



# **A Conceptual Model to Determine Factors Influencing Mobile Money Banking Adoption in Ghana**

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## **Authors' contributions**

*This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.*

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## **ABSTRACT**

The growth of mobile money service in Ghana has been attributed to many other factors outside the spectrum of technology. The research focus is to determine the factors influencing mobile money service from the point of technology. The study analysis was based on Structural Equation Modelling of Partial Least Squares using SmartPLS. It was determined that, the following construct, perceived risk, perceived cost, perceived usefulness, perceived ease of use, compatibility, relative advantage, observability, trialability, and social influence with ( $p < 0.001$ ) influenced users in adopting mobile money banking in Ghana. The research finding will enable stakeholders related to the mobile money industry to strengthen its gains and sustain its growth in mobile money services. The research present the information technology factors that influence the adoption of mobile money and how these factors should be factored into the development of the mobile money industry. The research also gives industry players the systematic factors they could rely on when making any decision toward user acceptance of mobile money.

**Keywords:** *Adoption; mobile money; diffusion theory; technology acceptable model; structure equation model; Ghana.*

## 1. INTRODUCTION

The research examines mobile money, the upsurge in growth, and the factors accounting for such exponential growth, using Technology Acceptable Model (TAM) and Diffusion Theory (DT).

Mobile money is a widely used application in the mobile banking industry. It involves integrating digital payments and mobile telecommunication networks through cross-industry and cross-platform collaboration [1]. Mobile money financial system provides a wide range of financial services [2], such as merchant micropayments, person-to-person financial transfers between individuals, utility bill payments, checking bank accounts, and long-distance remittances [3,4]. Currently, various organisations and business strategies provide a mobile money system.

Mobile money banking solutions in Ghana has been around since 2009 and is considered vital in the FinTech sector [5]. The number of registered mobile money customers as of the end of 2021 stood at 48.3 million, with 17.9 million active mobile money accounts and 442 thousand active agents of the four mobile money operators (Vodafone Cash, Airtel/Tigo and MTN momo) [6]. The total mobile money transaction stood at 164.80 billion in 2021 [6].

There is a growing demand for the adoption of mobile money in Ghana. However, there is insufficient research to understand why there is such interest and growth in Ghana's digital money transaction service. Moreover, the number of unbanked citizens is very high, as has been the case in most developing countries [7,8,9] as a result, when there is a system that is making citizens or users develop a keen interest in the banking system at both the micro and macro levels, it is worth to examine such a phenomenon.

Although mobile money banking provides clear advantages and conveniences, its limited use, acceptability and lack of broad adoption have resulted in a range of empirical investigations. Most academics concentrated on industrialized nations in this context, such as the USA [10] Germany [11], United Kingdom [12], and Japan [13]. There have been just a modest number of research about mobile money in developing and emerging countries (India, Emirate, Malaysia); the inadequacy of research in emerging and developing geographies has produced a

knowledge vacuum that has to be filled. It is based on this background that the research sought to bridge the vacuum of knowledge and factor that influence mobile money acceptance in Ghana.

### 1.1 Purpose of the Study

The purpose of the research is to determine using TAM/DT what factors contribute to the growth of mobile money banking in Ghana.

### 1.2 Research Questions

The following questions were set based on the purpose of the study.

- a. Is there a significant positive relationship between users' behavioural intentions and actual use of mobile money banking services?
- b. Is there a significant positive relationship between user attitudes and behavioural intentions to use mobile banking services?
- c. Is there a significant positive relationship between user attitudes toward mobile money services and perceived risk about mobile money ecology?
- d. Is there a significant positive relationship between the perceived costs of mobile money and the attitudes of users toward the use of mobile money banking services?
- e. Is there a significant positive relationship between perceived trust and user attitudes toward mobile money banking services?
- f. Is there a significant positive relationship between perceived usefulness and user attitude toward mobile money banking?
- g. Is there a significant positive relationship between perceived usefulness and actual use of mobile money services?
- h. Is there a significant positive relationship between user attitudes toward mobile money banking and perceived ease of use?
- i. Is there a significant relationship between users' perceived ease of use of mobile money services and user attituded to use mobile money applications?
- j. Is there a significant positive relationship between mobile money service perceived ease of use and perceived usefulness?
- k. Is there a statistically significant relationship between compatibility and user attitude toward using mobile money banking services?

- l. Is there a relation between relative advantage and user attitude toward mobile money services?
- m. Is there a statistically significant positive relationship between observability and user attitude towards mobile money services?
- n. Is there any significant positive relationship between, trialability and user attitudes toward mobile money banking services?
- o. Is there a statistically significant positive relationship between users' attitudes and social influence towards mobile money?

### 1.3 Research Hypothesis

Table 1 details the hypothesis set for the research.

**Table 1. Research hypothesis**

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H01: The behavioural intentions significantly influence the actual use of mobile money banking services.
H02: Users' Attitudes positively impact behavioural intention toward mobile money services.
H03: Perceived risk about mobile money ecology impact user attitude towards mobile money services.
H04: Perceived cost of mobile money positively impacts users' attitudes towards using mobile money
H05: Perceived trust significantly impacts user attitude towards mobile money services.
H06: Perceived usefulness of mobile money service positively impact users' attitude towards mobile money.
H07: Perceived usefulness of mobile money positively impact actual Use of mobile money services.
H08: User attitude towards mobile money services significantly influenced perceived ease of use.
H09: Perceived ease of use positively impact the perceived usefulness of mobile money.
H010: Perceived ease of use significantly impact on actual Use of mobile money
H011: Compatibility positively impacts users' attitudes to using mobile money services.
H012: There is a significant impact of relative advantage on users' attitudes towards mobile money services.
H013: Observability of users' mobile money positively impact users' attitude toward mobile money services.
H014: Trialability of mobile money banking ecology influences user attitudes toward mobile money services.
H015: Social influence significantly impacts users' attitudes towards mobile money.

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## 2. LITERATURE REVIEW

The literature review considers the factors in both TAM and DT that were taken into account for the conceptual framework development of the study. The literature details are summarised in Fig. 1.

