The Effects Of Compatibility, Social Influence, And Perceived Ease Of Use On Perceived Usefulness Of Mobile Payment Services

Didha Bacha Moti, Nidhi Walia

Abstract: The use of mobile phones for the provision of digital financial services in developing countries like Ethiopia is with an increased level of importance mainly in communities that are either unbanked or under-banked. There are several factors that influence user's perception towards the usefulness of mobile payment services, among which perceived compatibility, social influence and perceived ease of use on the usefulness have taken the attention of the researchers. Accordingly, the study aimed at examining the effect of mobile payment services' perceived compatibility, social influence and perceived ease of use on the usefulness of mobile payment services. The data for the study were collected from 406 active M-BIRR and HelloCash MPS users through a questionnaire. The collected data fit the requirements for SEM; the study results indicate that perceived compatibility (COMP), social influence (SI) and perceived ease of use (PEOU) influence significantly the perceived usefulness (PU) of mobile payment systems (MPS).

Index Terms: Mobile Payment Systems, Perceived Compatibility, Perceived Ease of Use, Perceived Usefulness, Social Influence

1. INTRODUCTION

The progress in technology has provided a wide range of opportunities with mobile phones or devices, boosting numerous digital financial services; for example, proximity payments at the point of sale (POS), bill payment, money transfers, remote payments to buy several goods & services. The extensive use of mobile phones or devices and its continuous proximity to the clients make them appropriate for mobile payment developments [1]. That is why many Internet-based services have been ported to the mobile-based atmosphere. Therefore, embracing this new service is very decisive to deriving revenue for services providers and to reach potential customers especially those who are under-banked or/and unbanked by the current financial institutions. MPS allows the users to eliminate the requirement to use physical money or cash [2], offering suitability and speed [3], assures functionality and transfer of protected information between devices, from individual item transactions to arena with high capacities of payments, such as restaurants, large retailers, and others [4].

• *Didha Bacha is a Ph.D. Research Scholar at University School of Applied Management, Punjabi University, Patiala, India.*
E-mail: dibaat@gmail.com
• *Nidhi Walia is an Assistant Professor at University School of Applied Management, Punjabi University, Patiala, India.*
E-mail: nidhiwalia79@gmail.com

Both traders and individual clients are beneficiaries of substantial process time reduction with clear productivity improvements. The m-payment system is undergoing a fast-growing in various potential users as more and more commercial stakeholders realize the prospective development and sustainability of the services [5]. Companies working in the sectors of communication (e.g. network providers) and payments (e.g. financial institutions) are focused on worthy business opportunities that are resulted due to the fulfillment of these alarms and needs [6]. The procedure is mainly aimed at the payment and transfer of money through the mobile phone or device without using cash and paper transactions or without the need for direct involvement of banks or other financial institutions [7]. In accordance with the survey undertaken by the [8], the return for the global m-payment system is the most important means of conducting transactions. GSMA reported that Ethiopia had about 34.70 million mobile subscribers in 2017 [9]; however, [10] stated in the Findex report of 2017 that only about 0.30% of adult individuals had an m-payment account in the year. Besides, the Findex report also indicated that about 13 million individuals having a mobile phone have been unbanked. This in part illustrates that mobile phone subscribers are not able to access DFS easily. Besides, cash is an overwhelmingly dominant method of payment for different transactions in the country, Ethiopia, as most individuals still rely on cash to pay and receive payments. These all show that though there is an ample opportunity for MPS and other digital financial services, the adoption rate and volume have been low in Ethiopia. Therefore, the current study aimed at examining the effect of perceived compatibility, social influence and perceived ease of use on users' perception of the usefulness of mobile payment services. Explicitly, the study makes an effort to achieve the following specific research objectives:

1. To determine the influence of perceived compatibility on perceived usefulness;
2. To examine the effect of social influence on perceived usefulness; and
3. To investigate the influence of perceived ease of using MPS on perceived usefulness.

2. 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 [11]. Alternatively, literature from viewpoints of behavioral sciences and individual psychology advocates that social influences and personal traits are practically important explanatory variables in innovation or technology adoption [12], [13].

