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Mobile phones in enhancing education: Factors influencing their Phones Use in Accessing Academic Information in Tanzania

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Abstract

Despite the well-known adoption of mobile phones, it has been shown that the students' usage of mobile phones in accessing academic information is low. Using the Technology Acceptance Model (TAM), the study investigated the factors which influence students' use of a mobile phone for accessing academic information in higher learning institutions in Tanzania. The study involved 120 undergraduate students at Sokoine University of agriculture. At the same time, Structural Equation Modeling (SEM) was employed to analyze data. The findings showed that age, sex, and experience of owning a mobile phone significantly influenced Behavioral Intention (BI). Furthermore, the results indicate that behaviour intention (BI) significantly predicted actual use of mobile phone (AU) while attitude (AT)) and perceived usefulness (PU) were statistically significant, as predictors of BI, and also Perceive Ease of Use (PEOU) and perceived usefulness significantly influenced students' attitude (AT) toward the use of mobile phone. It is recommended that education practitioners when designing the mobile phone system for learning should consider students' socio-economic characters and ensure that it is less complex and useful.

Keywords: Perceive usefulness, perceive ease of use, social norm, attitude, actual use, mobile phone, Gender

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I.0 Introduction

Information and Communication Technology (ICT) has been used to improve the provision of services in Tanzania. The Government of Tanzania advocates the use of ICT to improve education, as it has shown in the national plans and guidelines for improving the learning environment (Mshangi, 2013). Therefore, Tanzania's ICT policy recognizes the potential of using electronic devices in higher learning institutions (Tanzania Commission for Universities (TCU), 2012; United Republic of Tanzania (URT), 2014; URT, 2016).

The major ICTs devices in higher learning institutions in most developing countries are desktop computers (World Bank, 2011). Desktop computers, however, are inadequate as the number of students is high due to a high increase of students' enrolment (Mwantimwa & Emmanuel, 2017; Ngeze, 2016; Mosha. & Bea, 2014). Also, they are not flexible and movable to students (Ngeze, 2016). For that reason, mobile phone usage can be used to improve students learning in higher learning institutions to supplement the available ICTs facilities in university computer laboratories.

A mobile phone is a small movable telephone device. It is used to share information over long distances without telephone lines. Mobile phones are among the most rapidly growing new ICT in the world (Vashist et al., 2015). They are used for a variety of reasons, such as to communicate with relatives, perform business, keep records, and to inform colleagues on emergence events. Studies (Mtega et al., 2013; Mosha. & Bea, 2014) show that students have been previously using mobile phones for several activities such as financial services and social networking. Recent the use of mobile phones has gone further than the conversational means of communication through supporting teaching and learning. Studies show that most of students own smartphone phones (Mtega et al., 2013; Mosha. & Bea, 2014; Mahenge & Sanga, 2016; Bursztyn et al., 2017). The smartphones support a very wide range of other services apart from making and receiving calls (World Bank, 2011). The smartphones enable access to services such as video calling, internet, sending messages, downloading files, playing games (Carroll & Heiser, 2017).

Furthermore, the rate of mobile phone use in Tanzania is increasing at a higher rate. The number of mobile phone subscribers rose to 43.6 million which is more than half of its total population (Tanzania Communication Regulatory

Authority, 2018). This has created an opportunity to use mobile phones among most of the Tanzanians in both urban and rural areas. In addition, ownership of mobile phones among students in higher learning institutions is high (Mahenge & Sanga, 2016). Thus, the use of mobile phones for accessing academic information is possible because most of the students own mobile phones.

The use of mobile phones is a multifaceted matter that is influenced by several variables such as perceived usefulness, perceived ease to use, attitude and subjective norm (Venkatesh & Davis, 2000; Yen & Wu, 2016; Roy et al., 2018). However, other studies opted to omit attitude because of its primary limiting mediating effect (Sun & Zhang, 2006; Binyamin, et al., 2020). This background forms the bottom line for this study which aims empirically to assess factors which influence the use of mobile for learning purposes among students in Tanzania.

