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August 22, 2022

# A Stimulus-Organism-Response Paradigm to Word-of-Mouth and Continuance Intention of Mobile Application

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**Abstract.** In recent years, the utilization of mobile applications has been increasing worldwide. However, the antecedents that would motivate users to engage with word of mouth and continue using mobile application are relatively understudied. Thus, this study looks to capture the variables that would drive users to continue using mobile application. In order to achieve this objective, a research model was developed via a uniquely developed Stimulus-Organism-Response framework. Following that, data was collected via an online survey which yielded 300 usable responses. Subsequently, the data was analyzed using PLS-SEM. The results show that perceived complementarity and perceived usefulness are significant facilitators of satisfaction. Besides, satisfaction was determined as a significant driver of word of mouth and continuance intention. Based on the results of this study, there were several insights proposed to the relevant stakeholders. In addition, this study filled the theoretical gap of comprehending the main antecedents influencing customers' intention to continue using mobile application.

**Keywords:** Word-of-Mouth, Continuance Intention, Mobile Application, Stimulus-Organism-Response Partial Least Squares-Structural Equation Modeling.

## 1 Introduction

Over the past decade, the number of mobile applications has increased all around the world [1]. As of the first quarter of 2022, the Google Play Store has roughly 3.3 million mobile applications while the Apple App Store has about 2.1 million mobile applications [2]. Furthermore, the number of downloads for mobile applications have also been steadily rising in recent years [3]. In addition to that, the functionalities of mobile applications have constantly been evolving with the aim of making user's lives more convenient [4]. It is undeniable that people nowadays rely heavily on mobile applications, be it for entertainment, education, gaming, banking and so on [5].

Hence, companies with mobile applications were compelled to consider how they can leverage opportunities to meet users' demands [6]. This led to companies increasing the functionalities of single-purpose mobile applications by offering more features to their users. One example is Grab which was initially a transport hailing mobile application. As of today, users can make payment as well as order groceries and food delivery through the mobile application [7]. With that said, global mobile application retention rate at 30 days from installation was below 7% [1]. This is drastically low as it indicates that more than 93% of mobile applications would be abandoned after 30 days since they were installed.

In view of the above-mentioned, this study aims to (1) establish the constructs that influence the intention to continue using mobile application and (2) develop a theoretical framework to investigate the users' continuance intention to use mobile application. Overall, this study is postulated to contribute to numerous novel findings and practical insights to mobile application developers. From the theoretical perspective, this study can serve to expand the existing knowledge on continuance intention to use mobile application.

## 2 Literature Review

### 2.1 Stimulus-Organism-Response Theory

The Stimulus-Organism-Response theory serves as a framework to investigate users' behavioral intention from a multi-component perspective [8]. More precisely, the three components posited in this theory are stimulus, organism, and response. In summary, the theory elucidates that the environmental cues (stimulus) would have an effect on people's internal state (organism) which would subsequently compel them to perform a certain action (response) [9]. The Stimulus-Organism-Response is among the most prominent theory when investigating online consumer behavior. In particular, this theory has been applied by past studies in a variety of digital [10,11] and mobile [12,13] settings. In this study, the stimuli are signified by perceived complementarity and perceived usefulness. Besides, satisfaction serve as the organism while the responses are conceptualized in the form of word of mouth and continuance intention. These constructs were selected in view of their relevance to the subject matter which are further elaborated in the next section.

## 3 Hypotheses Development

### 3.1 Perceived Complementarity

Perceived complementarity denotes "the availability of complementary goods or services that provide additional value or benefits to the users" [14]. Perceived complementarity is relevant to mobile applications as the majority of them provide users with complementarity services. Hence, these complementary services would increase the users' satisfaction [15]. This is because users' satisfaction is tied to their perceived value which would increase from the use of complementary services [16]. Thus, the hypothesis below was developed:

*H1: Perceived complementarity has a significantly positive relationship with satisfaction.*

### 3.2 Perceived Usefulness

In this study, perceived usefulness has been adapted to denote the users' perceptions of increased performance arising from the utilization of mobile application [17]. This is because users can derive utility from the service offered by mobile application [5]. Subsequently, the utility derived from using mobile application will facilitate the users' satisfaction towards it. Several past studies [18,19] have obtained empirical support for the facilitating effect of perceived usefulness on satisfaction in various mobile settings. Therefore, the hypothesis below was developed:

*H2: Perceived usefulness has a significantly positive relationship with satisfaction.*

### 3.3 Satisfaction

Based on the cumulative perspective, satisfaction is a result of a person's overall evaluation between their actual experiences and initial expectations [18]. Moreover, "satisfaction has been defined as an emotional response based on users' overall evaluation of their expectations and experiences derived from their previous interactions with an m-service" [20]. It has been postulated by Cao et al. [21] that users' satisfaction towards a mobile application would facilitate frequent usage behavior. Several recent studies have found empirical support for the significant facilitating effect of satisfaction on continuance intention in a number of mobile settings [22,23].

In addition, through positive interactions with the mobile application, satisfaction creates a unique position in the minds of users in terms of its value [24]. Following that, satisfied users would be inclined to share their positive experiences with others [25]. This is referred to as positive word of mouth which has been posited as a user's way of reciprocating the satisfaction gained from the interactions [26]. Based on the above-mentioned, the hypotheses below were developed:

*H3: Satisfaction has a significantly positive relationship with word of mouth.*

*H4: Satisfaction has a significantly positive relationship with continuance intention.*

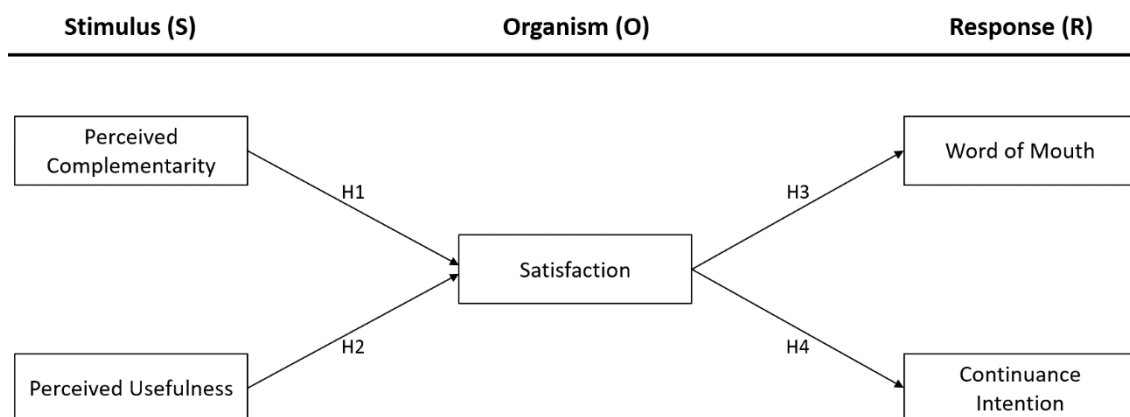


Fig. 1. Proposed Conceptual Model.

## 4 Methodology

The target respondents for this study were smartphone users in view of the subject matter of this study. As no sampling frame was available for this group of people, a non-probability sampling technique was utilized [27]. More specifically, purposive sampling was employed which involved the screening of respondents to ensure better fitting with the subject matter [28,29]. Initial participants who were not smartphone users were filtered out. In other words, only those who were smartphone users were solicited to complete the survey. Overall, a total of 300 responses were collected which is roughly similar with the samples of mobile-related past studies [5,30].

In terms of the data collection tool, an online survey was used [31,32]. Prior to the actual data collection, the survey's content validity and reliability were established through a pre-test and a pilot test respectively [33,34]. The online survey's demographic section captured the respondents' gender, age, occupation, and education level as shown in Table 1. More specifically, there were slightly more female (50.7%) than male respondents (49.3%). Based on each of the demographic characteristics, the highest proportion of respondents were between 20-29 years old (52.7%), students (47.0%), and pursuing their Bachelor's Degree (58.0%). In addition, all variables had five items each and gauged with a 5-point Likert scale. Subsequently, the PLS-SEM was employed for data analysis as it is suitable to analyze complex research models [35,36,37].

Table 1. Descriptive Analysis.

