of them earned between ₦50,000-₦100,000, that is \$114.94 - \$229.89 U.S dollars per month at an exchange rate of 435 per dollar in 2021.

Table 1: Distribution of respondents by their socioeconomic characteristics (n=208)

Personal characteristics	Frequency	Percentage %
Age		
26-35	77	37.0
36-45	29	13.9
46-55	87	41.8
56 and above	15	7.2
Sex		
Male	164	78.8
Female	44	21.2
Marital status		
Single	88	42.3
Married	120	57.7
Religion		
Christianity	120	57.7
Islam	88	42.3
Level of Education		
No formal education	12	5.8
Primary education	21	10.1
Secondary education	68	32.7
Tertiary education	107	51.4
Income (₦)		
50,000-100,000	122	58.7
101,000-150,000	43	20.7
151,000-200,000	43	20.7

Awareness of Cyber Extension

The result in Table 2 indicates that 78.8% of the extension workers were aware of E-mail, and News and Discussion groups (78.8%), Video Conferencing

(78.4%) and Expert Systems (78.4%) as cyber-extension service delivery tools. This implies that familiarity with cyber extension delivery tools is still low in the study area.

Table 2: Distribution of respondents by awareness of cyber-extension (n= 208)

Cyber extension service delivery mode	Yes		No	
	Frequency	%	Frequency	%
E-mail	164	78.8	44	21.2
News and Discussion groups	164	78.8	44	21.2
Video Conferencing	163	78.4	45	21.6
Expert systems	163	78.4	45	21.6
Internet Browsing for extension Information	75	36.1	133	63.9
Call Centres and Satellite Communication network	75	36.1	133	63.9

Sources of Information on Cyber Extension Mode

The sources of information on cyber extension service delivery mode by the extension workers are presented in Table 3. The result revealed that radio ranked 1st followed by social media (2nd) and television (3rd) as major sources through which extension workers access information on cyber extension service delivery mode.

Table 3: Distribution of respondents by sources of information on cyber extension mode (n = 208)

Sources of Information on cyber extension delivery method	Yes (%)	Rank
Radio	100	1st
Social media	78.8	2nd
Television	78.8	2nd
Seminars	70.0	4th
Meetings	57.2	5th
Training	53.0	6th
Internet	45.5	7th
Colleagues	42.8	8th
Newspaper	42.8	8th
Conferences	42.3	10th
Workshops	42.3	10th

Respondent's Ability to Use Cyber Extension Tools

The result in Table 4 reveals that the extension workers had the ability to use Radio (99.5%), Zoom (78.8%), Social media (78.8%), E-mail (63.3%), Farmer Call Center (53.0), Personal Messaging App (62.9%) and News/ Discussion Group (57.2 %) as cyber

tools to reach out to clients. This finding agrees with Rathore and Sumanth (2021).

Table 4: Distribution of respondents by their ability to operate cyber extension tools (n = 208)

Ability to use cyber tools	Yes %	No %
Radio	99.5	0.5
Zoom	78.8	21.2
Social media platform	78.0	22.0
E-mail	63.3	36.7
Farmer Call center	53.0	47.0
Personal messaging app	62.9	37.1
News and Discussion Group	57.2	42.8
Telnet	36.1	63.9
World wide web	45.5	55.5
Video Conferencing	36.5	63.5
Interactive Expert System	0.5	99.5

Perception of Cyber Extension Method

From Table 6, majority (54.8 %) of the respondents strongly agreed that it is easier and faster to find the information you need using the cyber-extension delivery method, 51.2% agree that cyber-extension tools help to reach out to farmers wherever they are, and no training is required for extension workers to use cyber-extension (51.2%). It was noted in Table 7 that majority (57.2%) of the extension workers have a positive perception of the use of cyber-extension service delivery mode. The result implies that the extension workers have an accurate understanding of cyber extension as means of providing the needed support to improve access to farmers' extension services in the study area.

Table 6: Distribution of respondents by perception of use of cyber extension mode

