BEHAVIOURAL INTENTIONS: A MEDIATOR OF PERFORMANCE EXPECTANCY AND ADOPTION OF MOBILE COMMUNICATION TECHNOLOGIES BY UGANDAN COMMERCIAL FARMERS

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Abstract
This study examined the mediating role of Behavioural Intentions to Use on Performance Expectancy and Adoption of mobile communication technologies by commercial farmers in Uganda. The study adopted across-sectional design and quantitative method from which 302 commercial farmers and agribusiness traders in Eastern Uganda were surveyed using self-administered questionnaires as a data collection tool. Mediation analysis was carried out using bootstrap. Confirmatory Factor Analysis and Structural Equation Modelling were used to test the hypothesized relationships between the study variables. Findings revealed a partial mediating effect of Behavioural Intentions to Use on the relationship between Performance Expectancy and Adoption; significant positive relationship between Performance Expectancy and Behavioural Intentions; Performance Expectancy and Adoption; Behavioural Intentions and Adoption. There is need for knowledge creation and market research required to understand the unique needs of performance expectancy and behavioural Intention on demand side of commercial farmers in developing countries.

Key Words: Mobile communication Technologies; Performance Expectancy; Behavioural Intentions to Use; Adoption.

Introduction

Access to agricultural market information is one of the major challenges to agriculture in many Sub-Saharan countries like Uganda. Yet, according to Monitoring African Food and Agricultural Policies [MAFAP (2013)] as well as Farhad *et al* (2011), accessing up-to-date and accurate agricultural information is key to improving productivity as well as marketing efforts of farmers. Agricultural market information includes pricing information for agricultural products, information on weather, crop advisory, fertilizer availability and updates on government schemes, information on new technology together with information on better farming practices and better management (Dick, 2012; O'Donnell, 2013). With the right information at the right time, farmers are able to make informed decisions on products to produce, where to sell their products, what prices to charge and when to sell their farm products thereby avoiding exploitation from intermediaries. In order to improve access up to date and accurate agricultural market information, in the advent of new technologies lately, access to agricultural marketing information has been simplified. Information and communication technologies (ICT) play an important role in addressing challenges of agricultural market information access and uplifting livelihoods of the rural poor (Stienen *et. al.*, 2007). In Uganda particularly, one of the ICT technologies that has dominated the Ugandan market is mobile technologies. According to Duncombe (2012), mobile phone-based services have proliferated in recent years, providing new

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ways to access price and market information, and coordinate input/output resources including transport and logistics, finance and production techniques. Mobile technologies such as voice calls, Short Messaging Service (SMS) platforms and social media platforms can now be used in promoting agricultural market information access and dissemination in many developing countries (Stienen *et. al.*, 2007).

However, despite vast benefits, low adoption of mobile communication technologies has been reported (Aker, 2010; Dey, 2008). A study conducted by Miwanda *et al.* (2014) shows that only 0.5 percent of interviewed respondents were using mobile phones technologies to access agriculture marketing information in the western region of Uganda thereby clearly indicating low adoption of mobile communication technologies. Factors such as infrastructural development, user training and cost of mobile-based communication technologies, socio-economic factors like farmer's income, relatives and friends have been reported to influence farmers' intention to adopt mobile communication technologies (Nyamba *et. al*., 2012).

To clearly examine factors influencing adoption of mobile technologies in agriculture, several studies have employed the Unified Theory of Acceptance and Use of Technology (UTAUT) theory developed by Venkatesh (2003) to determine factors that affect adoption of mobile technologies in agriculture. A study by Jambulingam (2013) showed that Performance Expectancy (PE) plays an important role in influencing adoption of mobile technologies among students in tertiary institutions with Behavioural Intentions to Use as a mediating factor. Therefore, Behavioural Intentions to Use is said to significantly play an important role in mediating between independent variables of Performance Expectancy, Effort Expectancy, Social Influence and the dependent variable of Adoption. These independent variables indirectly predict adoption and use of mobile technologies (Malima *et. al.*, 2015; Kahenya *et. al.*, 2014; Jambulingam, 2013; Venkatesh *et. al.*, 2012; 2003). With proper measures instituted to influence adoption of mobile communication technologies, governments in developing countries like Uganda are in position to benefit from agriculture in terms of poverty reduction among citizens and economic growth.

The purpose of this study was to conduct an empirical examination on the mediating effect of Behavioural Intentions to Use (BIU) on Performance Expectancy (PE) and Adoption of mobile-based communication technologies by commercial farmers in Uganda based on the research question, "Do Behavioural Intentions to Use mediate between Performance Expectancy and Adoption of Mobile Communication Technologies by Ugandan Commercial Farmer? In order to answer the stated research question and achieving the purpose of this study, it is important that the relationships between the independent variables, mediating variable and the dependent variable are examined. They are clearly stated out as follows:

1. To examine the relationship between Performance Expectancy and Behavioural Intentions to Use Mobile Communication Technologies by Ugandan Commercial Farmers;
2. To examine the relationship between Behavioural Intentions to Use and adoption of Mobile Communication Technologies by Ugandan Commercial Farmers;
3. To examine the relationship between Performance Expectancy and adoption of Mobile Communication Technologies by Ugandan Commercial Farmers; and
4. To examine the mediating role of Behavioural Intentions to Use on Performance Expectancy and Adoption of Mobile Communication Technologies by Ugandan Commercial Farmers.