The behavioural intentions of users influence their actual use of service. According to Davis's TAM theory [14], one's attitude has a greater influence on their behavioural intention to use a particular service or technology. When a user has a positive attitude toward a service or product, the user is more likely to use that particular service [15].

The attitude of users influences their behavioural intention to accept a particular service. Most studies in the fields of information science, e-commerce, and many other studies related to users' acceptance of technology. Users' attitude

has become a pivotal variable in such studies to determine their choice [16,17,18,19].

Perceived risk impact on user attitude to adopt. A user's risk of a subject matter, in this case, a mobile payment system, will influence the individual's attitude toward using the service [20,21,22].

The perceived cost impact users' attitude towards the actual use of the service. The factor that keeps surfacing in the face of adopting mobile payment is the transaction cost associated with the services provided and its related charges have not been uneasy. According to Abooleet and Fang [23], most of these payment methods continue to face some opposition due to a variety of variables such as transaction costs. The acceptability of mobile money payment is completely dependent on those who are willing to pay the extra cost

[24,25]. According to Luarn and Lin [26], mobile banking adoption has been associated with cheaper cost of transaction charges by the telcos. This has been collaborated by Tobbin and Kowornu [27] research who suggests that the cheaper cost of transactions associated with mobile banking has influenced users' rate of acceptance. The cost here is in comparison to other charges associated with mobile banking transaction charges compare to all costs relatable to mobile money charges [28,29,30].

Perceived trust impacts users' attitude to accept technology services. It has been demonstrated by other studies that trust reduces the customers need to understand, control, and facilitate transaction time to complete a task by the user [31,32,33]. There are more than twenty-nine (29) types of trust identified according to Soderstrom [34]; he did categorise trust into three-set, thus; technology, organisation and person. Trust, therefore, is demonstrably the option for the user. In the subject of mobile banking, when the user perceived that the service rendered is less of security and meets the user's purpose and need, they developed the technology trust toward such service. The perceived trust associated with organisations providing mobile banking services improves or increases the users' adoption of that service [35,36].

Perceived usefulness impact users' attitude to adoption [37,38]. There is a certainty that the perceived usefulness of innovation, particularly on the part of users, will influence their willingness to use the service and technology provided [37,38,39,40,41]. Users have a very reluctant attitude towards a change of behaviour, and they would cling to their former way of doing things, as long as that work for them. However, when there is an innovation of technology, and it is perceived to be useful in terms of its convenience and speed, Hung et al. [42], in meeting the user's need, that attitude turns to skew in favour of the technology subsequently to its adoption. A higher and positive rate for perceived usefulness turns to speed and facilitates a system's adoption.

Perceived ease of use is one most determinant factors in defining the acceptance or the rejection of a technology, according to Davis [14]. There have been other studies that concluded with the same outcome [37,38,39,40,41]. Technology or new system are developed with the concept of it being accepted. Users adopt mobile banking not based on any experience of using it or what it used to be, but the desire to choose such a level

of banking is based on their current need and the immediate solution available to meet that requirement [43].

Compatibility impact users' attitude toward adoption [16,44]. The willingness of an individual to easily initiate and integrate mobile banking services into their existing technology will eventually sway the user to be associated with such technology. The user is always looking for ways to use and be associated with technology in order to make their lives easier and not become subjugated by it [16,44,45]. The relative advantage of mobile money service impact users' attitudes to using mobile money[46]. When a user perceives a positive impact on their regular financial service when using mobile money services, they are more likely to adopt that application to their regular financial activities [46,47].

Users' observability impact user attitude to adoption [45]. Prior to using technology, user observability has to do with asking questions and inquiring about the technology. These are done in order to comprehend and appreciate the system and the value such technology could add to their existing and normal routine daily financial transactions without any hassle [45,48].

The trialability influences users' attitude to adopt a service [49].The trial period is critical; it is the time when the user appreciates, understands, and participates in the communication channel to ensure the system's successful completion. This lesson is available to users during the registration process for any mobile banking service at any accredited agent [50,51,52].

Social influence impact users' attitude toward to adopt [53,54]. The association between social influence and TAM has a long derivative narration starting from Tarde's [55,56] theory of imitation to Dearing and Cox's [58] diffusion of hybrid seeds. According to Butera and Mugny [57], social influence explains whenever user engages with other people and organisations, how they learn or modify their attitudes, knowledge, and behaviours. The study of Dearing and Cox's [58] on the innovations theory principles and practices, indicated that innovation is affected by three main construct variables; social influence, and the larger social and political context. Social influence is also influenced by perceived risk, perceived cost, and trialability [47,53,54,59,60,61], each of which has shown to positively influence a user's behavioural intentions to use or adopt technology or new services.