In Tanzania, scarce studies have been conducted to assess the use of mobile phones for accessing academic information by students in higher learning (Kafyulilo, 2012; Mtebe & Raisamo, 2014; Mahenge & Sanga, 2016). Mtega et al. (2013) have shown that most of the students use a traditional feature such as calling and sending messages. Thus, this study entails understanding and examining factors that influence students to adopt and use of mobile phones for accessing academic information. Mtebe and Raisamo (2014) used the Unified Theory of Acceptance and Use of Technology (UTAUT) to assess factors influencing students' use of mobile phones for learning purposes. The current study investigated factors influencing students' use of mobile phones for accessing academic information at Sokoine University of Agriculture using TAM but including the moderating variables such as age, sex, the experience of using mobile phones and year of study of the students. The study results provide useful information to policymakers, and other stakeholders when developing and formulating, implementing strategies for policies relating to the use of mobile phones for learning purposes.

1.1 Conceptual Framework of Study

The conceptual framework of this study was adapted from TAM as proposed by Venkatesh and Davis (2000). The model indicates three factors that influence adoptions of technology: perceived usefulness (PU), perceive ease of use (PEOU), attitude (AT) and behavior intention (BI) as shown in Figure 1. Perceive usefulness refers to the extent to which an individual believes that the

use of the technology will improve his or her performance whereas perceive ease of use is the extent to which a person believes that using the technology will not consume a lot of energy (Sánchez-Prieto et al., 2017; Roy et al., 2018). The attitude towards the use of technology is influenced by positive or negative perceptions toward the technology (Venkatesh & Davis, 2000; Asiri et al., 2012). Usage can also be determined by a person's awareness of the capability to use the technology (Yen & Wu, 2016). User attitude determines the use of the technology and is influenced by two main factors (PEOU and PU). PU is directly influenced by PEOU (Venkatesh et al., 2003; Park et al., 2012).

Also, social norms are the indirect determining factor of new technology usage (Venkatesh et al., 2003). A person's intention to use technology is high if that person expects that using the technology will draw attention from colleagues. The behavioural intention of an individual is determined by subjective norms which are determined by the influence of fellows' perception (Jain & Hundal, 2007; Park et al., 2012). It is expected that if the colleagues, superiors, juniors around an individual have positive opinions or behaviors to the use of mobile phones, it will influence students to use mobile phones for accessing academic information.