Theoretical Grounding

Variables in this study were adopted with modification from the UTAUT model (Venkatesh *et. al.*, 2012; 2003). The UTAUT model has been widely used in studying adoption and use of technology products in different study fields because it is regarded as an adequate model rather than any other technology adoption model due to its ability to explain 70 percent of variance (adjusted R^2=70%) in usage behavioural intentions compared to other models (Zeinab *et. al.,* 2014; Venkatesh *et. al.,* 2012, 2003). The UTAUT model is also comprised of a variety of explanatory variables derived from earlier theoretical models that were developed also to explain technology acceptance and use. That has made it to have a global and integrative approach in addressing technology acceptance issues in many industries (Attuquayefio *et. al.,* 2014). Two variables from the UTAUT model informed this study as explained in the conceptual framework in Figure 1. They include Performance Expectancy (PE) and Behavioural Intentions to Use (BIU), which are said to positively influence Adoption of MCTs.

Further analysis of literature was performed to understand users' Behavioural Intentions to use. Literature on Behavioural Economics was critically reviewed to understand how it affects users' intentions to adopt technology products. Behavioural Economics is looked at as the study of cognitive, social and emotional influences on people's observable economic behaviour while putting into use psychological experimentation to develop theories about human decision-making (Samson, 2015). This discipline has brought together psychologists, brain scientists and economists so as to understand better human behaviour (Datta & Mullainathan, 2014). Therefore, Behavioural Economics has changed the way it is thought why people choose to as they do and what really motivates them to make those decisions and actions. Accordingly, Behavioural Economics has been applied in coming up with innovative solutions to persistent development problems such as uptake, adoption and utilization of products (Datta & Mullainathan, 2014). Thus, it has helped in solving persistent problems in economic development such as adoption of technology in agriculture and other sectors of the economy (Duflo *et. al*., 2008; Hanna *et. al*., 2012). Therefore, Behavioural Economics helps to understand why users choose to do something and what influences them to do something.

Relationship between Performance Expectancy and Behavioural Intentions to Use

Performance Expectancy has been defined by Venkatesh (2003) as the degree to which someone believes that using a particular technology will help to enhance his or her job performance. Jambulingam (2013) defined Performance Expectancy as the degree to which an individual believes that perceived usefulness of utilising a particular mobile technology will assist in improving his/her performance. Therefore, he (*ibid.*) looked at Performance Expectancy as being related to perceived usefulness as defined by earlier models such as the Technology Acceptance Model (TAM). In this study, Performance Expectancy is defined as the degree to which a farmer believes that using mobile communication technologies for agricultural marketing information dissemination will lead to faster access to accurate information. According to Ghalandari (2012), Performance Expectancy came as a result of five factors from previous models. They include perceived usefulness derived from technology acceptance models, external motivation derived from motivational models, job fit, which belongs to the PC utilization model, relative advantage from innovation diffusion theory and finally, outcome expectations derived from social cognition theory (*ibid*.).

Behavioural intention to use is referred to as an individual's decision to exhibit a particular behaviour in future. It is also argued that once strength of a behavioural intention to conduct an act is greater, then it is more likely that such an act will be conducted in future (Alotaibi, 2013). Several studies conducted by researchers such as Engotoit *et al.* (2016); Malima *et al.* (2015); Vekatesh *et al*. (2012) argue that Performance Expectancy is found to uniquely, significantly and positively influence on one's behavioural intention to accept and use mobile technologies in agricultural marketing.

Relationship between Behavioural Intentions to Use and Adoption of MCTs in agricultural market information dissemination

Behavioural intention to use is a construct from the Theory of Reasoned Action and according to Kahenya *et al*. (2014), it is defined as the "measure of strength of one's intention to carry out a specific behaviour." Fishbein and Ajzen (1975) also defined Behavioural intention to use as the extent to which a user is motivated and intends to accept as well as use a system/technology. Several studies have shown that the three constructs of Performance Expectancy, Effort Expectancy and Social Influence are found to uniquely, significantly and positively influence on prediction of behaviour intention to accept and use mobile technologies (Malima *et. al.*, 2015; Venkatesh *et. al*., 2012; Venkatesh *et. al*., 2003). Behavioural intention to use, on the other hand, is said to have a significant direct impact on an individual's adoption and actual use of a particular system/technology. This has been proven by several studies such as Venkatesh *et al*. (2003; 2012) as well as Kahenya *et al.* (2014) who found that Behavioural Intentions to Use Model has a significant positive influence and a direct effect on adoption as well as usage of a technology/system.

Relationship between Performance Expectancy and adoption of MCTs

According to Venkatesh *et al.* (2003), Performance Expectancy was examined to significantly influence Behavioural Intentions to Use and this has been confirmed by several others studies (for example, Engotoit *et. al.,* 2016; Malima *et. al.,* 2015; Kahenya *et. al.,* 2014; Jambulingam, 2013; Venkatesh *et. al*.,2012). However, fewer studies have tried to examine the direct influence of Performance Expectancy on adoption of technology products. Yet, Davis (1993) argued that Perceived usefulness currently known as Performance Expectancy could also have a direct effect on actual system adoption and usage. A study conducted by Kahenya *et al.* (2014) showed that, indeed, Performance Expectancy had the potential to influence adoption and use of ICTs by agricultural extension workers. Thus, the current study sought to explore the direct relationship between Performance Expectancy and adoption of MCTs.