Perceived compatibility: Rogers [14] defined compatibility as the extent to which an innovation is viewed as being in harmony with the potential user's prior experiences, existing values, and needs. Several studies found that individual users' perception of technology compatibility has a positive and significant impact on their perception of technology's usefulness [15], [16]. Accordingly, the following hypothesis has been developed.

H_1: Perceived compatibility of mobile payment services has a significant positive effect on the perceived usefulness.

Social influence: It is defined as the magnitude to which an individual person perceives that other important individuals like friends, family members, and other referents believe that he/she should use a particular technology [13]. To the best knowledge of the researchers, there is no study that had been conducted on the effect or association between social influence and perceived usefulness except a single study that found that there is a significant and positive relationship between social influence and perceived usefulness [17]. In reply, the following hypothesis has been formulated for the study.

H_2: Social influence (SI) has a positive and significant influence on users' perception of MPS usefulness.

Perceived ease of use: PEOU is used in this study representing the extent to which an MPS user believes that using the MPS would be free of effort [18], [19]. The terms effort expectancy [13] and complexity [20] are used (both in the opposite direction) to describe the construct, PEOU. This is to mean that PEOU is analogous to effort expectancy and perceived complexity. A number of studies' results (e.g., [18], [21], [22], [23]) show that individuals' perception of ease of use of a specific technology has to environment significant positive influence on their perception of the technology's usefulness. Consequently, the third hypothesis for the study is shown as follows.

H_3: PEOU has a significant positive influence on perceived usefulness.

Perceive usefulness: The definition for perceived usefulness (PU) is taken from Davis [18] which he defines as the extent to which a user believes that using MPS would improve his/her job performance. According to Venkatesh [13], perceived usefulness is similar to the relative advantage of Rogers' Innovations Diffusion Theory [19]. It is also termed as job-fit [20], outcome expectations [24], extrinsic motivation and performance expectancy [13].

In general, the conceptual framework for this study is based mainly on technology acceptance models which are set forward by Davis [18], and Venkatesh & Davis [23] among others. All of the constructs are adapted from previous research findings but modified to fit the context of mobile payment services in general and the objectives of the study in particular. Therefore, the study model has been adapted as shown below.