Characteristics	Description	Count	Percentage
Gender	Male	148	49.3
	Female	152	50.7
Age	19 years old and below	10	3.3
	20-29 years old	158	52.7
	30-39 years old	43	14.3
	40-49 years old	38	12.7
	50-59 years old	35	11.7
	60 years old and above	16	5.3
Occupation	Student	141	47.0
	Employee	100	33.3
	Self-Employed	33	11.0
	Unemployed	17	5.7
	Retiree	9	3.0
Education Level	Primary / Secondary School	64	21.3
	Pre-U / Diploma	60	20.0
	Bachelor's Degree	174	58.0
	Postgraduate Degree	2	0.7

## 5 Analysis

### 5.1 Common Method Bias (CMB)

The presence of CMB was examined as there only one method utilized for this study's data collection. It can be established that CMB is not found in the dataset of this study as demonstrated in Table 2. This is because all Ra values were significant ( $p < 0.001$ ) [38,39]. This on top of the substantially higher  $Ra^2$  average (0.806) than  $Rb^2$  average (0.000) [40,41].

**Table 2.** Common Method Bias

Construct	Item	Substantive factor loading (Ra)	$Ra^2$	Method factor loading (Rb)	$Rb^2$
Perceived Complementarity	PC1	0.912***	0.832	-0.165*	0.027
	PC2	0.924***	0.854	-0.149*	0.022
	PC3	0.782***	0.612	-0.058	0.003
	PC4	0.583***	0.340	0.212*	0.045
	PC5	0.654***	0.428	0.160 <sup>NS</sup>	0.026
Perceived Usefulness	PU1	0.926***	0.857	-0.131 <sup>NS</sup>	0.017
	PU2	0.902***	0.814	-0.128 <sup>NS</sup>	0.016
	PU3	0.780***	0.608	0.055 <sup>NS</sup>	0.003
	PU4	0.827***	0.684	0.014 <sup>NS</sup>	0.000
	PU5	0.610***	0.372	0.194*	0.038
Satisfaction	SAT1	0.870***	0.757	-0.091 <sup>NS</sup>	0.008
	SAT2	0.900***	0.810	-0.077 <sup>NS</sup>	0.006
	SAT3	0.895***	0.801	-0.069 <sup>NS</sup>	0.005
	SAT4	0.736***	0.542	0.096 <sup>NS</sup>	0.009
	SAT5	0.693***	0.480	0.141 <sup>NS</sup>	0.020
Word of Mouth	WOM1	0.919***	0.845	-0.070 <sup>NS</sup>	0.005
	WOM2	0.881***	0.776	-0.021 <sup>NS</sup>	0.000
	WOM3	0.731***	0.534	0.098 <sup>NS</sup>	0.010
	WOM4	0.916***	0.839	-0.106 <sup>NS</sup>	0.011
	WOM5	0.735***	0.540	0.103 <sup>NS</sup>	0.011
Continuance Intention	CI1	0.887***	0.787	-0.067 <sup>NS</sup>	0.004
	CI2	0.834***	0.696	-0.034 <sup>NS</sup>	0.001
	CI3	0.801***	0.642	0.041 <sup>NS</sup>	0.002
	CI4	0.747***	0.558	0.045 <sup>NS</sup>	0.002
	CI5	0.704***	0.496	0.017 <sup>NS</sup>	0.000
<b>Average</b>		<b>0.806</b>	<b>0.660</b>	<b>0.000</b>	<b>0.012</b>

Note: \*\*\* =  $p < 0.001$ ; \* =  $p < 0.05$ ; <sup>NS</sup> =  $p > 0.05$

### 5.2 Measurement Model Assessment

According to Table 3, the reliability of all constructs was determined as the values of Cronbach's Alpha, rho\_A, and Composite Reliability were above 0.7 [42,43]. Besides, convergent validity was established as all of the average variance extracted values (AVE) were greater than 0.5 [44,45].