Research Hypotheses

H1: There is a significant positive relationship between Performance Expectancy and Behavioural Intentions to Use Mobile Communication Technologies by Ugandan Commercial Farmers.

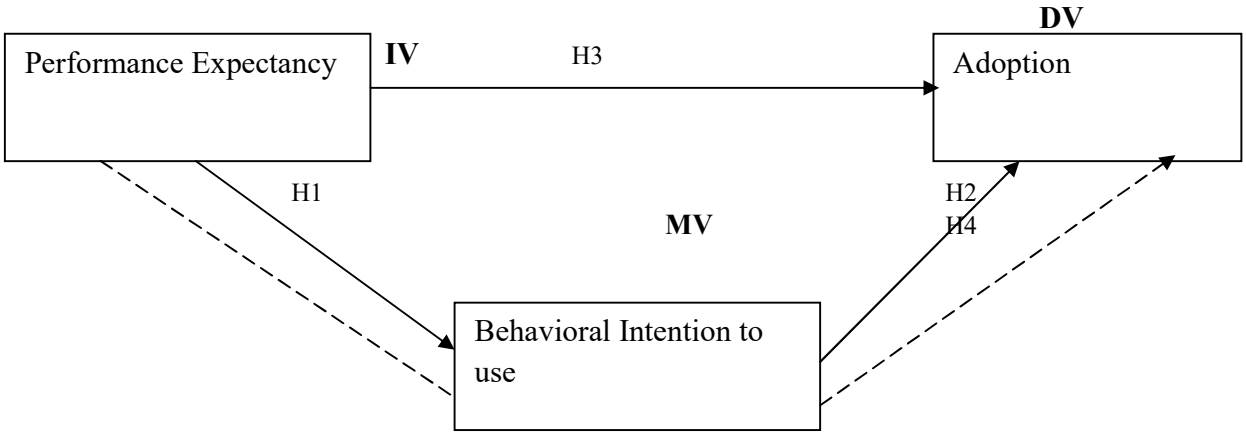
H2: There is a significant positive relationship between Behavioural Intentions to Use and Adoption of Mobile Communication Technologies by Ugandan Commercial Farmers.

H3: There is a significant positive relationship between Performance Expectancy and Adoption of Mobile Communication Technologies by Ugandan Commercial Farmers.

H4: Behavioural Intentions to Use positively mediates Performance Expectancy and Adoption of Mobile Communication Technologies by Ugandan Commercial Farmers.

Conceptual framework

Figure 1. Conceptual framework of the study



Source: Venkatesh *et al., (*2003), Venkatesh *et al*.,(2012), and Engotoit *et al., (*2016)

The conceptual framework as shown in Figure 1 is comprised of study variables adopted from Venkatesh *et al.,* (2012; 2003) UTAUT models. As explained before, the UTAUT model is used because it is regarded as an adequate model rather than any other technology adoption model due to its ability to explain 70 percent of variance (adjusted R^2=70%) in usage behavioural intentions compared to other models (Zeinab *et. al.,* 2014; Venkatesh *et. al.,*2012; 2003). The UTAUT model concludes that Performance Expectancy, effort expectancy and social influence play a significant role in influencing behavioural intentions of users such that Behavioural Intentions to Use later influences adoption of a technology product. The conceptual framework of this study indicates that Performance Expectancy as an independent variable (**IV**) that influences behavioural intentions as a mediating variable (**MV**) and in turn, Behavioural Intentions to Use influences adoption as the dependent variable (**DV**). Performance Expectancy is also hypothesized to directly influence adoption of MCTs by commercial farmers in Uganda.

METHODOLOGY

Research Design

The study follows a deductive research strategy, which begins with the general and ends with the specific (Soiferman, 2010). This approach is based on positivism paradigm, which clearly states that "the purpose of a theory should be to generate hypotheses that are in position to be tested and can allow explanations of laws to be assessed" (Dudovskiy, 2014; Schrag, 1992). Following this strategy, quantitative research approach was employed and it looked at the empirical investigation of observable research items using statistical, mathematical or computational techniques (Given, 2008). Thus, the approach involves generating data in a quantitative form using scientific methods of inquiry such as experiments and surveys, which often lead to rigorous quantitative analysis in a formal and rigid fashion (Kothari, 2009). Quantitative research approach was preferred because it enables the researcher to get a quantitative answer or to quantify opinions, attitudes as well as behaviours and find out how the whole population feels about a certain issue (Sukamolson, 2010).

The study used a cross-sectional field survey research design following the quantitative research approach given that emphasis is put on collecting and analysing numerical data, while concentrating on measuring scale, range as well as frequency of phenomena (Neville, 2007).

Cross-sectional field survey research design was preferred because it enables researchers to gather data on beliefs, practices or situations from a random sample of subjects in the field using survey questionnaires, which are most frequently used. Therefore, with this kind of research design, independent and dependent variables were measured at the same point in time using a single questionnaire (Bhattacherjee, 2012). The survey was conducted from December, 2015 for a period of 2 months and the target respondents were commercial farmers. They formed the basis for the survey because the likelihood of commercial farmers to adopt mobile technology tools for agricultural purposes is high (Engotoit *et. al.,* 2016; Lashgarara *et. al.,* 2011).