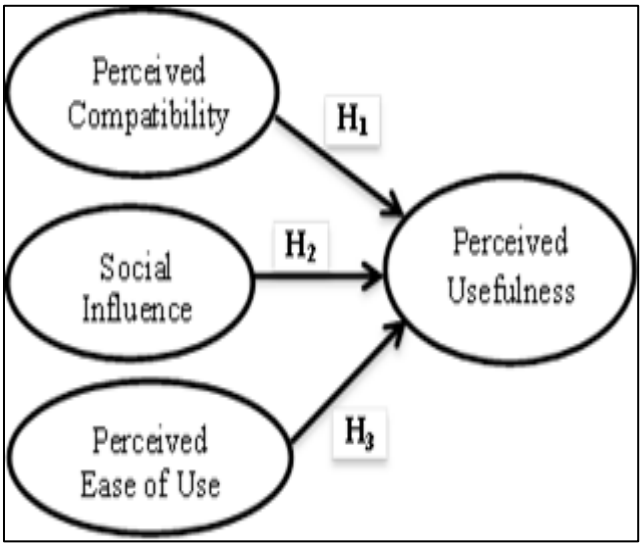

Figure 1: *Framework of the study*

3. RESEARCH METHODOLOGY

The main objective of this study is to determine the effect of perceived compatibility, social influence and perceived ease of use on perceived usefulness of mobile payment services in Ethiopia. The population of the present study is the entire M-Birr and HelloCash mobile payment services users in Ethiopia who had experience of at least two years in using the MPS. The study is categorized as a cross-sectional study as it targeted the collection of data just once, though it took a period of one month. Besides, the study is a correlational study, and it was carried out in non-contrived settings. A typical case sampling technique was applied to select the study population, and a convenience sampling technique was used to identify individual MPS users who would participate in this study as a final respondent. The target population for the study is mobile payment service users in Ethiopia. Specifically, the study was carried out in Adama District, Oromia Regional State of Ethiopia. The primary data was collected from the selected research participants where they were taking part in their day-to-day habitual jobs, mainly when they visited financial institutions and MPS agents. It was collected via a personally administered questionnaire. The items of the questionnaire were structured based on a 5-point Likert scale as it is very popular for measuring perceptions and it is simple to administer in processing, analyzing and interpreting the collected information [25]. For all operationalized constructs of the study, the validated items from prior research works were selected and retested [23], [26]. As of June end 2018, the total number of mobile payment systems users in Ethiopia was 2,496,033, of which 1,796,595 (about 72%) was M-Birr and HelloCash users. As the population size (N) is 1,796,595, the appropriate sample size (n) becomes 384

[27]. Having taken into account 85% of the response rate, the self-administered questionnaire was distributed to 442 subjects, and 406 of them were returned. The collected data were analyzed using SEM with the support of SPSS and AMOS. Structural Equation Modeling (SEM) is a technique applied to estimate a series of interrelated associations among variables as well as items instantaneously [28].

4. RESULTS AND DISCUSSION

A. Demographic Profile of the Respondents

Table-1 reveals that female respondent are 152 (37.40%) and respondents are 254 (62.60%). About 21.92%, 18.72%, 18.23%, 16.01%, 11.82%, 8.13% and 5.17% of the respondents were merchant, self-employment, employed in governmental service sectors, or state-owned enterprises, or private organizations, enterprise owners, farmers, students, and those who had no permanent job respectively. Among the sampled mobile payment services users, 42.86% of the respondents were with education level 8-12 grades; 35.96% of the users were either certificate or diploma holders; 15.27% of them were bachelor degree holders; 4.68% of them were 2nd-degree holders; 1.23% of them completed Ph.D.

Table-1: *Respondents' demographic profiles*

Demographic Variables	Category	Frequency	Percent
Gender	Male	254	62.60
	Female	152	37.40
	Total	406	100.0
Occupation	Merchant	89	21.92
	Farmer	48	11.82
	Student	33	8.13
	Employee	74	18.23
	Enterprise Owner	65	16.01
	Other Self-employed	76	18.72
	No Permanent job	21	5.17
	Total	406	100.0
Education	Grade 8-12	174	42.86
	Certificate and Diploma	146	35.96
	Bachelor Degree	62	15.27
	Master Degree	19	4.68
	Ph.D.	5	1.23
	Total	406.00	100.00

B. Factor Analysis and ModelFit Assessment

All measurement items fit the skewness and kurtosis thresholds. The overall KMO value is 0.962 (see Table-2) which is above the minimum requirement of 0.60 [29]. Besides, the diagonal values of the anti-image correlation matrix, which represent individual items' KMO values for all observed variables, are greater than 0.90 (see Appendix-I). These in part, indicate that there is superb sample adequacy for EFA [30], [31].

Table-2: *KMO and Bartlett's Test*

KMO Measure of Sampling Adequacy		0.962
Bartlett's Test of Sphericity	Approximate Chi-Square	4293.618
	df	105
	Sig.	.000

Table-3 also reveals that the factor loading of each item and the values of communalities are greater than 0.74 and 0.60 respectively. Therefore, the data of the study is much appropriate for EFA [30]. Furthermore, Cronbach's Coefficient Alpha (α) values of all the measured constructs are greater than 0.8 which indicates that data for all constructs are reliable [29].