Perception	Strongly agree	Agree	Undecided	Disagree	Strongly Disagree	Mean
	F (%)	F (%)	F (%)	F (%)	F (%)	\bar{x}
Cyber extension helps to reach farmers wherever they are	76(36.5)	106(51.2)	10(4.8)	2(0.8)	14(6.7)	4.10
Cyber extension increases farmers' access to extension	102(49.2)	77 (37.3)	12(5.6)	2 (0.8)	15(7.2)	4.19
It is easier and faster to find information using cyber extension	114(54.8)	71(34.1)	15(7.2)	1 (0.4)	7(3.3)	4.36
Cyber extension enhances the quality of information delivered to farmers	104(50.0)	76(36.5)	13(6.3)	1 (0.4)	14(6.7)	4.22
Cyber extension costs less than other methods	98 (47.2)	86(41.3)	16(7.5)	1 (0.4)	7(3.6)	4.28
Cyber extension provides e-training opportunities for extension workers	84(40.5)	82 (39.3)	16(7.5)	0(0.0)	26(12.7)	3.95
Cyber extension enables service delivery to both genders based on their need	62 (29.8)	89(42.9)	20 (9.5)	0(0.0)	37(17.9)	2.33
Cyber extension does not provide a feedback mechanism to farmers	62 (29.8)	89(42.9)	20 (9.5)	0(0.0)	37(17.9)	2.33
Cyber extension does not fit well in supplementing inadequate technical manpower	65(31.3)	89(42.8)	31(15.0)	2(0.8)	21 (10.1)	2.16
Cyber extension does not allow extension services to be delivered in local languages to farmers	99(47.6)	68(32.5)	13(6.3)	2(0.8)	26(12.7)	1.98
No training is required for extension workers to use cyber extension	76(36.5)	106(51.2)	10 (4.8)	2(0.8)	14 (6.7)	1.90
It is hard to share knowledge on the use cyber extension with fellow workers	76(36.5)	106(51.2)	10(4.8)	2 (0.8)	14(6.7)	1.90
Cyber extension tools are not user's friendly	102(49.2)	78 (37.3)	12 (5.6)	2(0.8)	14 (7.1)	1.54
The use of cyber extension mode is limited by the literacy level of extension workers	84 (40.5)	82 (39.3)	16 (7.5)	0(0.0)	26 (12.7)	2.05

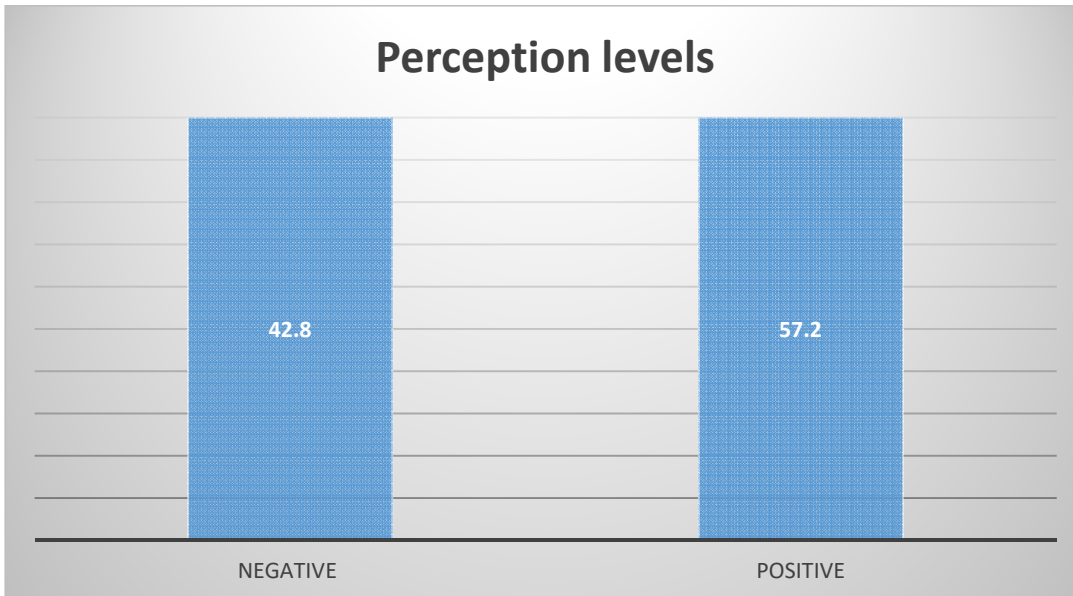


Fig. 1: Perception levels of extension workers on the use of cyber extension mode

Factors Promoting Cyber Extension Utilization in the Area

Table 8 shows the factors promoting cyber extension utilization among the respondents. The result revealed that the workers’ perception was positively correlated with the factors including provision of electricity ($r=0.429^{**}; p=0.000$), data ($r=0.195^{**}; p=0.005$), laptop ($r= -0.151^{**}; p=0.029$); good network ($r= 0.148^*; p=0.033$); access to social media ($r= 0.239^*; p=0.000$), and capacity building of extension agents ($r= 0.195^{**}; p=0.005$). These factors significantly influenced the workers’ perception of the use of cyber extension service delivery mode. The correlation between the ability to use cyber extension tools and the workers’ perception was found to be negatively significant ($r= -0.157^*; p=0.024$) implying that the ability to use cyber extension has an indirect influence on the perception of extension agents in the area. The result shows that there is significant relationship between

respondents' perception of cyber extension mode and ability to utilize cyber extension. Therefore, the first null hypothesis was rejected.