A quantitative survey method was used to collect data from five districts representing the Eastern region of Uganda. This is because the survey method enables researchers to collect data from a larger population more easily (Jackson, 2011). Self-administered questionnaires were used because they encourage consistency in asking questions and it is easy to analyse the yielded data (Bhattacherjee, 2012). The questionnaires were distributed to commercial farmers and agribusiness traders in five districts of Soroti, Mbale, Busia, Iganga and Jinja.

Measurement of variables

Variables used in this study were measured using factors adapted from Venkatesh *et al.*, 2012; 2003). The study variables included Performance Expectancy and Behavioural Intentions to Use, which predict adoption as shown in Table 1. Behavioural intentions to use were adopted as a mediating variable between adoption of MCTs and Performance Expectancy.

Table 1 Measurement of variables

Variable	Measurement of variables	Source
Performance Expectancy	• MCTs are time saving • MCTs provide Access to agricultural prices • MCTs enable dissemination of agricultural prices • MCTs provide accurate and reliable agricultural market information	UTAUT (Venkatesh *et al.*, 2012;2003)
Behavioural Intentions to Use	•I predict to use MCTs •I recommend others to use MCTs •I Will Continue to use MCTs in future	UTAUT (Venkatesh *et al.*, 2012;2003)
Adoption	•MCTs Save time than traditional methods •MCTs are Reliable than traditional methods	UTAUT (Venkatesh *et al.*, 2012;2003)

Reliability and validity of research instrument

Prior to the survey, a pilot study was conducted to test validity and reliability of the research instrument. The questionnaire was structured with 3 variables accruing from Venkatesh *et al*. (2012, 2003), namely, Performance Expectancy (PE) with 4 items, Behavioural Intentions to Use (BIU) with 3 items and Adoption (A) with 2 items. Validity questions were presented on a five point Likert scale (1=Not relevant, 2 = Somewhat relevant, 3 = Quite relevant, 4 = Relevant and 5 = Very relevant). Content Validity Index (CVI) was used to test for validity (Polit *et. al.,* 2007), whereas testing for reliability of the questionnaire was done using Cronbach Alpha Coefficients [(CAC) Cronbach, 1951]. Results are presented in Table 2.

Table 2: Reliability and validity

Variable tested	No of items	Cronbach alpha coefficient	CVI
Performance Expectancy	4	0.72	0.75
Behavioural Intentions to Use	3	0.70	1.00
Adoption	2	0.88	1.00

Results in Table 2 show that all tested variables had a CAC score above 0.7, which, according to Nunnaly (1978) and Cronbach (1951), a questionnaire with variables scoring a CAC>0.7 is considered valid. On the other hand, results in Table 1 show that all variables scored a CVI>0.6, which is in-line with Polit *et al.*, (2007) who posit that a variable measuring CVI>0.6 meets minimum acceptable standards.

Population and sample design

Given that statistics were lacking on several commercial farmers in Uganda especially Eastern Uganda, a sample size of 384 respondents based on Cochran's (1963) formula for unknown populations was chosen. Using purposive sampling procedure, the questionnaires were distributed to respondents who owned mobile phones and were knowledgeable with use of mobile communication technologies. Then 302 questionnaires were returned, giving a response rate of 78.6 percent, which was adequate enough (Roscoe, 1975).

Data collection methods

Questionnaire was used as he main data collection tool for this study. Self-administered questionnaires were used because they encourage consistency in asking questions and it is easy to analyse the yielded data (Bhattacherjee, 2012). The questionnaire comprised of structured questions adapted from the UTAUT variables of Performance Expectancy, Behavioural Intentions to Use and Adoption. The questionnaires were distributed to commercial farmers and agribusiness traders in the five districts of Soroti, Mbale, Busia, Iganga and Jinja.

Data analysis methods

The primary data were collected, coded, cleaned and analyzed using Statistical Package for Social Sciences (SPSS) software and presented in tables. Descriptive statistics using frequencies and percentages were used in analysis of background characteristics of commercial farmers, whereas diagnostic tests were also conducted to determine normality and linearity of the study variables. Further analyses were carried out using Confirmatory Factor Analysis and Structural Equation Modelling (SEM) techniques so as to test and confirm set hypotheses between the three variables. The techniques helped in determining Average Variance Extracted (AVE) and the path coefficients. According to Zaremohzzabieh *et al.* (2014), SEM is a preferred statistical analysis strategy because it is able to reduce measurement error, it is able to test the unobserved and manifest variables in independent relationships and it is also able to assess simultaneous overall tests of model fit. SEM also helped in coming up with a structural equation model for the conceptual framework.

ANALYSIS AND INTERPRETATION OF FINDINGS

This study sought to examine the mediating role of Behavioural Intentions to Use (BIU) on Performance Expectancy and Adoption of mobile-based communication technologies for

agricultural market information dissemination in Uganda. Findings are discussed in the subsequent sub-sections.

Background characteristics

Background characteristics were analysed using frequencies and percentages. Results are presented in Table 3.