Table-3*: Cronbach's alpha, loading, and communalities*

Items	Factor Loading	Communalities /Extraction/	α
Perceived Compatibility			
COMP1	0.75	.615	0.81
COMP2	0.79	.628	
COMP3	0.75	.603	
Social influence			
SI1	0.81	.703	0.85
SI2	0.83	.698	
SI3	0.78	.677	
Perceived Ease of Use			
PEOU1	0.83	.729	0.92
PEOU2	0.85	.723	
PEOU3	0.80	.683	
PEOU4	0.83	.679	
PEOU5	0.83	.677	
Perceived Usefulness			
PU1	0.84	.675	0.88
PU2	0.77	.635	
PU3	0.78	.635	
PU4	0.82	.625	

In addition, Table-4 portrays that the values of univariate skewness and univariate kurtosis are within ±1 which indicates that each measured item of all constructs is normally distributed [32], [33]. In addition, the critical ration of multivariate kurtosis is -0.010 which is less than 1.96 and greater than -1.96 and indicates that joint data of the study variables considered to be normally distributed [34], [35].

Table-4: *Assessment of normality*

Variable	min	max	skew	c.r.	kurtosis	c.r.
PEOU2	1.00	5.00	-.361	-2.972	-.808	-3.323
PEOU3	1.00	5.00	-.511	-4.203	-.643	-2.643
PEOU4	1.00	5.00	-.478	-3.931	-.702	-2.886
PEOU5	1.00	5.00	-.466	-3.836	-.472	-1.943
PEOU1	1.00	5.00	-.456	-3.755	-.726	-2.984
PU4	1.00	5.00	-.362	-2.978	-.388	-1.594
PU3	1.00	5.00	-.437	-3.596	-.762	-3.135
PU2	1.00	5.00	-.409	-3.368	-.583	-2.397
PU1	1.00	5.00	-.520	-4.274	-.518	-2.129
SI1	1.00	5.00	-.437	-3.594	-.488	-2.008
SI2	1.00	5.00	-.365	-3.003	-.645	-2.654
SI3	1.00	5.00	-.388	-3.192	-.855	-3.517
COMP1	2.00	5.00	-.394	-3.244	-.533	-2.191
COMP2	1.00	5.00	-.306	-2.518	-.431	-1.772
COMP3	1.00	5.00	-.515	-4.236	-.055	-.226
Multivariate					-.021	**-.010**

N.B.: c.r.= critical ration.

As the study constructs had already been identified by a number of studies so far, the inter-items correlations or items' loading >0.40 has been used to assess the convergent validity of the study data [34]. Zikmund [25] also recommends that a correlational analysis is one of the tools used to verify construct validity for particular research. Several scholars advocate that the cutoff point of item-to-total correlation (IIC) for a given concept or factor in measuring internal consistency should be at least 0.40 [36], [37]. Furthermore, others have set the minimum value of item-total correlation (ITC) for a factor to 0.30 [38]. Accordingly, the inter-item correlation and item-to-total correlation values exceed 0.57 (see Table-5). Various scholars identify the cutoff point for AVE to the value of at least 0.50 for the convergent validity of a study data [29], [39]. Besides, the value of CR should be at least 0.70 and above the value of AVE [29], [39]. Accordingly, AVE and composite reliability (CR) values of the study exceed 0.58 and 0.80 respectively, and CR>AVE for all factors (see Table-5).

Table-5*: AVE, items' loadings, IIC and ITC*

Factors	*AVE*	*CR*	*Min. ITC*	*Min. IIC*	*Min. Std. Estimates*
COMP	*0.59*	*0.81*	*0.763*	*0.580*	*0.760*
SI	*0.65*	*0.85*	*0.800*	*0.637*	*0.793*
PEOU	*0.69*	*0.92*	*0.820*	*0.614*	*0.825*
PU	*0.64*	*0.88*	*0.785*	*0.608*	*0.796*

For convergent validity, the standardized estimates or factor loadings should be at least 0.5, and at the same time, it should be significant [29]. In view of this, Fig. 2 shows that all the standardized estimates of the measured variables are greater than 0.75. These five results satisfy the criteria for construct validity.

