INNOVATIONS

The Mediating Role of Perceived Usefulness in Mobile Payment Services Adoption in Ethiopia

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Abstract

The use of mobile payment systems becomes essential in assisting day-to-day transaction of users.The central objective of the study is to identify the mediating role of perceived usefulness in the effects of perceived compatibility, social influence, and perceived ease of use on intention to continue the usage of mobile payment services in Ethiopia, specifically in Adama City and District. A correlational cross-sectional survey research design was deployed. A quantitative survey wasalso used. The sampling unit for the study is individuals who wereusers of mobile payment services delivered by M-Birr and HelloCash. The sample size,406 mobile payment services users, was purposively selected from 1,796,595 M-Birr and HelloCash mobile money system users. SEM was considered to test the proposed study model.In view of that, the study results show that perceived usefulness has a statistical significant mediating role between the effects of perceived ease of use, perceived compatibility, and social influence on continuous usage of mobile payment services.

Keywords: 1. Perceived usefulness 2. perceived ease of use 3. Compatibility 4. social influence 5. Intention to use 6.Mobile payment services

1. Introduction

Different scholars referred to mobile payment as mobile money (m-money) and defined it differently. One of the main reasons for various definitions of MPS is the absence of a clear understanding of nature and type of MPS. Mobile technologies have become well-known in haste, and now they have the advantage of reaching users widely. Cell or mobile phones have numerous points of interest against different devices, for example connecting with any individual wherever; it tends to be utilized independently; customized data and administrations; and discovering snappy reactions from clients. Due to different challenges, users may not able to utilize fully these advantages.

With regard to the concepts of technical innovation adoption models, there are different models of technology acceptance that have been used based on the nature of the

technology under consideration. There are also numerous factors affecting technology acceptance of users. These factors can be categorized as technology-specific, personal, and organizational factors affecting individual users' adoption and usage of technical innovations.

Merriam-Webster [1] defined in a comprehensive sense of technology as the practical application of knowledge, wisdom, process, methods in a particular area. According to [2], technology acceptance refers to how users adopt some technologies for use. Further, [3] underlined that technology's acceptance by a user is explained as the perceptible willingness of a user to employ it for the functions it has been designed to perform. Therefore, acceptance can be considered a function of user actual participation in technology use. Acceptance can also be described as the critical element in verifying the success or failure of any type of technology and acceptance is conceived as an outcome factor in a psychological process that users experience in making decisions related to the technology to be used [3]. Many researchers have developed different theories and models of technology acceptance to demonstrate and predict individual as well as organizational user acceptance of technology [4].

The mobile services are allied to other technologies ranging from network infrastructure to software, communication equipment or hardware [5]. Flexibility, compatibility, mobility, and efficiency are among the qualities mobile services resolve everyday problems and satisfy the needs of the users [6].

Progress in technology has also empowered a wide range of new functionalities for mobile phones or devices, boosting numerous mobile financial services; for example, proximity payments at the point of sale (POS), bill payment, money transfers, remote payments to purchase several goods and services. The extensive use of mobile phones or devices and its continuous proximity to the users make them appropriate for mobile payment developments [7]. Therefore, embracing this new service is very decisive to deriving revenue for services providers and to reach potential customers especially who are under-banked or/and unbanked by the current financial institutions.

Mobile payments system allows consumers to eliminate the requirement to usecash [8], offering suitability and speed [9], assures performance and transfer of protected information between devices, from individual transactions to environment with high capacity of payments, such as restaurants, large retailers, and others. Both traders and individual customers are beneficiaries of substantial operation time reduction with clear productivity improvements. The mobile payment system is undergoing a fast-growing in various markets [10] as more and more commercial entities realize the potential development and sustainability of it.

The mobile payment system is one of the most vital drivers for successful mobile commerce and person-to-person money transfer. The mobile payment represents payments for goods, services, and bills using a mobile phone and other communication technologies or devices [11].Hoofnagle and others [12] also identified that mobile payment provides unique advantages over other bank payment systems. In view of that, MPS benefit the users to maintain purchase records in a mobile device, and tackle the problem of lost paper-based receipts and the rejected purchase returns. The authors further described that MPS benefits for better payment security.