The result further shows that provision of electricity ($r=0.306^{**}; p=0.000$), data ($r=0.744^{**}; p=0.000$), laptops ($r= 0.992^{**}; p=0.000$); access to social media ($r= 0.745^{**}; p=0.000$), capacity building of extension agents ($r= 0.744^{**}; p=0.000$), a good network ($r= 0.738^{**}; p=0.000$) had positive and significant correlation with the perception of extension workers on the use of cyber extension service delivery mode. On this basis, the second null hypothesis was rejected.

The postulated seven constructs have positive and significant correlations with respondents’ perception of the use of cyber extension service delivery mode. Thus, availability of constant electricity, access to social media, laptops, data allowance, good network, and capacity building of extension workers have high tendencies to influence the extension workers’ positive

perception and trigger the formation of positive attitude towards the use of cyber extension service delivery mode. This finding is in line with the theory of planned behaviour by Ajzen (1991) which postulates that the behaviour of an individual is based on perception and attitude as well as socio-cultural influences.

The correlation between respondents' ability and extension workers' perception of the use of cyber-extension was significant. This implies that the extension workers who claimed to possess the ability

to use cyber-extension have a better perception of cyber-extension. In the long run, the extension worker's ability would trigger a positive attitude towards the use of cyber extension mode. This view is consistent with the report by Meijer et al. (2015) that the perception of an individual is a precursor for a change of attitude. The finding agrees with Davis (1989) who reported that the overall feeling or attitude toward using a system/ procedure determines whether or not the individuals will ultimately use the system/ procedure.

Table 8: Factors promoting cyber extension utilization among the respondents

Variable	Mean	SD	Electricity	Data allowance	Lap Tops	Access to social media	Capacity building	Good network	Ability	perception
Provision of Electricity	1.3606	0.48133	1							
Provision of data allowance	1.1490	0.74334	0.862** 0.000	1						
Provision of laptops	0.7885	0.40938	0.389** 0.000	0.803** 0.000	1					
Access to social media	1.1442	0.74753	0.862** 0.000	0.996** 0.000	0.795** 0.000	1				
Capacity building of extension workers	1.1490	0.74334	0.862** 0.000	1.000** 0.000	0.803** 0.000	0.996** 0.000	1			
Provision of a good network	1.1538	0.74561	0.854** 0.000	0.996** 0.000	0.804** 0.000	0.983** 0.000	0.996** 0.000	1		
Ability	13.072 1	5.74668	0.306** .000	0.744** .000	0.992** .000	0.745** .000	0.744** .000	0.738** .000	1	
Perception	95.326 9	11.28758	.429** .000	.195** .005	-.151* .029	.239** .000	.195** .005	.148* .033	-.157* .024	1

Determinants of Perception of Use of Cyber Extension Delivery Mode

The determinants of perception of the use of cyber extension delivery mode were examined using the linear regression model. The result in Table 9 shows that the model parameter, F-value (4.512) is significant at $p < 0.01$. The coefficient of education (0.137) of extension workers, had a positive and significant relationship with the use of cyber extension delivery mode meaning that education is important in cyber extension service. This finding was corroborated by Bonabana-Wabbi (2002) that reported that religion has positive influence on adoption technology.

Computer literacy (0.057), positively and significantly influenced the use of cyber extension delivery mode at $p < 0.01$ possibly due to the use of computer and associated accessories in the online extension service. Religion (0.223) also enhanced the use of cyber extension delivery mode significantly at $p < 0.05$. Perhaps, the level of faith of the workers promoted their moral value in performing the job with these significant relationships between the variables, the third null hypothesis was rejected. This finding agrees with Hamstra, (1998) who reported that religion has positive influence on adoption of technology.

Table 9: Estimates of the Linear Regression Model

Variable	Coefficient	Standard Error	t- value	Significance level
Constant	1.716***	0.322	5.326	0.000
Age (year)	-0.005	0.004	-1.218	0.225
Sex	0.041	0.111	0.368	0.713
Marital status	-0.184	0.121	-1.528	0.128
Educational level (year)	0.137*	0.072	-1.909	0.058
Computer literacy (year)	0.057***	0.020	2.918	0.004
Religion	0.223**	0.096	2.321	0.021
Salary income (N)	-0.027	0.058	-0.463	0.644
F – value	4.512***			0.000
R2	0.136			
Adjusted R2	0.106			

Conclusion

The findings revealed that provision of a good network system, regular supply of electricity, constant training of extension workers to update their knowledge and skill as well as provision of laptops and data allowance are prerequisites for the use of cyber-extension service and should be created because they explain the perception of cyber extension utilization. The infrastructure, incentives, and empowerment of the workers should inform policy formulation so that the extension workers can be motivated to

adopt cyber-extension service delivery to farmers.

The study explains that the perception of the extension workers is a precursor for the formation of attitudes towards the use of cyber-extension service delivery mode. Therefore, government needs to facilitate extension workers to use cyber extension service delivery mode through necessary infrastructure and improved conditions of services as incentive. These would enable them to acquire more basic skills and abilities to properly use cyber extension

delivery mode in content development as well as outreach programmes to farmers.

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