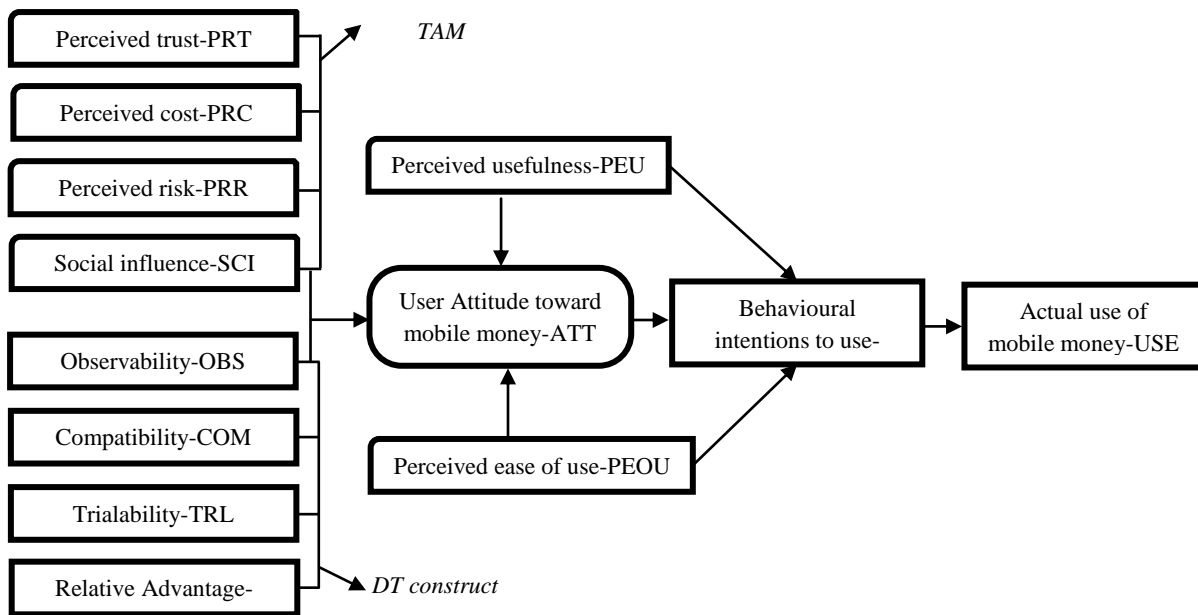


Fig. 1. Research model for study

### 3. METHODOLOGY

The primary data collection method is used in conjunction with the quantitative research method [62,63]. The target audience consists of mobile money users in Ghana who use Vodaphone cash, AirtelTigo wallet, and MTN momo and are over the age of eighteen (18).

According to Fowler [64], determining sample size precludes three factors: margin of error, confidence level, and response rate. The sample size for the study was determined using the margin of error, confidence level, and response rate of 2%, 98%, and 50%, respectively. As of 2021, Ghana has 17.9 million active mobile money users [6].

Using Uttley's [65] sample size regime, which follows Taherdoost's [66] equation  $n = \frac{p(100-p)z^2}{E^2}$  where n (sample size), p (percentage of population), E (maximum percentage error to tolerate), Z (confidence level). The sample size determine from the equation is 2298. The data collected were analyzed using the structural equation model (SEM) [67] with SmartPls.

### 4. RELIABILITY AND VALIDITY

SEM's SmartPLS data analysis tools were employed for the analysis. Endogenous variables and exogenous variables are the two main constructs of variables for the subject test element under consideration [68,69]. TAM and DT variables were used as exogenous constructs

in the study. Perceived trust, perceived cost, perceived risk, social influence, observability, compatibility, trialability, and relative advantage are exogenous factors considered. User attitude, perceived ease of use, perceived usefulness, behavioural intention to use, and actual use are the endogenous factors.

The SmartPLS data analysis was based on construct reliability and validity. Cronbach's Alpha, AVE, composite reliability, and rho A were used to assess reliability, as well as discriminant validity (R-square(R<sup>2</sup>) and Q-square(Q<sup>2</sup>), Heterotrait-Monotrait correlation ratio (HTMT), Fornell-Larcker Criterion, and Model Fit).

#### 4.1 Reliability

The consistency of the study outcome is considered when determining the research's reliability. Internal consistency is the level or degree to which the variables set for the study behave the same way when the study is repeated with the same variable in the same given environment when discussing research reliability. The use of SEM via SmartPLS to assess data reliability. The AVE is used to test both convergent and divergent validity. It also considers the variance loading of both the attribute and its related measurement outcomes, which should be greater than 0.50 [70,71], When the AVE value is less than 0.5, it indicates that the data may contain missing values or errors. In a reflective model, composite reliability is the best way to determine convergent validity. The

composite reliability scale is 0-1, with 1 being the most reliable. Composite reliabilities in framework and exploration studies should be equal to or greater than 0.60 [72]. For confirmatory studies, a score of 0.80 or higher is considered a strong simulation conclusion [73]. Cronbach's alpha considers whether latent variable coefficients are convergent or not. When the final result of a Cronbach's alpha test is 0.70 on a scale, it is acceptable for confirmatory research and 0.60 for exploratory research.

**4.2 Validity**

Validity takes into account how much the constructs absolutely differ from one another or how much the study constructs overlap. Validity is determined using the Heterotrait-Monotrait (HTMT), Fornell-Larcker criterion, model-fit, R<sup>2</sup> and Q<sup>2</sup>. The Heterotrait-Monotrait correlation ratio should not be greater than 0.90 Henseler et al.[73] and Sarstedt et al.[74] The Fornell-larcker criterion compares latent construct correlation to the square root of the extracted average variance (AVE). R<sup>2</sup> values of 0.75, 0.50, or 0.25 for endogenous latent variables are significant, moderate, or weak, according to Hair et al.[75] Greater than zero Q<sup>2</sup> values indicate that the study values were well reconstructed and the model is predictive.

**5. ANALYSIS**

Two items (PRT2 and COM1) were excluded from the analysis as part of the measurement

model evaluation due to low factor loadings (<0.600) [75,76]

Cronbach's alpha and composite reliability (CR) were used in the study to test the reliability of the constraints. All of the CRs exceeded the recommended value of 0.70 [74,77] Cronbach's alpha for each construct was greater than 0.70.

Convergent validity was acceptable since AVE was greater than 0.50. Table 3 shows the reliability and validity results and the factor loadings for the research construct used.

The rho-A parameter determine whether the model structure construct performances are consistent. A rho-A measurement scale of 0.7 or higher is required to establish composite reliability. Meanwhile, a rho- A value greater than one is out of the ordinary, and thus should be avoided in the model. Table 3 expresses the rho-A, determined in the research data analysis, which aid to determine the reliability of the study constructs.

Table 2 illustrates the proportion of mobile money users from the research, with 54% and 46% representing both male and female users, respectively. The age group of 29 - 38 years old represented 29.3% of those who responded to the study, indicating that they are also the most mobile money users. The level of education respondents revealed that those who completed High School dominated, accounting for 29.7% and 42.4% are employed.