Osafo-Kwaako and others [13]also rationalize that mobile money systems provide a dual advantage: as an instrument for financial inclusion, and as a business opportunity for service providers. The authors explain that success in financial inclusion involves reaching individuals and small scale enterprises with different financial products that go beyond payments and can considerably improve their financial positions. For those

who provide digital financial services, mobile money is a means of entering into huge unreached potential markets.

In developing countries, more than 2.5 billion adults, about half of the world's adult population, had no access to financial services, i.e., they are unbanked [14]. The main reasons for the exclusion of such a considerable number of potential users are related to obstacles like costs, distances and documentation requirements for opening a bank account. Nevertheless, according to GSMA [15], among more than seven billion world's people, there were six billion phone subscribers. Mobile payment services have been used and positioned in developing countries as a way of providing financial services to the unbanked nations [16].

According to World Bank [17], about 22% of adults, whose ages were 15 and older, in Ethiopia had an account bank, microfinance or mobile money provider as of 2014. Frost & Sullivan [18] argued that while persistent poverty and a need to persist improving communications markets caused challenges to financial inclusion in Ethiopia, the government of the country has taken part much effort to advance inclusive growth. As one of the efforts, Ethiopia turned out to be a member of the Alliance for Financial Inclusion's Maya Declaration in 2011, and in January 2013 National Bank of Ethiopia approved a mobile and agent banking regulatory framework [19].

The annual report of the National Bank of Ethiopia underlined that the designed financial inclusion strategy has been bearing fruits in terms of increased financial intermediation and in boosting the use of electronic money [20]. Bessir [21] stated that in 2017, the proportion of adults with a bank account grew to 35% upward from 22% in 2014. He argued that regardless of the growth in bank account ownership, the country delays behind its neighboring countries. For instance, 82% and 50% of adults have bank account in Kenya and Rwanda respectively. Furthermore, in Sub-Sahara Africa, 43% of adults have a bank account which is so greater than Ethiopia's position. This, in part, shows that Ethiopia hasn't taken properly the advantages of DFSs that have driven access to and usage of financial services [21].

2. The Objectives and Hypotheses of the Study

There are three specific objectives for the study. They are:

- To determine the indirect effect of perceived compatibility on users' intention to continue the usage of mobile payment services via perceived usefulness;
- To identify the indirect effects social influence on intention to continue usage of mobile payment services through perceived usefulness and
- To examine the indirect effects perceived ease of use on intention to continue usage of mobile payment services via perceived usefulness.

Three hypotheses were formulated for the study based on the previous research findings on factors affecting the adoption of technical innovations and developed models.

H_1: Perceived compatibility has a significant indirect effect on intention to use MPS through the perceived usefulness.

In line with TAM2 [22], as well as Combined TAM and TPB [23], perceived usefulness has been theorized as a direct factor or determinant of intention to use a given technology. Besides, it was found that perceived usefulness mediates positively the

relationship between perceived compatibility and intention to continue the usage of a technology [24].

H_2: Social influence has a significant indirect effect on intention to use MPS via the perceived usefulness.

The mediating role of perceived usefulness on the relationship between social influence and intention to use has been studied [25], [26]. The former researchers found that the indirect influence of SI on the relationship between PU and ITU is not significant. On the contrary, the later researchers concluded that the effect of social influence on user's intention to use technology is strengthened if he/she perceives that the technology is useful in improving his/her job performance.

H_3: Perceived ease of use has a significant indirect effect on intention to use MPS via the perceived usefulness.

Some of the previous studies [22], [27], [28] have found that perceived usefulness (PU) significantly moderates the relationship between perceived ease of use (PEOU) and intention to use (ITU) a particular technology.

3. Related Literature Review

In contemporary literature, research on mobile payment system adoption focuses mainly on notions of instrumentality, such as perceived usefulness and perceived ease of use [29]. Alternatively, literature from viewpoints of behavioral sciences and individual psychology advocates that social influences and personal traits like subjective norms, social image, and individual innovativeness, and knowledge are practically important explanatory variables in innovation or technology adoption [28].

Effects of Perceived Ease of Use (PEOU)

Along with the direct effects of PEOU, as noted by [30], [31], an indirect effect through perceived usefulness (PU) has been reported that increase in PEOU rises perception of technology's usefulness and this perception leads to technology acceptance by potential adopters. On the other hand, various studies [31],[32], [33],[34] give an account only an indirect as in opposition to a direct effect of PEOU.