Table 3 Background Characteristics

Demographic characteristic	**Frequency**	**Percentage**		
1.Age				
18-25	41	13.6		
26-30	88	29.1		
31-40	92	30.5		
41-50	57	18.9		
51 and above	24	7.9		
	302	**100.0**		
2.Gender				
Male	177	58.6		
Female	125	41.4		
	302	**100**		
3.Academic Qualifications				
Certificate	73	24.2		
Diploma	53	17.5		
Bachelor's Degree	82	27.2		
Master's Degree	11	3.6		
PHD	2	.7		
primary and secondary drop outs	81	26.8		
	302	**100**		
4.MCTs used by commercial farmers	**Yes**		**No**	
	Frequency	**Percentage**	**Frequency**	**Percentage**
SMS/text application	129	42.7	173	57.3
social media applications (Facebook, twitter, WhatsApp)	94	31.1	208	68.9
custom built Mobile Agricultural applications	16	5.3	286	94.7

Results in Table 3 show that more than half of respondents were males (58.6%) and about 41.4 percent of the respondents were females, indicating that the most active commercial farming group is the male group. Of the 302 respondents, 13.6 percent of interviewed commercial farmers and agribusiness traders were between 18 to 25 years, 29.1 percent between 26 and 30 years, 30.5 percent between 31 and 40 years, 18.9 percent between 41 and 50 years, while those above 50 years made up only 7.9 percent of the total respondents (Table 3). This is an indication that the most active commercial farming age group is 31 to 40 years. Respondents were asked whether or not they utilized MCTs in their daily transactions to acquire and disseminate agricultural market information. Only 42.7 percent of the respondents agreed that they were using SMS/text application for information access and dissemination; only 31.1 percent of the respondents also agreed that they were using social media applications to access as well as disseminate agricultural market information; and 5.3 percent utilized custom built mobile

agriculture applications for information access and dissemination (Table 3). Therefore, such results gave an indication that MCTs have not been fully embraced in the agricultural sector purposely for information access and dissemination. Yet, majority of interviewed commercial farmers and agribusiness traders were reported to have attained higher education qualifications of certificate, diploma, bachelor's degree, master degree and doctoral degree [PhD (freq= 221, 73%) Table3].

Diagnostic tests

Normality tests indicated that Performance Expectancy as well as behavioural intentions were fairly and normally distributed according to PP, QQ and Histograms, Skewness and Kurtosis were in the limits of -1 to +1 and -3 to + 3, respectively, indicating normal distribution of variables (Cisar *et. al.,* 2010). Linearity tests using baseline regression indicated F-statistic >3 and Sig<0.05. There was no multi-collinearity because there was only one independent variable and there was homogeneity of variance as Levene test Sig>0.05. Therefore parametric tools of analysis were used to test the hypotheses.

Relationship between study variables

Confirmatory Factor analysis (CFA) and Structural Equation Model (SEM) analysis

Using SPSS and AMOS software, CFA and SEM were developed as shown in proceeding sub-sections. Validity of SEM was done using content validity and discriminate validity.

Convergent Validity

In this study, convergent validity, which assessed degree to which the construct measures are associated, was used. Convergent validity was determined using average variance explained (AVE) in CFA. Results indicated that average variance extracted (AVE) of each variable was above 0.5 as presented in Table 7 and it is an indication of convergent validity (Hair *et. al*., 2010).

Discriminant Validity

Discriminant validity was determined in CFA, a comparison of average variance extracted (AVE) and square of correlation or factor loading between constructs and variables was used to determine discriminant validity. Results indicated that the average of variance extracted (AVE) for all variables were above 0.5. In addition, the AVE for each manifest variable were greater than the square of correlation coefficients with other variables presented in the zero order correlation as presented in Table 7. Results confirm construct validity and composite reliability of Adoption, Performance Expectancy, Behavioural Intentions to Use and their items, respectively. Therefore, there is no significant difference between the hypothesised and observed model regarding Adoption. A summary of the validity results is shown in Table7.

Table 7 AVE and correlation matrix

Variable	Performance Expectancy	Behavioural Intentions	AVE
Behavioural Intentions	.408**	-	0.5742
Adoption	.411**	.487**	0.6480
AVE	0.5330	0.5742	

Estimating the Structural Models

After assessing measurement models, confirming the study hypotheses and ascertaining validity and composite reliability of the measurement scales, CFA was further used to develop the structural model based on the mediation path coefficients and variances explained. This explains the study linking dummy control variables (gender, age, education) with adoption also of Performance expectancy and behavioural intention with adoption.