**Table 2. Demographic overview of respondents**

Variable		N	%
Gender	Male	1102	54.0%
	Female	939	46.0%
Age	18 - 28 years	473	23.2%
	29 - 38 years	598	29.3%
	39 - 48 years	461	22.6%
	49 - 58 years	332	16.3%
	59 years and above	177	8.7%
Occupation	Schooling	403	19.7%
	Household work	119	5.8%
	Employed	865	42.4%
	Unemployed	542	26.6%
	Retirement	112	5.5%
Academic	No formal education	336	16.5%
	High school	607	29.7%
	Certificate	184	9.0%
	Diploma	396	19.4%
	Bachelor's degree	350	17.1%
	Master's degree	164	8.0%
Doctorate degree	4	0.2%	

**Table 3. Convergent reliability**

	<b>Factors Loadings</b>	<b>Cronbach's Alpha</b>	<b>rho_A</b>	<b>Composite Reliability</b>	<b>Average Variance Extracted (AVE)</b>
<b>Attitude</b>					
Mobile money services have been very useful to me (ATT1).	0.959				
Mobile money services are convenient (ATT2).	0.931	0.921	0.953	0.944	0.810
In all, I have a positive attitude toward using mobile money services (ATT3).	0.936				
I can recommend mobile money service to others (ATT4).	0.760				
<b>Compatibility</b>					
Mobile money service fits in the way I like my banking payments (COM2).	0.898				
Using mobile money service is compatible with my lifestyle (COM3).	0.825				
Using mobile money services fits the way I would like to manage my finances (COM4).	0.741	0.816	0.821	0.874	0.636
Adopting the new innovation with mobile money is favourable to me (COM5).	0.714				
<b>Observability</b>					
I got to know about mobile money from the others (OBS1).	0.755				
It is easy for me to observe others using the mobile money service (OBS2).	0.877				
I have seen what others do using their mobile money services (OBS3).	0.898	0.852	0.864	0.900	0.694
Observing others was the best means for me to learn how to use mobile money services (OBS4).	0.794				
<b>Perceived Ease of Use</b>					
The mobile money usage is understandable (PEOU1).	0.738				
Learning to use the mobile banking service was simple (PEOU2).	0.749				
I am able to use mobile money to complete my transaction easily (PEOU3).	0.826	0.835	0.867	0.882	0.599
Mobile money usage does not require a lot of thinking (PEOU4).	0.734				
I get the mobile money services to do what I want it to do (PEOU5).	0.817				
<b>Perceived Usefulness</b>					
Operating the mobile money services is easy for me (PEU1).	0.936				
It is easy to get the mobile money services to do what I want it to do (PEU2).	0.952	0.920	0.974	0.948	0.859
Mobile money service is user-friendly (PEU3).	0.891				

	Factors Loadings	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
<b>Perceived Cost</b>					
The Telecoms charges on mobile money services are not reasonable (PRC1)	0.947				
Getting a discount for every purchase I make using my mobile money payment service influence my attitude towards mobile banking (PRC2)	0.838	0.880	1.042	0.920	0.794
Telecoms with less or no charges on their mobile money services influence my attitude to use their services (PRC3).	0.885				
<b>Perceived Risk</b>					
Personal information acquired through mobile money is risky (PRR1).	0.836				
Money lost on my mobile wallet is mostly linked to mobile money usage (PRR2).	0.900	0.780	0.950	0.862	0.677
There is some loss of privacy due to the usage of mobile banking information gathered about you (PRR3).	0.722				
<b>Perceived Trust</b>					
The perceived misuse of my personal information by service providers is a concern to me (PRT1).	0.896				
My mobile money service provider is collecting too much information about me (PRT3).	0.845	0.875	0.878	0.923	0.801
The security of my payment details when using mobile money is a concern (PRT4).	0.940				
<b>Relative Advantage</b>					
Mobile money enhances my financial transactions (RAD1)	0.749				
Using mobile money improves my financial transaction performance (RAD2)	0.768	0.836	0.868	0.883	0.601
Mobile money enables me to accomplish my financial services quickly( RAD3)	0.838				
Mobile money is more helpful to me than actual banking services (RAD4)	0.712				
Using mobile money increases my financial productivity(RAD5)	0.804				
<b>Social Influence</b>					
I use the mobile money service because most of my friends use the mobile money services (SCI1).	0.869	0.872	0.996	0.918	0.789
Using mobile banking services elevates one's social status among relatives and friends (SCI2).	0.850				
My friends' and relatives' usage experience with mobile money services has influenced me to use mobile banking services (SCI3).	0.943				



	Factors Loadings	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
<b>Trialability</b>					
Mobile money payment service is available to me to perform any payment applications successfully (TRL1).	0.842				
Using mobile money services, I got enough time to try it out appropriately (TRL2).	0.847	0.845	0.864	0.906	0.763
Trying the mobile banking service long enough enable me to understand how it works (TRL3).	0.929				
<b>Intention to Use</b>					
How strong is your intention to use mobile money services? (USE1)	0.947				
How likely are you to recommend mobile money services to others? (USE2)	0.843	0.936	0.974	0.953	0.836

## 5.1 Discriminant Validity Analysis

### 5.1.1 R-Square and Q-Square

The total effect magnitude measurement for the conceptual framework is  $R^2$ . The measuring of  $R^2$  to every variable in the model, allows integration to be tested for both the measurements outer loading and structural models. The incremental  $R^2$  is regarded in the same way as regression. They [72,76] classify “cut-offs of 0.67, 0.33, and 0.19 as substantial, moderate, and weak.” for the endogenous construct. It also establishes the proportion of variation in the entirely reliant variable.

The predictive relevance deduced the most influential interrelationships between the structural model's constructs. The predictive semantic similarity test was used to calculate the  $Q^2$  value for ATT, BIU, PEOU, PEU, and USE. If the value is greater than zero, the model is relevant. The framework was much more relevant when the  $Q^2$  value was close to one (1). Chart 1 exemplifies the inferential relevance values for ATT, BIU, PEOU, PEU, and USE. Once ATT was much more relevant, the impacts on BIU, PEOU, and PEU were greater, influencing USE even more, based on the  $Q^2$  values.

The Fornell-larcker criterion was used to assess discriminant validity; Table 4 shows that the square-root of AVE for the construct was greater than the inter-construct correlation. The Heterotrait-Monotrait correlation ratio [73] was also used to assess discriminant validity, with values falling below the 0.90 threshold. As a result, discriminant validity for HTMT is established as shown in Table 4

The HTMT considers the estimation of the correlation between constructs. The HTMT threshold was achieved as shown in Table 5 when all the construct values are below 0.85 [73].