Effects of Perceived Compatibility (COMP)

As a determinant of technology acceptance, compatibility relates to the idea of intergeneration time, which is the time duration between an introduction of innovation and an upgrade of the innovation. As found by [35], intergeneration time influences the adoption of the upgrade negatively. The longer time duration may make the size of the upgrade wider, which may result in a lower user's perceived compatibility of these upgrades. The overall consensus is that the perceived compatibility of innovation increases its acceptance [31], [36].

Effects of Perceived Usefulness (PU)

Various studies have examined the influence of perceived usefulness (PU) on potential users' acceptance of different technologies. From these studies [36], [37], the overall consensus is that PU increases the potential user's acceptance of new technologies. Specifically, [30] reported that PU increases potential user's attitudinal acceptance of

new technologies. Similarly, [31], [32], concluded that PU increases potential user's intentional acceptance of new technologies. Likewise, some studies ([33],[34]) found that PU increases potential user's behavioral acceptance.

Effects of Social Influence (SI)

When the technology use is perceived to be voluntary, social influence has insignificant direct effect on its adoption [22]. Moreover, they [22] underlined that subjective norm positively impacts image; accordingly, if others in the social group believed that an individual should execute a behavior, performing the behavior in question positively affects an individual's image in that group. Social influence also affects technology acceptance indirectly through its direct positive impact on perceived usefulness of the technology [22].

4. Research Methodology

On the basis of theoretical or conceptual grounds, a correlational cross-sectional survey research design was deployed to offer a substantial body of knowledge about the mediating effects of perceived usefulness on users' adoption of mobile payment systems in Ethiopia, specifically in Adama District. Variables that are covered by the study were measured at a single point in time.

A quantitative survey was implemented to examine the indirect effects of perceived compatibility, social influence, and perceived ease of use on users' adoption of m-money via perceived usefulness. The prime research methodology for the present study is a survey (standardized questionnaire).All questions integrated into the questionnaire were based on the popular models or theories [22],[25], [27].

With the Likert scale, respondents indicate their attitudes by checking how strongly they agree or disagree with each statement that varies from extremely positive to extremely negative toward the perceptional object. The scales were identified as strongly disagree= 1, disagree= 2, neutral= 3, agree= 4, and strongly agree= 5.

The target population for the study is mobile payment service users in Ethiopia. Specifically, the study was conducted in Adama City and District, Oromia Region. The sampling unit for the study is individual users of M-Birr and HelloCash mobile payment systems.The sample size was determined based on [38] sample size recommendation. Accordingly, for the population size (N) of 1,796,595, the proper sample size (n) is 384. Having taken into account 85% of response rate, the questionnaire had been distributed to 442 potential respondents, and 406 of them were returned. Among 406 completely returned questionnaires, 247 and 159 subjects were M-Birr and HelloCash users respectively.The collected data wereanalyzed using structural equation modeling (SEM). With SEM, the proposed model could be tested in concurrent analysis of the entire system of variables to determine the degree to which the model is consistent with the collected data.

Reliability of the Instrument

Table 1: Cronbach's Alpha, Inter-Item Correlations and Item-to-Total Correlation

Factors/Constructs	Cronbach's Alphas (α)	Cronbach's Alphas if item deleted (Max.)	Inter-Item Correlation (Min.)	Corrected Item-Total Correlation (Min.)	Item-Total Correlation (Min.)
Compatibility	0.81	0.75	0.56	0.64	0.75
Social Influence	0.85	0.81	0.63	0.70	0.78

Perceived Ease of Use	0.92	0.90	0.61	0.76	0.80
Perceived Usefulness	0.88	0.85	0.60	0.71	0.77
Intention to Use	0.89	0.87	0.60	0.73	0.77

All inter-item correlation values exceed 0.40 and all the item-to-total correlation values exceed 0.50. Several scholars (e.g., [39]; [40] advocate that the cutoff point of item-to-total correlation for a given concept or factor in measuring internal consistency should be at least 0.40. Furthermore, [41]have set the minimum value of item-total correlation for a factor to 0.30. Accordingly, the collected data were reliable enough for further analysis based on the values indicated in Table 1.

Squared multiple correlation (SMC) also measures the correlation between a single indicator variable and the factor it is assigned to. The SMC of a good indicator variable should be at least 0.50 though sometimes SMC value of 0.30 indicates an acceptable internal consistency measurement [42]. In line with this, all the observed variables have shown good and acceptable reliability based on the values of SMC (see Table 2).