**Table 3.** Reliability and Convergent Validity

Construct	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Perceived Complementarity	0.830	0.839	0.880	0.594
Perceived Usefulness	0.869	0.870	0.905	0.656
Satisfaction	0.877	0.879	0.910	0.670
Word of Mouth	0.893	0.894	0.921	0.701
Continuance Intention	0.854	0.859	0.896	0.633

Moreover, discriminant validity was validated from the Fornell-Larcker criterion and cross loadings [46,47]. More precisely, the square root of each construct's AVE (Table 4) is greater than the actual AVE (Table 3). This is corroborated by the cross loadings as all construct's loadings are higher than the cross-loadings of other constructs (Table 5) [48,49].

**Table 4.** Fornell-Larcker Criterion

	PC	PU	SAT	WOM	CI
PC	0.771				
PU	0.710	0.810			
SAT	0.673	0.683	0.819		
WOM	0.667	0.677	0.715	0.837	
CI	0.711	0.682	0.791	0.735	0.796

Note: PC = Perceived Complementarity; PU = Perceived Usefulness; SAT = Satisfaction; WOM = Word of Mouth; CI = Continuance Intention.

**Table 5.** Cross Loadings

	PC	PU	SAT	WOM	CI
PC1	<b>0.760</b>	0.498	0.466	0.453	0.510
PC2	<b>0.783</b>	0.572	0.471	0.484	0.485
PC3	<b>0.718</b>	0.533	0.443	0.474	0.494
PC4	<b>0.783</b>	0.566	0.583	0.572	0.610
PC5	<b>0.807</b>	0.566	0.598	0.566	0.615
PU1	0.499	<b>0.811</b>	0.538	0.508	0.535
PU2	0.551	<b>0.785</b>	0.505	0.471	0.507
PU3	0.581	<b>0.829</b>	0.570	0.613	0.562
PU4	0.576	<b>0.840</b>	0.583	0.582	0.577
PU5	0.664	<b>0.783</b>	0.563	0.559	0.573
SAT1	0.542	0.530	<b>0.782</b>	0.526	0.578
SAT2	0.533	0.558	<b>0.828</b>	0.572	0.643
SAT3	0.558	0.518	<b>0.832</b>	0.585	0.661
SAT4	0.564	0.580	<b>0.826</b>	0.629	0.657
SAT5	0.559	0.604	<b>0.824</b>	0.611	0.692
WOM1	0.528	0.569	0.590	<b>0.854</b>	0.634
WOM2	0.556	0.575	0.630	<b>0.864</b>	0.628
WOM3	0.647	0.568	0.575	<b>0.815</b>	0.595
WOM4	0.470	0.528	0.583	<b>0.823</b>	0.606
WOM5	0.593	0.594	0.614	<b>0.829</b>	0.612
CI1	0.517	0.548	0.682	0.603	<b>0.831</b>
CI2	0.565	0.549	0.626	0.576	<b>0.801</b>
CI3	0.636	0.564	0.654	0.630	<b>0.837</b>
CI4	0.599	0.552	0.634	0.558	<b>0.790</b>
CI5	0.514	0.498	0.544	0.558	<b>0.714</b>

Note: PC = Perceived Complementarity; PU = Perceived Usefulness; SAT = Satisfaction; WOM = Word of Mouth; CI = Continuance Intention.

### 5.3 Structural Model Assessment

Table 6 indicates that at a significance level of 0.05, all four hypotheses were supported. In particular, perceived complementarity was found to have a significant positive correlation with satisfaction. Thus, H1 was supported. Similarly, H2 was also supported as perceived usefulness had a significantly positive influence on satisfaction. Furthermore, satisfaction demonstrated a significant positive relationship with word of mouth, thereby H3 was supported. Additionally, H4 was also supported given that satisfaction was revealed as a significant facilitator of continuance intention.

**Table 6.** Hypotheses Testing

Hypothesis	Relationship	Path Coefficient	t-value	p-value	Remark
H1	PC → SAT	0.380	6.673	0.000	Supported
H2	PU → SAT	0.413	7.402	0.000	Supported
H3	SAT → WOM	0.715	29.366	0.000	Supported
H4	SAT → CI	0.791	19.448	0.000	Supported

Note: PC = Perceived Complementarity; PU = Perceived Usefulness; SAT = Satisfaction; WOM = Word of Mouth; CI = Continuance Intention.

