The Attraction of Personalized Service for Users in Mobile Commerce: An Empirical Study

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There has been a notable increase in consumer use of mobile applications. Consumers begin to adopt mobile commerce applications. In response, firms have been investing billions of dollars in order to enhance the hardware and software platforms for mobile commerce. Consequently, with such large investments, firms are highly motivated to attract new clients and retain their old customers. In the present study, the strategic parameters have been studied in order to determine the ways in which mobile service providers acquire new customers. For the purpose of analysis, the dependent variable is the service subscribers' intention to switch to a new service provider with personalized services. Four main constructs have been studied — the amount and the perceived usefulness of general advertisements, the perceived usefulness and privacy issues about personalized advertisements. This empirical study indicates that all four constructs are significant in affecting the decision by subscribers to change to a new mobile service provider.

Additional Key Words and Phrases: Mobile Commerce, Personalization, Privacy

1. INTRODUCTION

In response to consumer demands, extensive mobile phone handsets and sophisticated services, such as videoconferencing and video streaming, are being developed for 3G mobile phones. Mobile phones are ideally suited to wireless commerce, because the businesses can reach their customers all the times via the short message service (SMS) transmission. Mobile phones are also personal devices that can be transported with the client anywhere and at anytime. It is for this reason that mobile phones have the potential to be ideal personalized tools. Personalization services are context-specific services to each individual. These operations range from customized ring tone recommendations to location-based services. Business models have been constructed that allow service providers to locate consumers and business to create a revenue-generation decision point [18]. Many technology firms are developing a portfolio of engineering service packages that targets at mobile commerce (m-commerce) platforms. For example, on the software side, Qualcomm's BREW and Sun's Java 2 Micro Edition (J2ME) are two mobile application environments [10]. On the hardware side, Motorola has obtained a big share of J2ME device market. Yet, as Nokia has revealed J2ME devices on its way, it is likely that competition is going to speed up. Location-based services and portal services will be implemented. With the large investments, firms are eager to attract new customers and retain their old customers [6][19]. M-commerce is becoming a very lucrative business.

In m-commerce, one of the biggest challenges has been that the phone screens are

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too small. One screen can display three or four lines of characters. If the users receive more than four messages, they need to use the small keypads to "scroll" up and down when reading. In addition, mobile phones offer reduced user interfaces, little client data storage and limited client business logic. Mobile users are generally reluctant to enter large amounts of data due to the difficulties in keypad usage [10]. It is likely that consumers will become impatient when they read a lot of useless and general advertisements in a limited screen. Regarding this challenge, the provision of personalized services seems to be a promising development in the information-flooding environment [9]. Personalization has been widely studied on the Web [13][14][17]. The objective is to create a one-to-one relationship with the current customers and providing clients with uninterrupted relevant contents [2]. With personalization, the amount of messages sent to the customers will be reduced. The users will no longer receive numerous irrelevant messages. With smaller amount of messages, the users can view the message title, and hence select the interesting piece of news, more easily. Consequently, it is likely that personalization can solve the problem of small screen display in m-commerce. However, the question is whether or not personalization is an effective tool to attract more subscribers. The findings from this study will answer that question. The research will produce data from an empirical study, which will determine whether a mobile service provider can use personalized services to attract subscribers to switch to any particular company. An increased number of new subscribers would indicate client preference for personalized services from the provider. Subscription switching to their company is the starting point for the service providers to gain more businesses in m-commerce.

In m-commerce, there appears to be a trend for some service providers offering tailor-made products for their subscribers, while some broadcast general advertisements to all subscribers. Although it may seem intuitive, it is not enough to assume that customers like personalized service. However, the question is whether or not personalized service is sufficient to motivate the users to switch to a new service provider? This question has been addressed in the present study as to the nature of choice for mobile phone users. A survey study was administrated to collect data on personalization mobile services from service consumers, who were knowledgeable about personalization. The paper is organized as follows. Section 2 provides the study background and states the research hypotheses. Section 3 presents the operationalization of variables and Section 4 describes the findings. Section 5 sets out the study implications. A conclusion and study limitation will be presented in the Section 6.

2. THE STUDY

The present study investigates the factors that motivate or inhibit the tendency for mobile phone users to change to a new service provider with personalized services.