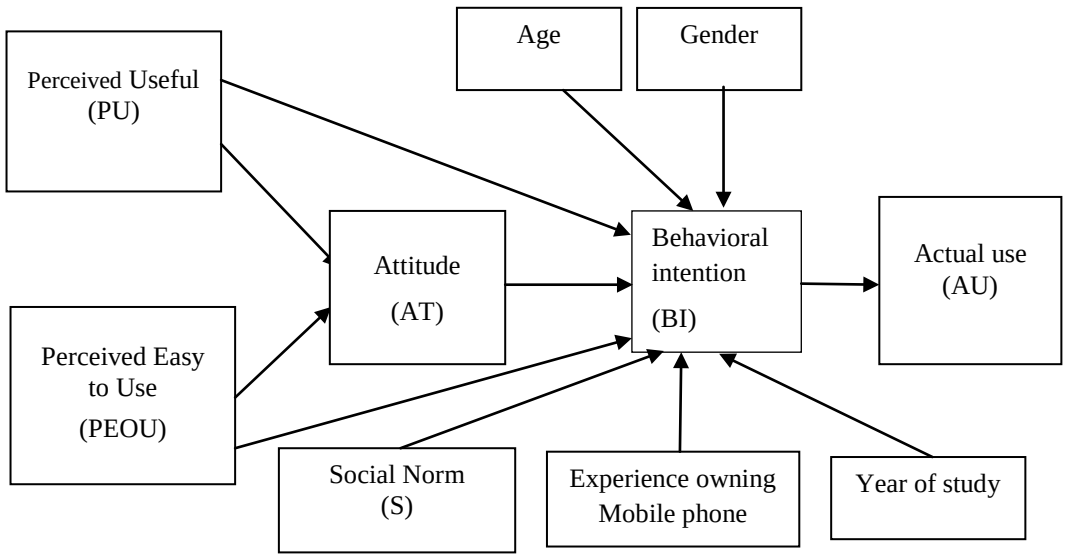


Figure 1: **Conceptual framework**

From the conceptual framework, the following research hypothesis was deduced:

H1a: BI influence students AU of mobile phone for accessing academic information
H1b: AT influences students' BI of mobile phones for accessing academic information.
H1c: P influence students AT on mobile phone for accessing academic information
H1d: PEOU influence students AT on using mobile phone for accessing academic information.
H1e: S influence students' BI of mobile phone for accessing academic information.
H1f: Age influences students' BI of mobile phones for accessing academic information.
H1g: Sex influences students BI of mobile phones for accessing academic information
H1h: Year of study influence students' BI of mobile phone for accessing academic information.
H1i: Experience of owning a mobile phone influences students BI of mobile phone for accessing academic information

2.0 Methodology

Cross-sectional research design was employed to collect data from selected respondents at Sokoine University of Agriculture (SUA). SUA was selected because is one of the popular and old higher education institutions. Thus, it provided a good setting for study. The questionnaire was used as the main data collection tool from the selected respondents. The questionnaire contained questions on respondents' responses on perceived usefulness (PU), perceived ease of use (PEOU), attitude towards usage (AT) and behavior intention (BI), social norm (S), actual use (AU) and selected socio-demographic characteristics such as age, sex, year of study, and experience of owning mobile phones. Furthermore, AT, PU, AU, BI, S, and PEOU were measured using Likert scale of five levels: *5-Strongly agree, 4-Agree, 3-Neutral, 2-Disagree* and *1-strongly disagree*. D1=Age was measured in the year of students, D2=Sex (1-Female, 0-Male), D4=Year of study and D5=Experience of owning a mobile phone (Years). Hoyle (1995) recommended a sample size between 100 to 200 for using Structural Equation Modeling (SEM). Hence in the current study, 120 students were selected to participate in this study.