Table 2: Squared Multiple Correlations for all Observed Variables

COMP1	COMP2	COMP3	SI1	SI2	SI3	PU1	PU2	PU3	PU4
0.582	0.587	0.591	0.64	0.679	0.641	0.688	0.616	0.631	0.633
PEOU1	PEOU2	PEOU3	PEOU4	PEOU5	ITU1	ITU2	ITU3	ITU4	
0.715	0.722	0.677	0.677	0.672	0.72	0.614	0.676	0.677	

The validity of the Instrument

According to Fornell-Larcker criterion, the convergent validity of a model can be measured by the Average Variance Extracted (AVE) and Composite Reliability (CR).The cutoff point for AVE is to the value of at least 0.5 for convergent validity of a study data [43]. Accordingly, the CR values for all factors of this study exceed 0.70 (the minimum cutoff point). Moreover, the AVE values of all factors are above 0.50 (see Table 3).

Table 3: Average Variance Extracted, Composite Reliability and Factor Loadings

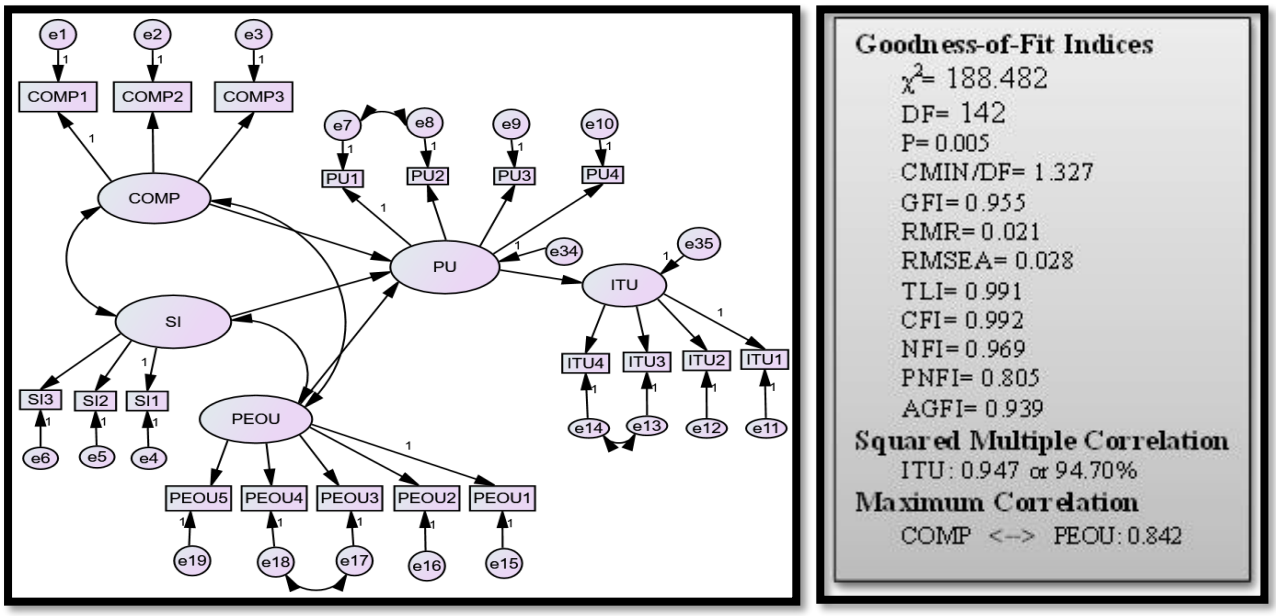
Factors/Constructs	Average Variance Extracted (AVE)	Composite Reliability (CR)	Items' Loadings (Min-Max)
Perceived Compatibility (COMP)	0.59	0.81	0.763-0.768
Social Influence (SI)	0.65	0.85	0.800-0.824
Perceived Ease of Use (PEOU)	0.69	0.92	0.820-0.850
Perceived Usefulness (PU)	0.64	0.88	0.785-0.830
Intention to Use (ITU)	0.67	0.89	0.784-0.849