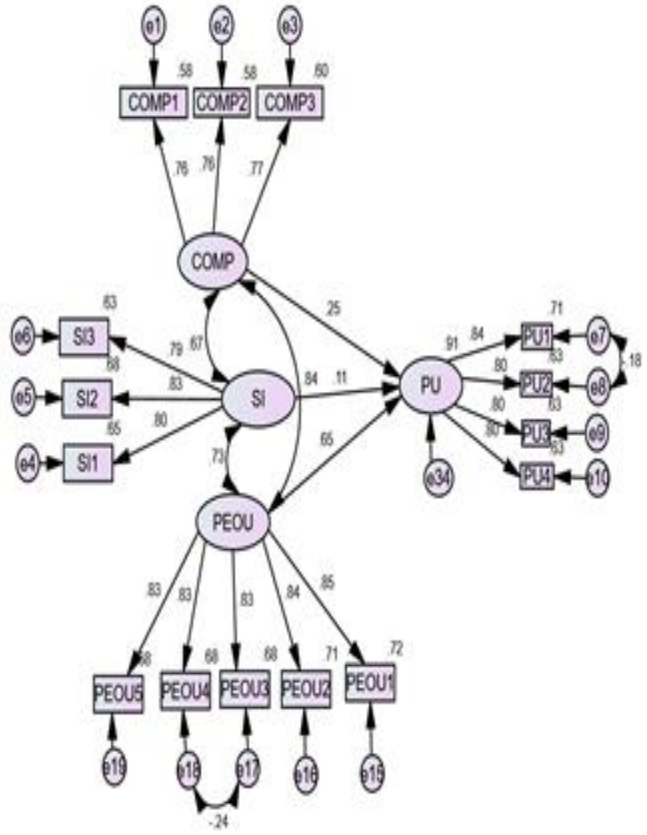

Figure 2: *Standardized estimates*

In addition, Table-6 reveals that the study model fits the data well since all the listed goodness-of-fit indices are within the prescribed cutoff points [29], [40], [41], [42].

Table-6: *Goodness-of-fit indices*

Indices	χ^2/DF	GFI	RMR	RMSEA	TLI	CFI	NFI	PNFI	AGFI
Results	1.283	0.968	0.02	0.026	0.994	0.995	0.976	0.768	0.953

N.B.: χ^2 = Chi-Square, DF = Degree of freedom, GFI = Goodness-of-fit, RMR= Root mean square residual, RMSEA = Root Mean Square Error of Approximation, TLI = Tucker-Lewis coefficient Index, CFI = Comparative-fit-index, NFI = Normed fit index, PNFI = Parsimony Normed Fit Index, AGFI =Adjusted Goodness of Fit Index In addition to goodness-of-fit measures, it is important to determine the squared multiple correlations (SMC) of the dependent variable in order to best describe the structural model as it is independent of all units of measurement [43]. Accordingly, SMC of the dependent variable, PU is 0.911 which implies that the three predictors (COMP, SI, and PEOU) account for 91.10% of the variance of the dependent variable, PU (see Fig. 2).

C. Findings

Table-7 depicts that the estimated values of all paths between each of the three predictors (COMP, SI, and PEOU) and PU are positive and statistically significant. Therefore, all hypotheses of the study are supported. Compatibility and perceived usefulness: The study result indicates that users' perception of compatibility of the mobile payment services has a positive relationship and significant effect on their perception of services' usefulness (see Table-VII). A number of previous studies [15], [16], [17], [18], [26], [44] also support this result. Hence, the H_1 of the study is supported, i.e., COMP has a significant positive effect on the PU of MPS. Social influence and perceived usefulness: The study result indicates that social influence has a positive association with and significant statistical effect on perceived usefulness of the mobile money services at the level of significance 0.05 (see Table-7). The previous research findings also support the current finding. For instance, [17], [23], [45] found the there is a significant positive relationship between the two factors. In general, this study has found that social influence has a significant positive effect on the perceived usefulness of MPS. Thus, the proposed H_2 of the study is supported.

Table-7: *Structural path analysis result*

DV	Paths	IV	Unstd. Estimates	S.E.	C.R.	P
PU	<---	COMP	0.307	0.086	3.593	***
PU	<---	SI	0.114	0.046	2.475	0.013*
PU	<---	PEOU	0.572	0.066	8.698	***

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

* P-value is less than 0.05, and significant at the level of 0.05.