The rho-A parameter is said to determine whether the model structure construct

performances are consistent. A rho-A measurement scale of 0.7 or higher is required to establish composite reliability. Meanwhile, a rho-A value greater than one is out of the ordinary, and thus should be avoided in the model. Table 3 expresses the rho-A determined in the research data analysis, which aid to determine the reliability of the study constructs.

### 5.1.2 Model fit

The goodness of fit (GoF) is used to identify whether a theory is well or poor fitted and to also identify the structural model measurement error [67]. According to [73], the relatively low the SRMR, the stronger the model's fit. Whenever SRMR is zero, a precise fit is established. A “standardised root mean squared residual (SRMR)” of 0.08 or less is appropriate. A value greater than 0.08 indicates that there is no fit. In this case, the research SRMR of 0.033, strongly indicate there is a model if fit. The comparatively low the “unweighted least squares discrepancy ( $d_{ULS}$ )”, the higher the quality fit of the framework, which also applies to the outcome of geodesic discrepancy ( $d_G$ ). Equally vital is the outcome of the Normed fit index (NFI) of the research model determination of best fit; this was achieved as the model outcome showed a determination outcome of 0.893. The SRMR,  $d_{ULS}$ ,  $d_G$  and NFI are well demonstrated in Table 6.

## 6. STRUCTURAL MODEL ASSESSMENT

The structural approach considers the relationship between the dependent variables and the proposed model's constructs. According to Hair et al.[75], they showed how to determine “the structural model” through these procedures, the path coefficient, the level of  $R^2$ , and the model fit, are used to demonstrate the model's validity [75,78].

Another measure of the structured model is path coefficient modelling through the bootstrapping calculation. There is a path coefficient from the algorithm's calculation; however, this method is limited in the output given the true reflection of

**Chart 1. Using R2 and Q2 to validate the endogenous construct**

	$R^2$	$Q^2$
ABI	0.030	0.029
ATT	0.725	0.569
USE	0.287	0.210
PEOU	0.314	0.179
PEU	0.072	0.051

**Table 4. Fornell-larcker criterion**

	ABI	ATT	COM	OBS	PEOU	PEU	PRC	PRR	PRT	RAD	SCI	TLB	USE
ABI	<b>1.000</b>												
ATT	0.339	<b>0.900</b>											
COM	0.505	0.563	<b>0.798</b>										
OBS	0.629	0.668	0.388	<b>0.833</b>									
PEOU	0.504	0.562	0.649	0.511	<b>0.774</b>								
PEU	0.176	0.272	0.162	0.241	0.198	<b>0.927</b>							
PRC	-0.403	-0.241	-0.362	-0.484	-0.465	-0.287	<b>0.891</b>						
PRR	0.221	-0.275	-0.251	-0.109	0.188	-0.005	-0.108	<b>0.823</b>					
PRT	0.690	0.604	0.784	0.720	0.551	0.191	-0.339	-0.246	<b>0.895</b>				
RAD	0.502	0.563	0.644	0.510	0.479	0.186	-0.450	0.184	0.549	<b>0.776</b>			
SCI	-0.470	0.197	-0.205	-0.119	0.115	0.036	0.192	0.024	-0.370	0.116	<b>0.888</b>		
TLB	0.529	0.625	0.413	0.909	0.619	0.176	-0.465	-0.048	0.643	0.624	0.026	<b>0.873</b>	
USE	0.180	-0.248	-0.412	-0.041	0.010	0.090	-0.177	0.589	-0.287	0.012	-0.045	0.082	<b>0.896</b>

Note: The bold values are the score root of AVE

**Table 5. HTMT ratio**

	ABI	ATT	COM	OBS	PEOU	PEU	PRC	PRR	PRT	RAD	SCI	TLB	USE
ABI	0.351												
ATT													
COM	0.512	0.555											
OBS	0.695	0.723	0.753										
PEOU	0.521	0.607	0.824	0.583									
PEU	0.190	0.279	0.172	0.261	0.213								
PRC	0.448	0.292	0.402	0.563	0.530	0.290							
PRR	0.199	0.319	0.347	0.245	0.388	0.069	0.173						
PRT	0.738	0.637	0.601	0.430	0.109	0.222	0.380	0.311					
RAD	0.521	0.607	0.823	0.383	0.197	0.213	0.530	0.388	0.599				
SCI	0.513	0.247	0.226	0.196	0.263	0.050	0.254	0.365	0.417	0.263			
TLB	0.544	0.661	0.491	0.564	0.049	0.192	0.555	0.205	0.719	0.749	0.177		
USE	0.194	0.255	0.474	0.281	0.091	0.112	0.271	0.649	0.332	0.092	0.127	0.188	

**Table 6. Model fit**

	<b>Saturated Model</b>	<b>Estimated Model</b>
SRMR	0.031	0.033
d_ULS	0.122	0.181
d_G	0.893	0.915
Chi-Square	561.247	569.158
NFI	0.881	0.894

construct significant to the model. As a result, the bootstrapping calculation is used for the path coefficient for appropriate and a good considerable outcome. Bootstrapping is non-parametric, which randomly does replacement samples from the original sample. The research measure of the model using the coefficient from the bootstrap is exceptionally significant as most of the outcome constructs were between good models fit, as shown in Table 6.

The conceptual framework's total effect magnitude measurement is  $R^2$ . The normal measure applies  $R^2$  to every variable in the model, allowing integration to be tested for both outer loading and structural model measurements. The incremental  $R^2$  is treated similarly to regression. The adjusted  $R^2$  is used to assess model complexity. Table 7 shows that the endogenous construct, user attitude, perceived ease of use, perceived usefulness, behavioural intention to use, and actual use are all significant. The positive connection discovered between the variables demonstrates the model variable's quality to the model's offered claim. The difference in the  $R^2$  obtained in each measure indicates the variance in the constructed endogenous variables. This model allows the researcher to be flexible in understanding the data and responding to the research measures.