Despite stating that the organism serves as a mediator between the stimulus and response [50,51], past mobile-related studies that have used the Stimulus-Organism-Response theory [e.g., 52,53] did not assess the mediation effect. Given this deficiency, the present study carried out a mediation analysis to which the results are reported in Table 7. In general, it can be established that organism (satisfaction) is able to serve as a partial mediator between the stimuli (perceived complementarity and perceived usefulness) and responses (word of mouth and continuance intention).

**Table 7.** Mediation Analysis

Relationship	Path Coefficient	t-value	p-value	Remark
PC → SAT → WOM	0.272	6.219	0.000	Partial Mediation
PU → SAT → WOM	0.295	6.174	0.000	Partial Mediation
PC → SAT → CI	0.301	6.134	0.000	Partial Mediation
PU → SAT → CI	0.327	6.745	0.000	Partial Mediation

Note: PC = Perceived Complementarity; PU = Perceived Usefulness; SAT = Satisfaction; WOM = Word of Mouth; CI = Continuance Intention.

Table 8 displays the results pertaining to the research model's predictive capabilities. In particular, all  $Q^2$  values were greater than 0 which indicates that the structural model is has good predictive relevance [54]. Additionally, the research model was able to capture 53.8%, 51.2%, and 62.6% of the variance for satisfaction, word of mouth, and continuance intention respectively.

**Table 8.** Predictive Relevance ( $Q^2$ ) and Power ( $R^2$ )

Construct	SSO	SSE	$Q^2 (=1-SSE/SSO)$	$R^2$
Perceived Complementarity	1500.000	1500.000		
Perceived Usefulness	1500.000	1500.000		
Satisfaction	1500.000	966.904	0.355	0.538
Word of Mouth	1500.000	968.879	0.354	0.512
Continuance Intention	1500.000	911.684	0.392	0.626

## 6 Discussion

From the results, perceived complementarity and perceived usefulness were found to be significant facilitators of satisfaction. These findings show that users would be more satisfied with mobile applications that have value added services that meet their demands. While the sought after benefits would vary between different users, this study established that they would generally value the increased performance in carrying out their daily activities [55]. As such, these benefits should result in increased convenience, faster speed and so on to the users. Besides, satisfaction was revealed to have significantly positive effects on word of mouth and continuance intention. The results for satisfaction as a significant facilitator are similar with mobile-related past studies such as Kalinić et al. [56] for word of mouth and Marinković et al. [57] for continuance intention. With that said, when users are satisfied with their use of mobile application, they would develop the desire to continue using it. In addition, they would also want to share their positive experiences with the mobile application with others.

Based on the findings, there are several implications that companies with mobile application can focus on to develop satisfaction as well as encourage their users to spread word of mouth and continue utilizing the mobile application. In essence, these companies should look to widen the assortment of functionalities that their mobile applications offer to the user. This can be done by providing more services in the mobile application. In addition to that, they should also ensure that users would consider the additional functionalities contained in the mobile application to be useful. This can be achieved by collecting feedback from users and providing the services that were indicated to be useful to the performance of the users' desired actions when using the mobile application. By enhancing the quantity and quality of services, users will have higher satisfaction which would automatically increase their desire to share their positive experiences with others and continue using the mobile application.

In terms of theoretical contributions, this study extends the current literature by looking into the continuance intention of mobile application. More precisely, this study proposed a unique research model with the Stimulus-Organism-Response framework as the foundational theory. Following that, the results validated the relevance of perceived complementarity on users' continuance intention of mobile application. Furthermore, the results of the mediation analysis established the Stimulus-Organism-Response theory's soundness as satisfaction was found to have significant mediating effects between the stimuli and responses.

There are several limitations identified in this study which should be addressed by future studies. Firstly, this study looked into the continuance intention of mobile payment from a broad perspective. Hence, future studies can narrow down the scope of study to be more specific. This is because there are several categories for mobile applications such as health, finance, and so on [58,59]. Secondly, this study only collected data from citizens in a single country. Therefore, the findings should be cautiously generalized in the context of other countries [60,61]. As such, future studies should collect data from several countries to better reflect a broader group and capture the differences between countries.

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