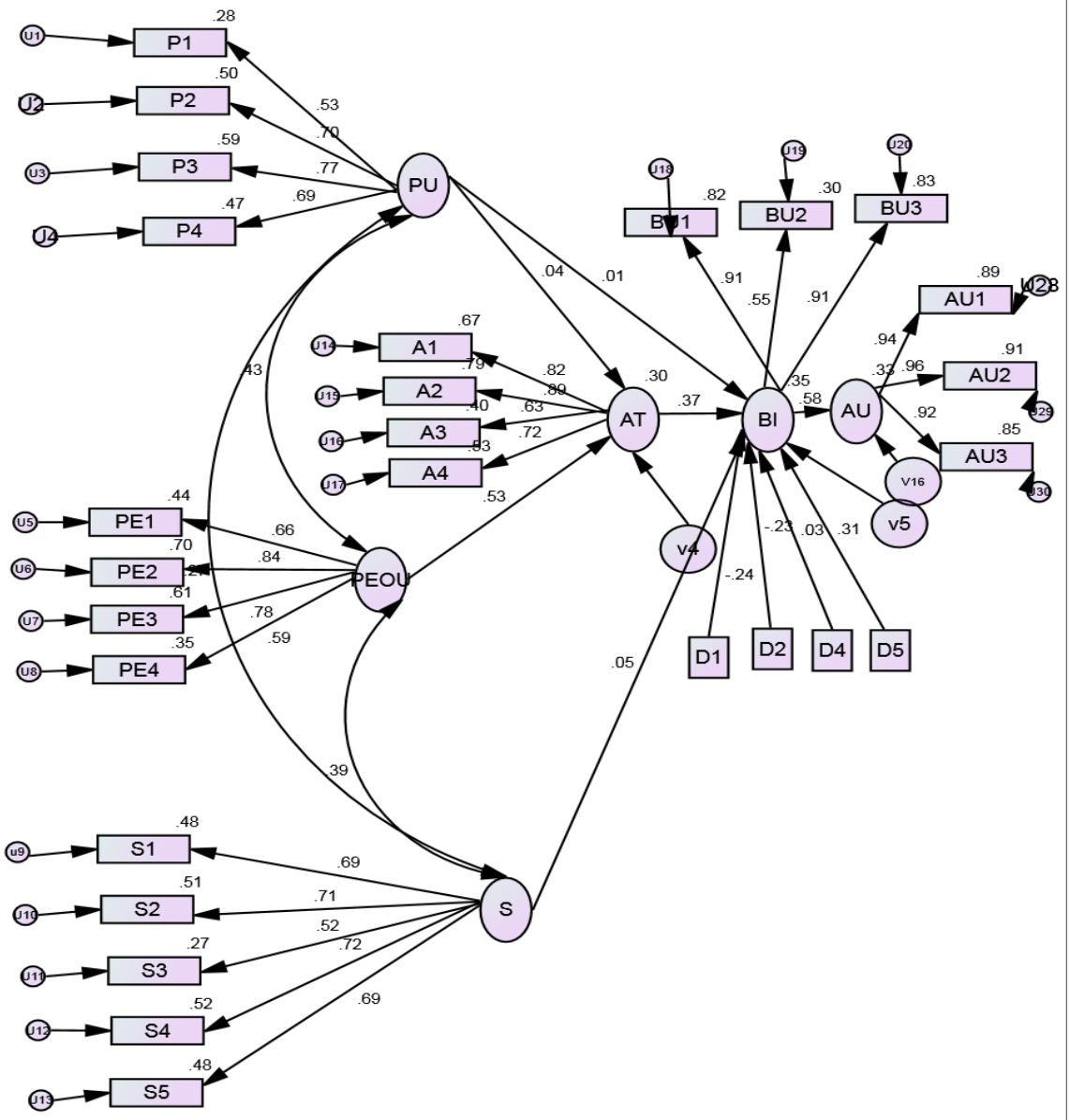
To assess the reliability of the research tool, the author conducted a pilot study with 20 respondents. Spearman-Brown split-half Cronbach's alpha was calculated and it was 0.81 which is higher than 0.7 hence the research tool was reliable as per recommendation by Hair et al. (2010). Quantitative data were coded on Statistical Package for Social Sciences (SPSS). The author analyzed frequency, percentages and mean. Furthermore, the hypothesis was tested using Structural equation modeling (SEM). Reliability analysis was conducted to assess the correlation among the statement of each study variable. A Cronbach's of 0.7 or higher indicates a reliable scale. In this study, a Cronbach's α obtained was 0.798 for PU, 0.740 for PEOU, 0.72 for S, 0.79 for BI, 0.86 for AU and 0.640 for A. Since the higher the Cronbach's the good the internal consistency, and value 0.648 is not acceptable indicating scale is not reliable. Then two statements with larger Cronbach's α if item deleted for attitude were deleted and remain with 4 statements and the Cronbach's α obtained after deleting the two statements with high Cronbach's α was 0.886 indicating a highly reliable scale.

Also, the exploratory factor analysis was carried out through principal component analysis to reduce 23 statements into six dimensions. The study adopted an orthogonal rotation (varimax rotation), which maximizes variation in the matrix system. Again, the data were suppressed at 0.4 factor loading. The Kaiser-Meyer-Olkin score 0.730 which is significant, this means that data were appropriate to perform exploratory factor analysis. Furthermore, Bartlett's test of sphericity (1159.00, df=120 and p=0.001) means that correlation is not the same for all factors (Field, 2013).