**6.1 Hypothesis Assessment**

H01: There is a significant impact of behavioural intentions (USE) on the actual use (ABI) of mobile money banking services. H01 evaluates whether USE has an impact on individual users in mobile money acceptance. The results show that USE has a significant effect on ABI ( $\beta = 0.095$ ,  $t = 3.435$ ,  $p < .001$ ), hence H01 was supported.  
 H02: There is a significant impact of ATT on behavioural intention (USE).  
 H02 evaluates whether ATT has a significant impact on ABI to use of mobile money services. The study outcome shows, ATT has a significant effect on ABI ( $\beta = -0.408$ ,

$t = 25.540$ ,  $p < .000$ ), hence H02 was supported.

H03: There is a significant impact of perceived risk (PRR) on user attitude (ATT). H03 evaluates the impact of PRR on ATT. The outcome of the analysis shows that PRR has a significant effect on ATT ( $\beta = -0.116$ ,  $t = 11.531$ ,  $p < .000$ ), hence H03 was supported.

H04: There is a significant impact of perceived cost (PRC) on attitude (ATT). H04 evaluates the impact of the PRC on ATT. The outcome of the analysis shows PRC has a significant effect on ATT ( $\beta = 0.141$ ,  $t = 8.611$ ,  $p < .000$ ), hence H04 was supported

H05: There is an insignificant impact of perceived trust (PRT) on attitude (ATT). H03 evaluates the impact of PRT on ATT. The outcome of the analysis shows PRT has no significant effect on ATT ( $\beta = 0.026$ ,  $t = 0.439$ ,  $p < 0.661$ ) hence H05 was not supported.

H06: There is a significant impact of perceived usefulness (PEU) on users' attitudes (ATT) towards mobile money banking.

H06 evaluates the impact of PEU on ATT. The outcome of the analysis shows that PEU has a significant effect on ATT ( $\beta = 0.235$ ,  $t = 11.446$ ,  $p < .000$ ), hence H06 was supported

H07: There is a significant impact of Perceived usefulness (PEU) on users' actual use (USE) of mobile money service.

H07: evaluates the impact of PEU on USE. The outcome of the analysis shows PEU has a significant effect on USE ( $\beta = 0.159$ ,  $t = 7.103$ ,  $p < .000$ ), hence H07 was supported

H08: There is a significant impact of perceived ease of use (PEOU) on attitude (ATT) towards the use of mobile money services

H08 evaluates the impact of PEOU on ATT. The outcome of the analysis indicates there is a significant effect of PEOU on ATT ( $\beta = 0.562$ ,  $t = 80.311$ ,  $p < .000$ ), hence H08 was supported.

H09: There is a significant impact of Perceived ease of use (PEOU) has a positive impact on Perceived usefulness (PEU)

H09 evaluate the impact of PEOU on PEU. The outcome of the analysis concludes that there is a significant effect of PEOU on PEU ( $\beta = 0.066$ ,  $t = 2.642$ ,  $p < .000$ ), hence H09 was supported.

H010: There is a significant impact of Perceived ease of use (PEOU) has a positive impact on users' actual use (USE)

H010 evaluate the impact of PEOU on USE. The outcome of the analysis shows that there is a significant impact of PEOU on USE ( $\beta = 0.208$ ,  $t = 8.132$ ,  $p < .000$ ), hence H010 was supported.

H011: There is a significant impact of compatibility (COM) on users' attitudes (ATT) to utilise mobile money.

H011 evaluates the impact of COM on ATT. The outcome of the analysis, therefore, shows that there is a significant effect on COM on ATT ( $\beta = 0.443$ ,  $t = 18.028$ ,  $p < .000$ ), hence H011 was supported.

H012: There is a significant impact of Relative advantage (RAD) on users' attitude (ATT) towards using mobile money services

H012 evaluates the impact of RAD on ATT. The outcome of the analysis from the study shows there is a significant effect of RAD on ATT ( $\beta = 0.158$ ,  $t = 9.386$ ,  $p < .001$ ) hence H012 was supported

H013: There is a significant impact of observability (OBS) on the user's attitude (ATT) toward the use of mobile money banking

services.H013 evaluates the impact of OBS on ATT. The outcome of the analysis shows that there is an effect of OBS on ATT ( $\beta = 0.899$ ,  $t = 23.268$ ,  $p < .000$ ), hence H013 was supported

H014: There is a significant impact of trialability (TLB) on user attitudes (ATT) toward mobile money banking services.

H014 evaluates the impact of TLB on ATT. The outcome of the analysis from the study indicates there is an effect of TLB on ATT ( $\beta = -0.413$ ,  $t = 19.446$ ,  $p < .000$ ), hence H014 was supported.

H015: There is a significant impact of users' attitudes (ATT) on social influence (SCI) toward mobile money banking services

H015 evaluates the impact of ATT on SCI. The outcome of the analysis shown from the study indicates there is a significant effect of SCI on ATT ( $\beta = 0.295$ ,  $t = 21.57$ ,  $p < .000$ ), hence H015 was supported.

Table7 summarises the research hypothesis using the structural model. This equally indicates the supported and not supported hypothesis. In all, there were fifteen (15) hypotheses and only one was not supported. Fig. 2 shows the research model represented in SmartPls with plotted independent and dependent variables.

Fig. 2 depicts the flow and plotting of the construct, this was used to analyse the structural model. This equal indicates the independent variables, moderating variables and dependent variables.