Structural Model's Goodness-of-Fit

The following exhibit indicates that the model fits the data well due to the fact that all the goodness-of-fit indices are within the prescribed cutoff points [43]. The goodness-of-fit parameters indicate how well the model fits the data. On the other hand, the strength of the structural paths in the model is determined by squared multiple correlations (SMC or R^2). It is the proportion of the dependent variable's variance that is explained by its predictors. So, SMC of the dependent variable (ITU) is 0.947 which implies that the two direct determinants (i.e., COMP, SI and PEOU) and the mediator

(PU) account for 94.70% of the variance of the dependent variable (i.e., ITU). This value witnesses the highest degree of explanation for the dependent variable in the model, given that other things remain constant. Moreover, [44] stressed that there is multicollinearity problem if the inter-correlation among independent variables is 0.90 or higher. As it is shown in Exhibit 1, the inter-correlation between the latent constructs (COMP, SI and PEOU) is less than 0.85 which indicates weak collinearity among the dependent variables.

Exhibit 1: Structural Model



Multicollinearity and Singularity Tests

Various studies have applied squared multiple correlations (SMC) in testing multicollinearity and singularity issues of the studied variables. As mentioned earlier, [45] stressed that an observed variable that has issues with singularity (i.e., wherein SMC close to 0.0) and multicollinearity (wherein SMC close to 1.0) should be deleted from the dataset. Concerning the present study data, the minimum value of SMC is 0.41 and its maximum value is 0.78 as shown in Table 4, below. This in part shows that the measured variables are free of multicollinearity and singularity issues.

Table 4: Squared Multiple Correlation (SMC) of the Observed Variable of the Study

Factors/Constructs	Nº. of Items	Squared Multiple Correlation (SMC)	
		Minimum	Maximum
Compatibility	3	0.56	0.63
Social Influence	3	0.61	0.70
Perceived Ease of Use	5	0.64	0.72
Perceived Usefulness	4	0.59	0.70
Intention to Use	4	0.60	0.78

5. Data Analysis and Discussions

With the help of AMOS, the proposed model of the study and hypotheses were tested using SEM. The findings are shown in detail as follow.

The mediation effect of perceived usefulness between the independent variables and intention to continue the usage of mobile payment systems has been examined by using AMOS-SEM in identifying both unstandardized and standardized estimates of direct and indirect effects. The standard errors for the mediation effect were computed using the method of Monte Carlo parametric bootstrapping in AMOS. The biased-corrected percentile method of bootstrapping in AMOS also produced similar values of standard errors for indirect effects. Additionally, the p-values for the indirect (mediation) effect were found out via the use of Partial Posterior approach. The Partial Posterior method provides p-values for the mediation effects that are interpreted in the same way as the p-value computed using Sobel's test [46]. This method has higher power than Sobel's test and other modern methods, and it appears to adequately control Type I error rates in most cases [47]. Besides, biased-corrected percentile method of bootstrapping in AMOS produced p-values which are significant ($p < 0.05$).

The study result indicates that the indirect effect of COMP on ITU through PU is statistically significant at a significance level of 0.005 ($p = 0.003$ which is <0.005). Therefore, perceived usefulness mediates positively and significantly the relationship between perceived compatibility and intention to continue the usage of mobile payment services (see Table 5).

Similarly, the study has found that the indirect effect of SI on ITU is positive and statistically significant at a significance level of 0.05 ($p = 0.029$ which is <0.05). So, perceived usefulness also plays a significant positive mediating role in the relationship between social influence and intention to continue the usage of mobile payment services (see Table 5). To the best knowledge of the researcher, there is only one study which was conducted on the mediating role of PU on the relationship between SI and ITU. The study's [26] finding is similar with the current study result which realized the significant indirect effect of SI on ITU via PU.

Table 5 also reveals that PEOU has a statistically significant indirect effect on ITU via the mediator (PU). A number of previous studies ([22]; [27]; [28]) also support the current study finding. Despite the fact that the indirect effect of PEOU on ITU is significant, its direct effect is stronger than its indirect effect on the same variable (ITU). Specifically, when measured by standardized regression weight resulted from AMOS, the direct effect of PEOU is 0.861 and its indirect effect is 0.746 (see Table 5). This implies that PU reduces the influence of PEOU on ITU, yet the effect of PEOU on ITU is significant.