Similarly, confirmatory factor analysis (CFA) was analyzed by using analysis of a moment structures (AMOS) version 22 in order to verify the construct validity. The CFA results were used to assess the 6 original factors derived from TAM theory. The model contained 23 statements (4 statements for PU, 4 statements for PEOU, 4 statements for AT, 3 statements for BI, 5 statements for S and 3 for AU). Furthermore, the study adopted various indices to assess the fitness of the CFA model. The indices included, the ratio of $\chi 2$ statistics to the degree of freedom (CMIN/DF), GoF index (GFI), adjusted GoF index (AGFI), normed fit index (NFI), expected cross-validation index (ECVI), Tucker-Lewis Index (TLI), comparative fit index (CFI) and root mean square error of approximation (RMSEA). The results show that the ratio of the minimum discrepancy to the degree of freedom (CMIN/DF) was 2.70 which is less than 3 as recommended by Byrne (2010). GFI= 0.93; AGFI= 0.850; NFI= 0.63; ECVI= 4.79; TLI= 0.78; CFI= 0.872; and RMSEA= 0.052 (PCLOSE=0.17).

Using the above indices, the results indicated that the CFA model fits well with the data (Byrne, 2010).

The estimates based on all 23 statements showed that the standardized regression weights are presented in Figure 2. The results show that the standardized regression weights for PU ranged from 0.53 to 0.77, PEOU (0.59 to 0.84), AT (0.63 to 0.89), S (0.69 to 0 0.72) and BI (0.54 to 0.90), and AU (0.94 to 0.95) (Figure 2). The results show that there was an interrelationship between explanatory all the items on the variables. The standard coefficients for all the statements are higher than 0.5 which is the least value according to Rauniar et al. (2014). The 23 items are partitioned into six component factors: PU, PEOU, AT, BI, S and AU. In addition, all the items showed Good Square multiple correlations ranging from 0.51 to 0.67. Moreover, to assess convergent validity using the composite reliability (CR) of each factor was also calculated due to the reason that it is an appropriate indicator than Cronbach coefficient α (Field, 2013; Rauniar *et al*., 2014). Thus the overall CR of each variable: PU (0.70), PEOU (0.71), AT (0.74), S (0.73), AU (0.81) and BI (0.76) was calculated. This implies that each variable reflects a good measurement model because CR is higher than the required level of 0.7 (Field, 2013).


P1
P2
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PU
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Figure 2: Standardized Estimate of the Confirmatory Factor Analysis

3.0 Results

3.1 Respondents' Characteristics

Table 1 shows the distribution of the respondent according to their demographic characteristics. The results show that more than half, (61.9%) of responders were male while only 38.3% of respondents were female (Table 1). This implied that there were a high proportion of male respondents than females. Again, less than half, (43.3%) of respondents reported that their ages ranged from 20 to 22 years. The implication here is that more young people were involved in the study. The high distribution of respondent's ages between 20 to 22 years could be due to reasons that 20-22 years comprise the age at which most of the young complete A-level and join higher education. The results show that the first year was (38.8%) while the second year was 23.8%. Furthermore, about half, (51.7%) of the respondents reported that their experience on owning a mobile phone ranged between 4 to 6 years. Experience is an advantage because it enables respondents to gain knowledge and skills on the use of mobile devices.

Table 1: Characteristics of Respondents (N=120)

Variable	Description	n	%
Sex	Male	74	61.9
	Female	46	38.3
Age categories	20 – 22	52.5	43.8
	23 - 24	43.5	36.3
	More than 24	24	20.0
Year of study	1	46.5	38.8
	2	28.5	23.8
	3	30	25.0
	4	12	10.0
	5	3	2.5
Experience of owning mobile phone	Less than 4	46	38.3
	4 - 6	62	51.7
	More than 6	12	10.0

3.2 Factors Influencing Students' Use of Social Media for Accessing Academic Information among Students

Table 2 shows the mean score of the 23 statements while Table 3 shows the results from Principal Component Analysis (PCA). All six factors explained 73.16% % of the total variation. The first principal component accounted 30.87% of the total variation. PC1 represents statements related to the social norm. The statements under this component include the influence of fellow students, colleague and instructors on students' mobile phone usage for accessing academic information (Table 3). The mean value of four items associated with first principal component is close to 4.2, which means that most of the respondents said they could think that colleagues think that it is important to use mobile phones for sharing academic information.