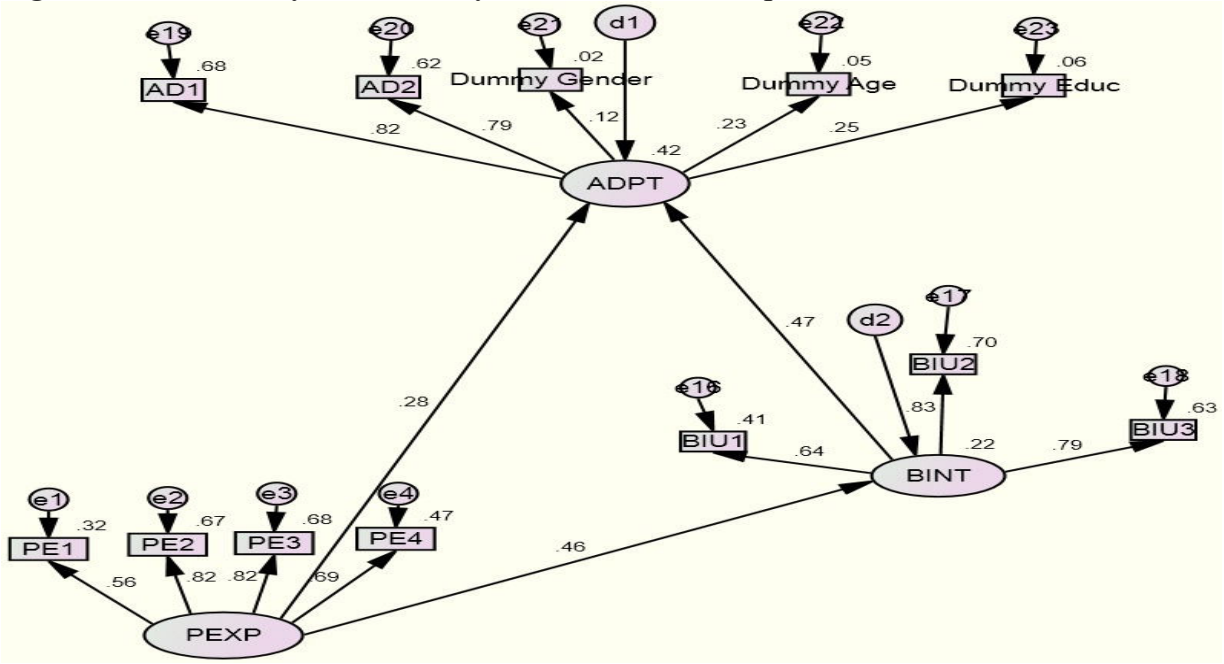
Hypothesis testing using SEM

The hypothesized model (Figure 1) developed from literature review implied testing direct and indirect relationships between the study variables. The results for Figure 3 generated a chi-square value of 108.367at p=0.000 for 51 degrees of freedom. Additionally, other recommended model fit indices specifically GFI=0.949, AGFI=0.921, Baseline Comparisons; NFI=0.907, RFI =0.904, IFI=0.949, TLI=0.932, CFI=0.948; and RMSEA=.061 suggested acceptable model fit. These results are also consistent with the accepted model fit levels provided by Bentler (2007); Hair and colleagues (2010); and Hu and Bentler (1999). Additionally, critical ratio results as presented in Table 8 show that measurement variables relating to accepted hypotheses are all above 1.96 and the p-values were less than .001. The results indicate that the model regression weights are significant and hence, different from zero, implying that dependence as well as correlation relationships between the manifest and latent variables were actually established accordingly.

Control variables of Age, Gender, Education, Behavioural Intentions to Use and Performance Expectancy linearly predicted adoption. There was a significant positive relationship between Behavioural Intentions to Use and Adoption (Beta=0.470, P<0.001), implying that if farmers predict to continue using MCTs now and in the near future, then they will easily be influenced to adopt MCTs. There is also a significant relationship between Performance Expectancy and Adoption (beta=0.276 P<0.001), implying that commercial farmers are easily influenced to adopt MCTs if they perceive MCTs to be beneficial in providing access to accurate and timely agricultural market information. There was a significant positive relationship between Performance Expectancy and Behavioural Intentions to Use (Beta=0.464, p<0.001). This implies that commercial farmers perceive MCTs to be time saving and can enable timely and accurate access to and dissemination of agricultural market information. Analyses of these results showed that Behavioural Intentions to Use significantly predicts Adoption rather than Performance Expectancy as shown in Table 8 and Figure 2.

The results uphold the hypotheses that, **H_1 "**There is a significant positive relationship between Performance Expectancy and Behavioural Intentions to Use Mobile Communication Technologies by Ugandan Commercial Farmers; **H_2"** There is a significant positive relationship between Behavioural Intentions to Use and Adoption of Mobile Communication Technologies by Ugandan Commercial Farmers; **H_3**T"here is a significant positive relationship between Performance Expectancy and Adoption of Mobile Communication Technologies by Ugandan Commercial Farmers."

Figure 2 Confirmatory Factor Analysis and Structural Equation Model



(BINT=Behavioural Intentions to Use, ADPT =Adoption and PEXP =Performance Expectancy)

Model 1: BINT=0.46PEXP+d_2
Where d_2 error term =0.063
Model 1: BINT=0.46PEXP+0.063
Model 2: ADPT=0.46PEXP+0.47BINT+d_1
Where $d_1$error term =0.144
Model 2: ADPT=0.46PEXP+0.47BINT+0.144

Table8 Model Fit Summary

Model Fit Summary- CMIN					
Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	27	108.367	51	0	2.125
RMR, GFI					
Model	RMR	GFI	AGFI	PGFI	
Default model	0.019	0.949	0.921	0.62	
Baseline Comparisons					
Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	0.907	0.904	0.949	0.932	0.948
RMSEA					
Model	RMSEA	LO 90	HI 90	PCLOSE	
Default model	0.061	0.045	0.077	0.121	

Table 9 Regression Weights: (Group number 1 - Default model)