Perceived ease of use and perceived Usefulness: The estimated value of the path between the predictors (PEOU) and the dependent variable (PU) is positive and statistically significant at the level of significance 0.001. Hence, the study result proves that the users' perception of ease of using mobile money services has a positive relationship with and significant influence on customers' perception of the services' usefulness (see Table-VII). This finding is consistent with previous studies' results of [18], [19], [21], [22], [23], [46]. Generally, this study finding indicates that PEOU has a significant positive impact on PU; hence H_3 of the study is supported.

5. CONCLUSIONS AND IMPLICATIONS

A. Conclusions

There are several factors that affect either positively or negatively and significantly or non-significantly the customers' perceptions of MPS usefulness. Among these factors, this study focuses on compatibility, social influence, and perceived ease of use. The study has found that the three predictors (COMP, SI, and PEPU) have a significant positive effect on the dependent variable (PU). About 91.10% of the variance in PU is explained by these three variables. Specifically, PEOU has the most significant positive effect on PU, followed by COMP.

B. Research Implications

The study findings provide direction for future researchers, mobile payment technology and services providers, and policy-makers. The study population was selected based on a typical case sampling technique which allows researchers to select a particular segment possessing the typical characteristics of the target population. The study data were also analyzed using AMOS-SEM which has several advantages over other approaches of testing and analyzing data given that the model fits completely the frequently used goodness-fit indices. The current study findings have

also theoretical implications as they support that COMP, SI, and PEOU have a positive and statistically significant effect on PU. These indicate that mobile payment technology and service providers need to have strategies to make their MPS compatible and easy to use. They should also design strategies that allow them to utilize the opportunity of social influences. Likewise, the study results imply that the policy-makers (e.g., National Bank of Ethiopia) need to formulate and implement a policy that increases people's perception of compatibility of MPS which in return increases their perception of the usefulness of the services.

C. LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCHERS

A. Limitations of the Study

Though the study population is characterized by inhabitants with different demographics and other sociocultural factors, it may be challenging to generalize the study findings to the whole target population; particularly, for potential mobile users residing in rural areas that are either under-banked or unbanked. The study sampling technique was one of the non-probability sampling approaches. With such non-probability sampling methods, it may be difficult to generalize the findings for the target population. The study has covered a few variables as a determinant of the perceived usefulness of MPS. Perceived usefulness might be affected by different factors like users' knowledge, education, occupation, and others.

B. Suggestions for Future Researchers

For future studies, the study scope in terms of the study population should be wide which incorporates under-banked and unbanked potential users. The respondents should also be selected using probability sampling techniques. Furthermore, it is better for future researchers in the areas of MPS if their studies concentrate on users' characteristics like adoption stage, age, education level, gender, occupation, and income as moderators between the direct determinants and the dependent variable. In addition to COMP, SI, and PEOU, the future study should also investigate the effects perceived cost, perceived risks, network effects, and perceived benefits/value on PU.