The second principal component accounted 13.20% of the total variation. It comprised of the statements related to the perceived usefulness of using mobile phones for sharing academic information. The mean score for all the items related to this component is higher than 4.0, which means that the respondents agree with the items.

The third principal component accounted 10.39% of the total variation; it contained statements related to the use of mobile phones. The mean score was generally near 4.1; this implies that most of the students had a positive attitude with the use of mobile phones for sharing academic information. The fourth principal component (7.04% of the total variation) contained statements relating to perceived easy to use, the fifth principal component (6.45%) consisted of statements relating to behavioral intention to use a mobile phone. Lastly, the sixth principal component (5.21%) consisted of statements related to the actual use of mobile phones for accessing academic information.

Table 2: Descriptive Statistics for the Responses on the Use of Mobile phone for Accessing Academic Information

Statements	Mean	Std. Deviation
Using mobile phones enables me to share information related to academic activities more quickly	4.68	.722
Using mobile phones enhanced my effectiveness in academics.	4.11	.052
Using mobile phones enhances the quality of my academic activities.	4.02	.037
I find mobile phones useful in sharing academic information	4.33	.873
Learning to use mobile phones is easy for me	4.32	.780
I find it simple to use mobile phones to do what I want to do in my academic activities	4.13	.987
I find it easy for me to become skillful in using mobile phones in sharing academic information	4.20	.866
I find mobile phones easy to use in sharing information in my academic activities	4.22	.918
Using mobile phones in sharing information would make my academic activities more interested	4.19	.023
Using mobile phones in sharing academic information is a good idea	4.29	.016
I have a generally favorable attitude toward using mobile phones in sharing academic information	4.08	.972
Mobile phone is user friend technology for accessing academic information	4.29	.956
If your close colleagues use mobile phones to share academic information	4.21	.839
If your institution would look favorably on you sharing academic information through mobile phone	4.36	.754
If your instructor requires you to use a mobile phone to share academic information	4.02	1.069
If your institution would look favourably on you sharing academic information through mobile phone	4.19	.938
If high performing students in your discipline use a mobile phone to share academic information	4.18	.895
Intend to begin or continue using mobile phone for learning purpose	4.29	.024
I will recommend the use of the mobile phone for academic purposes to others.	4.20	.026
Intend to use the mobile phone for academic purposes in the future	4.11	.971
I use mobile phone for academic purposes frequently	4.0	.23

I tend to use mobile phones for academic purposes as long as is necessary	4.4	.34
I have been using a mobile phone for academic purposes regularly	3.9	.67

Table 3: Factor Loadings for Various Principal Component Analyses of Statements

Statements	PC1 (30.87%)	PC2 (13.20%)	PC3 (10.39%)	PC4 (7.04%)	PC5 (6.45%)	PC6 (5.21%)
If your close colleagues use a mobile phone to share academic information	.835					
If your institution would look favourably on you sharing academic information through mobile phone	.796					
If your instructor requires you to use a mobile phone to share academic information	.736					
If your institution would look favourably on you sharing academic information through mobile phone	.744					
If high performing students in your discipline use mobile phones to share academic information	.713					
I find mobile phones useful in sharing academic information		.813				
Using mobile phones enhances the quality of my academic activities.		.807				
Using mobile phones enables me to share information related to academic activities more quickly.		.697				
Using mobile phones enhanced my effectiveness in academics.		.661				
The use of mobile phones in sharing academic information is a good idea			.855			
Mobile phone is user friend technology for accessing academic information			.794			
Using mobile phones in sharing information would make my academic activities more interested			.705	.438		
I have a generally favorable attitude toward using mobile phones in sharing academic information		.416	.530			
Learning to use mobile phones is easy for me				.728		
I find mobile phones easy to use in sharing information in my academic activities				.822		
I find it easy for me to become skillful in using mobile phones in sharing academic information				.792		
I find it easy to use mobile phones to do what I want to do in my academic activities				.696		
Intend to use a mobile phone for academic purposes in					.622	