			Unstandardised Estimate	S.E.	C.R.	Standardised Estimate	P
BINT	<---	PEXP	0.465	0.084	5.563	0.464	***
ADPT	<---	BINT	0.821	0.142	5.776	0.470	***
ADPT	<---	PEXP	0.482	0.132	3.653	0.276	***
PE1	<---	PEXP	1			0.563	
PE2	<---	PEXP	2.245	0.236	9.505	0.819	***
PE3	<---	PEXP	2.347	0.247	9.517	0.822	***
PE4	<---	PEXP	2.007	0.231	8.687	0.687	***
BIU1	<---	BINT	1			0.642	
BIU2	<---	BINT	1.521	0.143	10.658	0.834	***
BIU3	<---	BINT	1.488	0.141	10.521	0.791	***
AD1	<---	ADPT	1			0.823	
AD2	<---	ADPT	0.841	0.079	10.689	0.785	***
Dummygender	<---	ADPT	0.123	0.063	1.948	0.124	0.051
Dummyage	<---	ADPT	0.204	0.057	3.574	0.228	***
Educdummy	<---	ADPT	0.254	0.064	3.948	0.252	***

(BINT=Behavioural Intentions to Use, ADPT =Adoption and PEXP =Performance Expectancy)

Table 10 Variances: (Group number 1 - Default model)

	Estimate	S.E.	C.R.	P
PEXP	.080	.016	4.940	***
d2	.063	.011	5.567	***
d1	.144	.023	6.170	***
e1	.173	.015	11.268	***
e2	.199	.026	7.571	***
e3	.212	.028	7.477	***
e4	.362	.035	10.298	***
e16	.115	.011	10.517	***
e17	.082	.013	6.285	***
e18	.107	.014	7.666	***
e19	.117	.021	5.467	***
e20	.108	.016	6.675	***
e21	.239	.020	12.224	***
e22	.186	.015	12.115	***
e23	.234	.019	12.079	***

Assessment of Direct and Indirect Mediation Effects of Behavioural Intentions to Use

In this study, the bootstrap procedure provided by Preacher and Hayes (2008) as well as Preacher, Rucker and Hayes (2007) was used to test significance of mediation using direct and indirect mediation effects in the following hypotheses: **H_4 "**Behavioural Intentions to Use

mediates the relationship between Performance Expectancy and Adoption." The hypotheses previously tested were also confirmed using the standardized mediation effects. Preacher *et al*., (2007) argued that in order to accurately confirm and consequently interpret the data, emphasis should be based on both standardized direct and indirect effects.

Following assessment of significance of direct and indirect effects of behavioural intentions to use on adoption, confirmation of mediation and hypotheses was done using three different models (Preacher & Hayes, 2004). Analysis was done using the maximum likelihood (ML) parametric bootstrap method. Maximum likelihood method was selected in order to maximize the number of iterations to achieve better results. The analysis provides the average bootstrap estimates of indirect and direct effects and 95 percent confidence intervals by determining the 2.5 percent lower bound values and 97.5 percent upper bound values in distribution of indirect effect estimates from each bootstrap sample as presented in Table 10. Results in Table 11 indicate significant mediation effect of Behavioural intention to Use between Performance Expectancy and Adoption, implying that there is a partial mediating effect of Behavioural Intentions to Use on the relationship between Performance Expectancy and Adoption.

Table 11 Mediation Bootstrap tests and confidence levels results (***p<0.001)

Standardised Total effects	PEXP	BINT
BINT	0.464***	-
ADPT	0.494***	0.470***
Standardised Direct effects	PEXP	BINT
BINT	0.464***	-
ADPT	0.276***	0.470***
Standardised Indirect effects	PEXP	BINT
BINT	-	-
ADPT	0.218***	-

(BINT=Behavioural Intentions to Use, ADPT =Adoption and PEXP =Performance Expectancy)

DISCUSSION OF FINDINGS

There was a significant positive relationship between Performance Expectancy and Behavioural Intentions to Use MCTs by commercial farmers in Uganda. This implies that if commercial farmers can access and disseminate accurate, timely and reliable agricultural product prices and other pieces of information using MBCTs, they are likely to be influenced to adopt these technologies for agricultural purposes. This is in line with studies by Engotoit *et al.* (2016); Malima *et al.* (2015); Alotaibi *et al.* (2013) and Venkatesh *et al.* (2012, 2003) who agree that Performance Expectancy is found to uniquely, significantly and positively influence one's Behavioural intension to adopt and use a technology product.

There was a significant positive relationship between Behavioural Intentions to Use and adoption of MCTs by commercial farmers in Uganda. It implies that once commercial farmers' intentions are positive towards using MCTs for agricultural marketing purposes, once they believe that MCTs will be more reliable and time saving than traditional means of accessing agricultural market information, then they will use MCTs, they will recommend others to use MCTs and they will continue to use MCTs even in future thereby strengthening adoption and use of MCTs by

commercial farmers. This is in line with studies from Malima *et al*. (2015); Kahenya *et al.* (2014 and Venkatesh *et al.* (2012; 2003) who agree that Behavioural Intentions to Use strongly predicts adoption of technology products.