In summary, the findings of the study revealed that the indirect effect of perceived compatibility on the intention to continue the usage of mobile payment services through perceived usefulness is significantly positive. Perceived usefulness has also a significant mediating role between the relationship of social influence and intention to continue the usage of mobile payment services. Likewise, the relationship between perceived ease of use and intention to continue mobile payment services is significantly mediated by perceived usefulness of the services. Though the indirect effect of PEOU on ITU is significant, its direct effect is stronger than its indirect effect on the same variable, intention to use.

Table 5: Indirect Effects of the Perceived Usefulness

Dependent Variable	Paths	Mediator	Paths	Predictors	Standardized Estimates	Unstandardized Estimates	S.E.	C.R.	P
ITU	<---	PU	<---	COMP	0.162	0.214	0.086	2.488	0.003
ITU	<---	PU	<---	SI	0.080	0.086	0.05	1.720	0.029
ITU	<---	PU	<---	PEOU	0.746	0.695	0.074	9.392	***

***** P-value is less than 0.001, and significant at the significance level of 0.001**

6. Summary of the Major Findings

The indirect effect of perceived compatibility on the intention to continue the usage of mobile payment services through perceived usefulness is significantly positive. Perceived usefulness has also a significant mediating role between the relationship of social influence and intention to continue the usage of mobile payment services. Though the indirect effects of COMP and SI passing through PU are positive and significant, the mediating (or interaction) role of PU between the relationship of COMP and ITU as well as SI and PU is negative and statistically not significant. The relationship between perceived ease of use and intention to continue mobile payment services is also significantly mediated by perceived usefulness of the services. Besides, the direct effect PEOU on ITU is stronger than its indirect effect on the same variable, ITU. Besides, The SMC value indicates COMP, SI, and PEOU as the main predictors, and the PU as a mediator account for the highest (0.947) variance of the dependent variable, ITU.

All the formulated hypotheses were tested using AMOS software for correlation analysis, regression analysis, chi-square-based comparison, and pairwise coefficient comparison tools of data analysis. All the hypotheses have been supported and one has been rejected. The results are summarized in Table 6 below.

Table 6: Hypotheses Test Results

Hypotheses	Sig. Level	Result
H_1: Perceived compatibility has a significant indirect effect on intention to use MPS through the perceived usefulness.	0.005	Supported
H_2: Social influence has a significant indirect effect on intention to use MPS via the perceived usefulness.	0.05	Supported
H_3: Perceived ease of use has a significant indirect effect on intention to use MPS via the perceived usefulness.	0.001	Supported

7. Recommendations

Based on the results of the current study, the following recommendations are forwarded for the mobile payment technology providers, mobile payment services providers and policymakers.

- The mobile payment services providers should be aware of that users' decision to continue the use of the service is affected indirectly and significantly by perceived compatibility, social influence, and perceived ease of use at existence of perceived usefulness. The mobile payment service providers can also apply a strategy by which the existing users send their family members, friends, colleagues, and other partners a message via mobile phone freely to register and use the services.

- The providers of mobile payment system technology should also design and/or modify the technology which is compatible with the life, needs, and capability of the potential as well as the existing users.
- The National Bank of Ethiopia (NBE) needs to design different projects to promote MPS among the existing and potential users. These projects may include periodical seminars on the opportunities for and benefits of MPS and using media coverage with different languages to provide the community information on MPS.
- The financial services regulator, NBE, also needs to create a platform in which the key stakeholders of MPS (e.g., mobile payment technology providers, MFIs, banks, agents, network service providers, and financial service regulators) form alignment to support the coverage and quality of the services.

8. Suggestions for Further Research

- The study scope in terms of the study population should be wide which incorporates under-banked, but not unbanked, actual and potential users.Besides, the scope of the study, in terms of factors affecting intention to use MPS, is limited to COMP, SI, PEOU, and PU.Actually, ITU is not affected only by these determinants; there are a number of factors affecting ITU MPS as per the previous research works. Thus, in order to formulate an inclusive model of MPS adoption, the future researchers need to incorporate other MPS adoption determinants.
- Before collecting data from the prospective respondents, it is better if the users are clustered on the basis of their adoption stage as fresh users and senior users. Then, the 'adoption stage' variable can be used as a moderator.
- Future research in the areas of information technology in general and MPS, in particular, should also concentrate on users' demographic factors like age, education, and income as moderators between the direct determinants, mediators, and dependent variables.

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