**Table 7. Direct relationship results and structural model results**

Hypothesis Path	B	SE	T	P	Results
H01: USE -> ABI	0.180	0.021	8.476	0.000	Supported
H02: ATT -> USE	-0.408	0.016	25.540	0.000	Supported
H03: PRR -> ATT	-0.116	0.010	11.531	0.000	Supported
H04: PRC -> ATT	0.141	0.016	8.611	0.000	Supported
H05: PRT -> ATT	0.026	0.059	0.439	0.661	Not Supported
H06: ATT -> PEU	0.235	0.021	11.446	0.000	Supported
H07: PEU -> USE	0.159	0.022	7.103	0.000	Supported
H08: ATT -> PEOU	0.562	0.007	80.311	0.000	Supported
H09: PEOU -> PEU	0.066	0.025	2.642	0.008	Supported
H010: PEOU -> USE	0.208	0.026	8.132	0.000	Supported
H011: COM -> ATT	0.443	0.025	18.028	0.000	Supported
H012: RAD -> ATT	0.158	0.017	9.386	0.000	Supported
H013: OBS -> ATT	0.899	0.039	23.268	0.000	Supported
H014: TLB -> ATT	-0.413	0.021	19.446	0.000	Supported
H015: SCI -> ATT	0.295	0.014	21.570	0.000	Supported

Note: B= Beta Coefficient, SE= Standard Error, T= t-Statistics, P= Probability( P) value