the future			
I will recommend the use of a mobile phone for academic purposes to others.	.592		
Intend to begin or continue using a mobile phone for learning purposes	.566		
I have been using a mobile phone for academic purposes regularly			.768
I tend to use mobile phones for academic purposes as long as is necessary			.567
I use mobile phones for academic purposes frequently			.677

PC1-First Principal component; PC2-Second Principal component; PC3-Third Principal component; PC4-Fourth Principal component; PC5-Fith Principal component; PC6-Six Principal component;

Table 4 presents a summary of the SEM path coefficients. The results show that BI (β=.57, p=.000) was a statistically significant predictor of AU. This implied that students who had higher behavior intention were likely to adopt and use a mobile phone. Furthermore, the behavioral intention was influenced by AT (β=.37, p=.000), P (β=.01, p=.004), D1 (β=-.25, p=.039), D2 (β=-.23, p=.015) and D5 (β=.31, p=.000). The S did not have significant influence BI (β=.05, p=.559). The strongest significant path is AT → BI (β=.37, p=.000) while the weakest path is P → BI (β=.01, p=.004). The results show that PEOU (β=.53, p=.000) and P (β=.04, p=.002) significantly predicted the respondents' A. In addition, the findings show that there was a positive significant correlation between P and PEOU (r=.44, p= 0.002), PEOU and S (r=.39, p=0.004) and P and S (r=.27, p=0.027). Positive correlation implies that an increase in PEOU increases P, while an increase in S also increases P, and lastly, an increase in S increases P on mobile phone usage.

Table 4: The summary of the SEM Results

SEM regression path	SRW	SE	CR	p
BI<----S	.050*	.073	1.572	.559
BI<---D1	-.236**	.021	-2.776	.003
BI<---D2	-.225*	.097	-2.479	.015
BI<---D4	.027	.041	.869	.385
BI<---D5	.308**	.023	3.236	***
BI<---AT	.365*	.129	.903	***
BI<---P	.008	.125	.080	.004
AT<---P	.041**	.112	2.623	.002
AT<---PEOU	.532**	.173	.250	***
AU<---BI	.0.576**	.120	3.680	***

	r			
P<-->PEOU	.446	.043	3.104	.002
PEOU<-->S	.391	.071	2.919	.004
P<-->S	.270	.041	2.210	.027

SRW-standardized regression weights; r-Correlation; SE-standard error; CR-critical ratio.
*p<0.05; **p<0.01.

4.0 Discussions

4.1 Factors Influencing Students' Use of Social Media for Accessing Academic Information among Students

The age of the students negatively influenced students' intention of using mobile phones for accessing academic information. Studies show that older people had low chance of adopting and using technology than younger ones (Venkatesh et al., 2012). Older people were seldom hesitant to use new technology for learning purposes. This finding is similar to earlier studies by Binyamin et al. (2020) and Tarhini et al. (2014) which found that age was the moderating factor on behavior intention of using mobile for learning purposes. Therefore, any initiative for mobile phones use should provide education to all age categories.