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APPENDIX-I

Anti-image Matrices

		COMP1	COMP2	COMP3	SI1	SI2	SI3	PEOU1	PEOU2	PEOU3	PEOU4	PEOU5	PU1	PU2	PU3	PU4
Anti-image Covariance	COMP1	.497	-.143	-.072	-.034	.029	-.028	-.008	-.022	.009	-.003	-.021	-.033	-.011	-.045	-.005
	COMP2	-.143	.498	-.116	.000	-.027	.008	-.016	.011	-.021	-.026	.002	.008	-.015	-.015	-.044
	COMP3	-.072	-.116	.482	-.006	.015	-.004	-.002	-.021	-.022	-.005	-.042	-.044	-.065	.007	.005
	SI1	-.034	.000	-.006	.445	-.165	-.121	-.018	.036	.020	-.050	.000	-.026	-.006	-.012	.002
	SI2	.029	-.027	.015	-.165	.425	-.131	.020	-.021	-.024	-.028	.006	-.030	-.025	-.008	.004
	SI3	-.028	.008	-.004	-.121	-.131	.457	-.016	-.030	-.002	.003	-.010	.036	-.045	-.016	-.027
	PEOU1	-.008	-.016	-.002	-.018	.020	-.016	.310	-.040	-.112	-.037	-.051	.000	-.038	-.019	-.035
	PEOU2	-.022	.011	-.021	.036	-.021	-.030	-.040	.329	-.046	-.073	-.054	-.046	-.023	-.025	.000
	PEOU3	.009	-.021	-.022	.020	-.024	-.002	-.112	-.046	.351	.011	-.035	-.062	-.036	-.019	.012
	PEOU4	-.003	-.026	-.005	-.050	-.028	.003	-.037	-.073	.011	.343	-.072	.002	.011	-.082	-.030
	PEOU5	-.021	.002	-.042	.000	.006	-.010	-.051	-.054	-.035	-.072	.354	-.035	-.016	-.002	-.021
	PU1	-.033	.008	-.044	-.026	-.030	.036	.000	-.046	-.062	.002	-.035	.334	.001	-.059	-.105
	PU2	-.011	-.015	-.065	-.006	-.025	-.045	-.038	-.023	-.036	.011	-.016	.001	.408	-.043	-.083
	PU3	-.045	-.015	.007	-.012	-.008	-.016	-.019	-.025	-.019	-.082	-.002	-.059	-.043	.393	-.025
	PU4	-.005	-.044	.005	.002	.004	-.027	-.035	.000	.012	-.030	-.021	-.105	-.083	-.025	.398
Anti-image Correlation	COMP1	.964[a]	-.287	-.148	-.072	.063	-.058	-.020	-.055	.022	-.006	-.049	-.080	-.025	-.103	-.011
	COMP2	-.287	.957[a]	-.237	.000	-.060	.016	-.042	.027	-.051	-.063	.004	.020	-.034	-.034	-.100
	COMP3	-.148	-.237	.968[a]	-.014	.033	-.008	-.005	-.054	-.053	-.013	-.102	-.109	-.146	.015	.012
	SI1	-.072	.000	-.014	.930[a]	-.379	-.268	-.049	.093	.052	-.128	-.001	-.069	-.014	-.028	.005
	SI2	.063	-.060	.033	-.379	.931[a]	-.297	.055	-.055	-.061	-.073	.016	-.079	-.060	-.019	.011
	SI3	-.058	.016	-.008	-.268	-.297	.948[a]	-.044	-.078	-.006	.009	-.024	.092	-.105	-.037	-.063
	PEOU1	-.020	-.042	-.005	-.049	.055	-.044	.963[a]	-.127	-.340	-.114	-.153	.001	-.108	-.055	-.100
	PEOU2	-.055	.027	-.054	.093	-.055	-.078	-.127	.970[a]	-.135	-.218	-.157	-.138	-.062	-.071	-.001
	PEOU3	.022	-.051	-.053	.052	-.061	-.006	-.340	-.135	.960[a]	.031	-.100	-.180	-.095	-.050	.032
	PEOU4	-.006	-.063	-.013	-.128	-.073	.009	-.114	-.218	.031	.965[a]	-.206	.007	.030	-.224	-.081
	PEOU5	-.049	.004	-.102	-.001	.016	-.024	-.153	-.157	-.100	-.206	.975[a]	-.102	-.043	-.006	-.056
	PU1	-.080	.020	-.109	-.069	-.079	.092	.001	-.138	-.180	.007	-.102	.961[a]	.001	-.162	-.289
	PU2	-.025	-.034	-.146	-.014	-.060	-.105	-.108	-.062	-.095	.030	-.043	.001	.975[a]	-.107	-.206
	PU3	-.103	-.034	.015	-.028	-.019	-.037	-.055	-.071	-.050	-.224	-.006	-.162	-.107	.977[a]	-.062
	PU4	-.011	-.100	.012	.005	.011	-.063	-.100	-.001	.032	-.081	-.056	-.289	-.206	-.062	.966[a]

a. Measures of Sampling Adequacy(MSA)