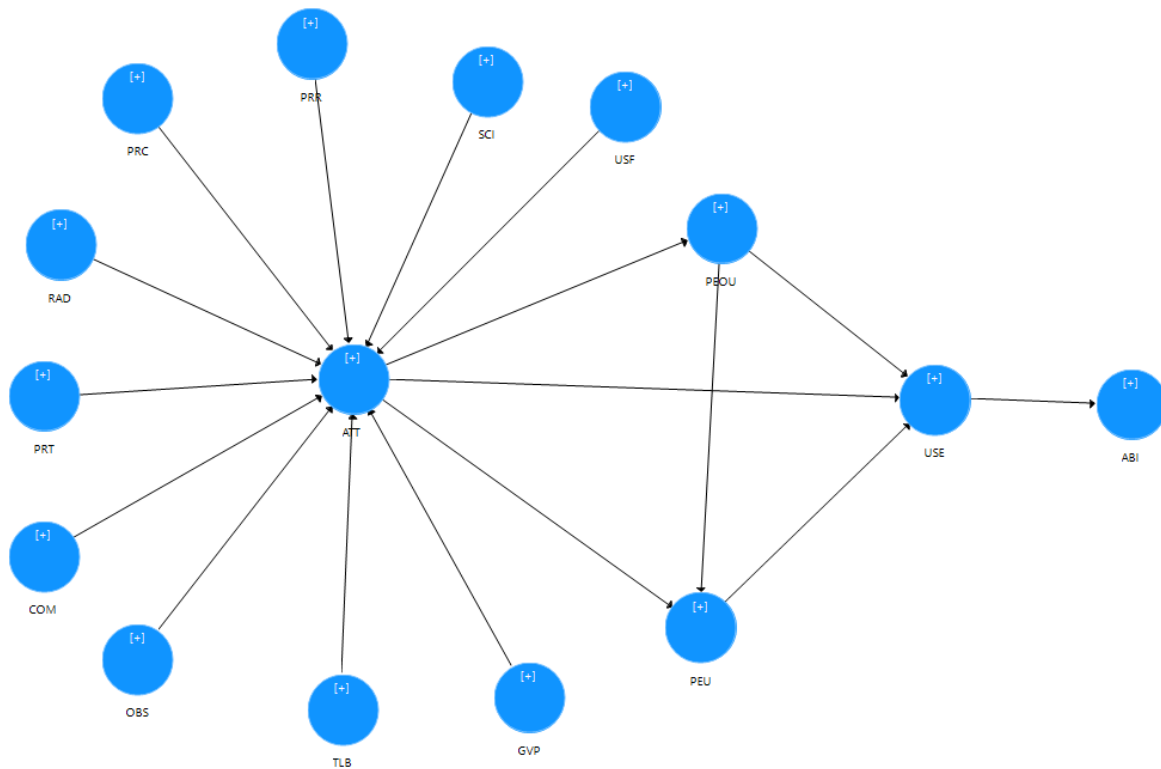


Fig. 2. Research model

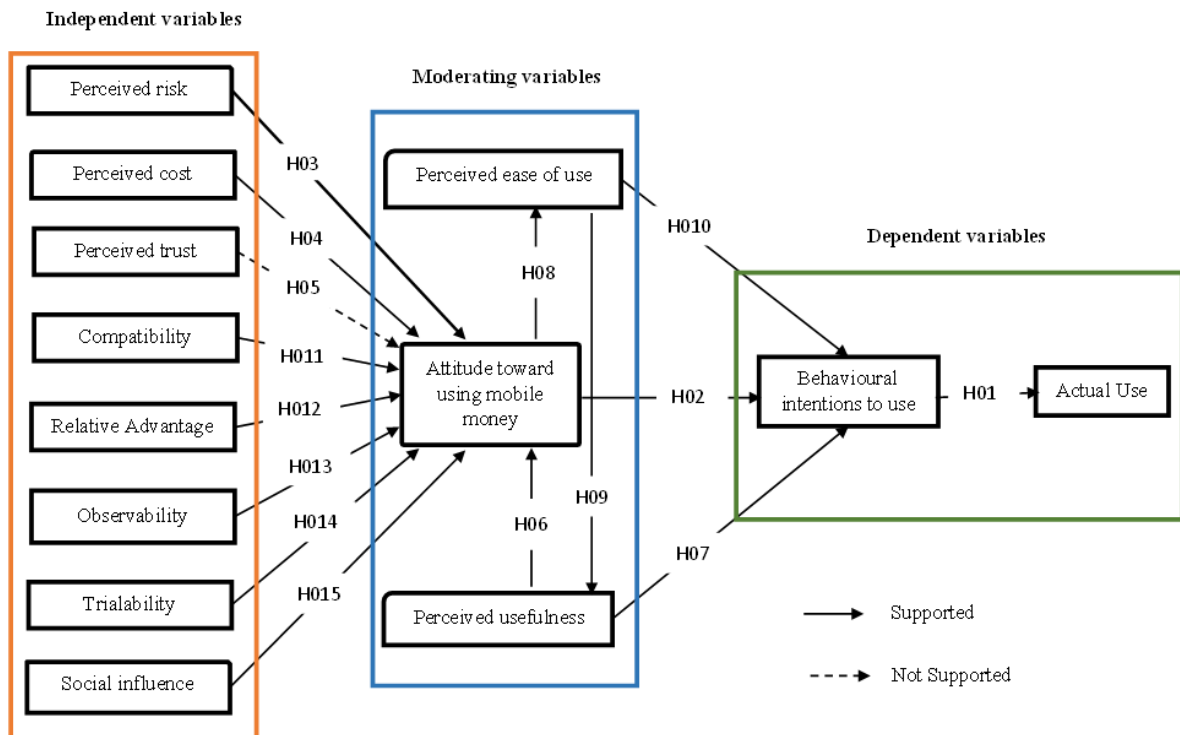


Fig. 3. Research model analysis outcome

**Table 8. Mediating analysis**

Total effects			Direct effects			Indirect effects					Mediation	
Total effects	Coefficient	p-value	Direct effects	Coefficient	p-value	Indirect effects	coefficient	SD	T-value	P-value	BI [2.5%, 97.5%]	
COM → USE	-0.110	0.000	COM → ATT	0.443	0.000	COM → ATT → PEOU → PEU → USE	0.001	2.517	0.012	0.001	.001 – .005	Partial mediation
OBS → USE	-0.223	0.000	OBS → ATT	0.899	0.000	OBS → ATT → PEOU → PEU → USE	0.002	2.557	0.011	0.002	.002 – .010	Partial mediation
PRC → USE	-0.035	0.000	PRC → ATT	0.141	0.000	PRC → ATT → PEOU → PEU → USE	0.000	2.447	0.014	0.000	.000 – .002	Partial mediation
PRR → USE	0.029	0.000	PRR → ATT	-0.116	0.000	PRR → ATT → PEOU → PEU → USE	0.000	2.498	0.013	0.000	.001 – .000	No mediation
PRT → USE	-0.006	0.658	PRT → ATT	0.026	0.658	PRT → ATT → PEOU → PEU → USE	0.000	0.404	0.686	0.000	.001 – .001	Partial mediation
RAD → USE	-0.039	0.000	RAD → ATT	0.158	0.000	RAD → ATT → PEOU → PEU → USE	0.000	2.456	0.014	0.000	.000 – .002	Partial mediation
SCI → USE	-0.073	0.000	SCI → ATT	0.295	0.000	SCI → ATT → PEOU → PEU → USE	0.001	2.554	0.011	0.001	.001 – .003	Partial mediation
TLB → USE	0.102	0.000	TLB → ATT	-0.413	0.000	TLB → ATT → PEOU → PEU → USE	0.001	2.542	0.011	0.001	.004 – .001	Partial mediation

## 6.2 Mediating Analysis

Mediating analysis was performed to assess the mediating role of (PEOU, PEU and ATT) on the linkage between Independent Variables (COM, PRR, OBS, PRC, PRT, SIC, RAD, and TLB) and Dependent Variables (USE). The results in Table 8 revealed that the total effect of PRR on USE was significant (H03:  $\beta = 0.029$ ,  $t = 10.134$ ,  $p < .001$ ). With the inclusion of the mediating variables (PEOU, PEU and ATT), the impact of PRR on USE became significant ( $\beta = 0.116$ ,  $t = 11.844$ ,  $p < .001$ ). The indirect effect of PRR on USE through ATT was found significant ( $\beta = .000$ ,  $t = .013$ ,  $p < .001$ ). This shows that the relationship between PRR and USE is partially mediated by ATT.

Fig. 3 depicts the research hypothesis outcome as well as the effect of independent variables, moderating variables, and dependent variables. From Fig. 3, all other factors were supported except perceived trust. The research, therefore, concludes that there is a significant effect of the research constructs undertaken in the study for both TAM/DT. This then shows that the research model was positively fit for the study. In conclusion, the adoption of users' behaviour towards technology is done through the TAM/DT.

## 7. DISCUSSION AND CONCLUSION

A number of studies have been conducted to determine which factors influenced mobile users to use mobile money banking [4,27,31,80]. The current concept is unique in comparison to previous research on the subject. The current study is unique in that the constructs under consideration are not the same as those considered by Cudjoe et al [79]. This is also true for Lee et al. [28], who stated that mobile payment service users should be tested and validated using both TAM and IDT theory. Matitila's (2003) study used constructs that were strikingly similar to those used in this study.

This distinction is also given in terms of the number of participants included in the current study, which was definitive and unanimous, resulting in a far-reaching outcome on the subject of mobile money acceptance. The study included 16 regions with a total population of 2,041 mobile money users. Min et al. [45] on the subject of security adopted for the study support the study's findings.

The research hypothesis set for the study all were met except the fifth hypothesis related to

the Perceived trust. The factors influencing users' adoption of mobile money are compatibility, observability, perceived cost, perceived risk, relative advantage, social influence, and trialability.

A variety of factors influence users' attitudes, which in turn influence their choice and subsequent decisions regarding the adoption of a specific service. It is unclear what causes that choice of judgment. What is clear from the study in terms of what influences users' choices is that those factors that influence their perceived ease of use and lead to perceived usefulness contributed and influenced users to make that final decision of acceptance of technology. Compatibility, observability, perceived cost, perceived risk, relative advantage, social influence, and trialability are the factors that influence user acceptance of technology.

The mediating links associated with the model, thus, the mechanism of impact independent variables on dependent variables are attitude, perceived ease of use and perceived usefulness have influenced users' in adopting mobile money in Ghana.

From the mediating analysis using Table 8, most of the coefficient values for all construct turn to increase when the dependent variable was introduced to the independent variables. This shows that the dependent variable is more correlated with the independent variables. These include compatibility, observability, perceived cost, perceived trust, social influence, and relative advantage. However, this was not the trend for trialability and perceived risk. The indirect effect is significant using the bias interval (BI), meaning the mediating role of perceived ease of use, perceived usefulness and attitude significantly influence users' actual use of mobile money. Again, most of the variables were partially meditating with the dependent variables, thus the dependent variables influence both independent variables and mediating variables.

The research outcome strongly concludes that perceived ease of use and perceived usefulness influenced users' behavioural intentions to adopt mobile money services. Also, users' attitude is influenced by perceived risk, perceived cost, compatibility, relative advantage, observability, perceived usefulness and trialability. Finally, users' attitude, perceived usefulness and perceived ease of use exclusively influenced behavioural intentions to adopt mobile money.



## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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