Also, sex negatively influenced behavior intention to use mobile phones for accessing academic information. A relationship between gender and intention of using mobile phones for academic purposes is because males and females had different perceptions and use the technology (Al-Youssef, 2015). The negative beta coefficient implied that female students were less likely to intend to use mobile phones for academic purposes. In most of the Tanzanian society, there is a difference in parent behavior to buy the ICTs devices for their children. Most of the parents give a high priority to boys than girls. Thus, most of the boys start possessing and using mobile devices as early as girls. This causes a low level of using mobile devices among girls, and thus low behavioral intention. This is similar to the study by Brinson (2016) which revealed that gender influenced the acceptance of using mobile phones for academic purposes. This shows that sex should be taken into account during the process of developing the systems for e-learning programs using mobile phones.

Experience on owning mobile phones positively influenced behavioral intention for mobile phone usage for accessing academic information. The results indicated that the experienced students had a higher likelihood of intending to use mobile phones. This is because an experienced one means have gained the knowledge on mobile phones usage; thus, they are likely to be better on various uses of mobile phones. These findings are similar to the findings by Lu et al. (2003) who found that experienced users of mobile devices had high adoption of wireless internet.

Similarly, attitude had positively influenced students' intention for using mobile phones to access academic information. The attitude towards mobile phones usage is highly influenced by students' intention for using mobile phones to access information than other predictors. Regardless of the usefulness of mobile phones, its influence on the behavior intention is low than attitude. This could be influenced by the fact that the perceived usefulness has a direct effect on the intention of using the technology but also influences the attitude toward an individual toward the technology. This result is similar to previous on student use of mobile phones for learning purposes (Park et al., 2012; Van De Bogart & Wichadee, 2015; Almaiah et al., 2016). Moreover, the study found that social norms positively influenced behavioral intention for mobile phones usage for accessing academic information. This is similar to the previous study by Ali and Arshad (2018) which found that social influence was significant to behavioral intention to use m-learning by students.

Furthermore, the findings show a positive value for perceived ease of use and perceived usefulness towards student's attitudes on the usage of mobile phones for accessing academic information. The beta value for perceived ease of use is higher than that of the perceived usefulness. This meant that the perceived ease of use is a stronger determinant of the actual use. This shows that students in higher institutions who believe that using mobile phones for academics is easy, and will facilitate them to do their learning activities more quickly, and are likely to build the intention of using mobile phones to access academic information. When students perceive mobile phone usage for academic purposes as easy to use as well as useful, they developed a positive attitude towards utilizing it. This is in line with a study by Almaiah et al. (2016), who found that perceived ease of use and perceived usefulness influenced students' use of technology. The implication here is to strengthen the attitude of students towards mobile phones usage for accessing academic information, educators

should develop a less complex tool for mobile devices that will facilitate student learning.

The results indicated that behavioral intention positively influenced the use of mobile phones for accessing academic information. Students with high intention had higher usage of mobile phones than those who do not. The results are similar to the past studies on the use of technology acceptance (Attuquayefio & Addo, 2014). Furthermore, the results show that all the major variables were correlated together. The value of correlation ranged from .377 to .437 which is considered as a medium according to Field (2013) and Hair et al. (2013). This is similar to the previous studies which found that there is a correlation between perceived ease of use, perceived and social norms (Abu-Al–Ais & Love, 2012; Khan et al., 2017; Lubua & Semlambo, 2017).

5.0 Conclusion and Recommendations

The previous studies show that behavioral intention influences the use of technology, such as mobile phones. This study assessed students' use of mobile phones using the Technology Acceptance Model (TAM) and included additional factors such as social influence and demographic characteristics of students. The study revealed that the predictor of mobile phones usage was the behavioral intention, while the intention behavior was predicted by attitude, age sex, and experience of owning mobile phones. However, subjective norms did not influence the intention of using mobile phones. Moreover, perceived ease to use and perceived usefulness were the factors that determined students' attitudes towards mobile use.

Therefore, to ensure the use of mobile phones in accessing academic information in Tanzania, the study recommends that education practitioners should take into consideration respondents' characteristics, intentions and attitudes when designing a learning system or curricula that intend to use mobile phones as teaching and learning tools. Furthermore, they should develop a system which is less complex to facilitate students learning.

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