A significant positive relationship was also found to exist between Performance Expectancy and adoption of MCTs by commercial farmers in Uganda, implying that perceived benefits of MCTs, perceived timeliness of MCTs and perceived access to and dissemination of agricultural market information can directly influence on commercial farmers to adopt MCTs for agricultural market information dissemination. This is in line with studies by Kahenya *et al.* (2014) and Davis (1993) who argued that Performance Expectancy had the potential to predict adoption of technology products. Behavioural Intentions to Use was found to have a mediating effect on the relationship between Performance Expectancy and Adoption. Performance Expectancy was significantly related to Adoption and Behavioural Intentions to Use, while Behavioural Intentions to Use was significantly related to adoption, implying that there was a partial mediating effect of Behavioural Intentions to Use on the relationship between Performance Expectancy and Adoption. Thus, it implies that commercial farmers will continue to use MCTs now and even in the futureand also recommend others to use MCTs only if they are time saving, MCTs provide Access to agricultural prices, enable dissemination of agricultural prices and provide accurate as well as reliable agricultural market information thereby influencing adoption. This finding is in line with studies by Venkatesh *et al.* (2012;2003) who argue that Performance Expectancy could indirectly predicts Acceptance and use through the mediation role of Behavioural Intentions to Use. The finding is also correlated with several other studies that have applied the UTAUT theory in their studies (Zeinab *et. al.,* 2014; Kahenya *et. al.,* 2014; Ghalandari, 2012).

CONCLUSION

From the findings, it can be concluded that Performance Expectancy influences on Behavioural Intentions to Use; Performance Expectancy is also confirmed to directly influence on adoption of MCTs, which is one of contributions of the study; Behavioural Intentions to Use significantly influences on adoption of MCTs; and finally, Behavioural Intentions to Use partially mediates the relationship between Performance Expectancy and adoption. This indicates that behavioural intentions of commercial farmers to use MCTs play a very significant role in influencing them to adopt MCTs. Therefore, if MCTs are perceived to be time saving, provide Access to agricultural prices, enable dissemination of agricultural prices and provide accurate as well as reliable agricultural market information, then their behavioural intentions to use can be positive given that they will be willing to use MCTs now and also in future. Also they will be willing to recommend others to use MCTs thereby encourage adoption. The Government of Uganda and telecommunication companies can put efforts in ensuring that commercial farmers can adopt and continue to use MCTs now and in future. That can be done by providing reliable internet connections; training commercial farmers on how to effectively use social media platforms and other internet-based mobile applications for access to agricultural information and dissemination purposes thereby subsidize prices acquisition and use of MCTs.

Contribution of the study

Several studies conducted by many researchers on performance expectancy, Behavioural Intentions and adoption have been in developing countries but mainly on employees and students' performance expectancy. However, limited research endeavours have been conducted on performance expectancy of farmers in a developing country like Uganda. Venkatesh *et al.*

(2012; 2003) recommends further studies to test the UTAUT and UTAUT2 Models in different countries, age groups, technology and professions. It is on this basis that the study was conducted to examine the mediating role of behavioural intentions to use on performance expectancy and adoption of MCTs in a developing country like Uganda. Theoretically, this study identified a direct link of performance expectancy in predicting adoption, which is an improvement to Vekatesh *et al.* (2012; 2003) models that had no direct relationships between performance expectancy and adoption. Use of second generation, advanced and confirmatory statistics to test the hypotheses with bootstrap as mediation test and covariance-based structural equation model using analysis of moments of structures (AMOS) boosts and gives highly credence to earlier studies that have used medgraph with sobel test for mediation and linear regressions and partial least squares (PLS) to predict behavioural intention, user behaviour and adoption.
Furthermore, this research is of a considerable contribution to the information technology discourse towards usage and adoption theory discourse, service providers and also further policy efforts in Uganda including other developing economies, as they continue to build developmental transformative models and strategies towards achieving complete usage for better service delivery. The study provides extant information to advance need for mobile usage services, data and research to guide managerial interventions.

RECOMMENDATIONS

There is need for knowledge creation and market research needed to understand unique needs of performance expectancy and behavioural intention on demand side of commercial farmers in developing countries. In due regard, it is recommended that policy makers should design mobile phone policies and adopt strategies geared towards performance expectancy and behavioural intention. Additionally, designing programs that stimulate individual farmers for their effectiveness is crucial in advancing mobile phone usage. Policy frameworks are also needed to support establishment of robust mobile phones in Ministry of Agriculture to enhance service delivery.

Policy makers need to provide a planning policy framework that recognizes farmers' performance expectancy and behavioural concerns when it comes to usage of MCTs. It is important to ensure awareness of behavioural challenges that propel voluntary use of mobile phones when proposing initiatives towards promoting highly inclusive mobile communication technologies. In order to increase on adoption of MCTs for agricultural market information dissemination, policy makers and telecommunication service providers need to improve on functionality of MCTs by incorporating user-friendly menu functions in MCTs like custom-made agricultural mobile applications. It is also imperative that a unified mobile platform for agricultural marketing transactions is developed. Such platform needs to be developed with specific user needs incorporated in the system. It will help to influence on intentions of commercial farmers to adopt MCTs given that majority responded that they intend to use MCTs now and in future.

It is also imperative that mobile network service providers should work towards innovating new ways in which MCT choices would be presented to commercial farmers given that they will influence on their intentions to adopt and use them. Therefore, commercial farmers will be in position to use MCTs for their transactions now and even in future. Also they will encourage others to use MCTs for agricultural purposes. Given that Behavioural intentions to use is a strong predictor of adoption of MCTs, governments need to openly engage behavioural experts when

designing policies and programs that will enable commercial farmers to adopt MCTs for agricultural marketing purposes.

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