When comparison is made between m-commerce and e-commerce, the major weaknesses in m-commerce include the limited information display area for navigation and the limited client data storage. In addition, the keypad is too small for the users to select their options freely [10]. Mobile users are, therefore, generally reluctant to spend time browsing and reading broadcast messages. Also, broadcast messages can be regarded as a kind of interruptions. Marketing researchers have pointed out that people are inclined to feel annoyed with interruptions. Also, their working efficiency is lowered when the frequency of interruption increases [20]. Intuitively, customers prefer personalized services to general services. However, it has not been established whether personalization is the factor that motivates customers to change their service provider. Consequently, two hypotheses are proposed as follows.

H1: General advertisements make consumers switch to a new service provider with personalized services.

H2: Difficulty in locating useful general advertisements provides positive impact on consumer to change to a new service provider with personalized services.

In Information Systems literature, innovation adoption research provides a theoretical framework with which to identify the innovation-related factors in order to assess their impact on adoption decisions. One of the established models is the technology acceptance model (TAM), which has been applied extensively to identify factors that facilitate or inhibit the adoption of an innovation [1][3][4][7]. In this study, one of its constructs, *Perceived Usefulness of Personalized Service*, will be employed. Perceived usefulness is defined as the degree to which a person believes that using a particular system would enhance his job performance [8]. It is a response to user assessment of the extrinsic characteristic of IT. It is also how IT helps users to achieve task-related objectives, such as effectiveness and efficiency. The following hypothesis is proposed:

H3: When a user perceives the personalized services to be useful, he/she will tend to switch to a service provider with personalized services.

Privacy is a controversial issue in the topic of personalization. Although subscribers prefer to have tailor-made services, there are concerns that their purchase history and navigation behavior could be analyzed and abused [11][15]. Thus, a hypothesis has been proposed with which to determine whether subscriber's refusal of personalized service is due to concerns regarding privacy.

H4: Privacy concerns in personalization discourage customers to switch to a service provider with personalized services.

3. VARIABLE OPERATIONALIZATION

3.1 Data Collection and Samples

A self-administrated survey on the acceptance of personalization services in m-commerce was conducted from July 2002 to August 2002. The questionnaire consisted of 45 questions and all questions were measured on a 5-point Likert scale. The time required to complete the whole questionnaire was 20 minutes. 350 computer technicians and full-time students in Hong Kong universities in the departments of Computer Science (CS), and Information Systems (IS) took part in the study. Emails were sent to these subjects to request them to complete online questionnaires. All subjects were mobile phone service subscribers and had experiences in receiving broadcast messages from service providers. Also, all subjects had Internet browsing experience, and they had knowledge of personalization and adaptive sites from Web browsing. However, they might not have actually experienced the personalized mobile services.

205 questionnaires were returned. The overall response rate was 58.57% (=205/350). There were 69 female and 136 male participants. Table I gives the descriptive statistics on their demographics, and their mobile service experience.

Table I. Respondent Demographics

	Under 20	21-25	26-30	31-35	36-40	Above 40	Total
Male	0	61	46	17	6	6	136
Female	2	44	18	3	2	0	69
Total	2	105	64	20	8	6	205

	Mobile Phone Experience	
	Frequency	Percent
< 1 year	2	1.0
1 year	8	3.9
2 years	23	11.2
3 years	37	18.0
4 years	27	13.2
5 years	27	13.2
6 years	24	11.7
> 6 years	57	27.8
Total	205	100.0

3.2 Measurements of Variables

All independent variables are standardized and then grouped by factor analysis. Principal Components Analysis is employed for factor extraction, whereas Varimax with Kaiser Normalization is used for factor rotation. Rotation converges in six iterations. A four-factor solution is obtained with all component eigenvalues greater than one. The independent factors are *the Amount of General Advertisements* (FX1), *Ease to Locate Useful General Advertisements* (FX2), *Perceived Usefulness of Personalized Messages* (FX3), and *Privacy Infringement from Personalization* (FX4). These factors explain 85.34% of the total variance in the survey. Items load highly (> 0.60) on their associated factors. Table II shows the factor matrices. Appendix I shows the questions in the survey, and Appendix II depicts the descriptive statistics of the four constructs.

Table II. Rotated Matrix Component

	FX1	FX2	FX3	FX4
X1				.890
X2				.865
X3		.658		
X4		.906		
X5		.918		
X6		.651		
X7	.836			
X8	.843			
X9	.916			
X10	.895			
X11	.864			
X12			.930	
X13			.893	

3.3 Reliability, Convergent and Discriminant Validity

The factors, which are discussed in 3.2, have been evaluated for reliability, convergent validity and discriminant validity. The whole statistical analysis was performed with SPSS version 9.0. In the reliability test, the internal consistency for each factor was assessed by computing Cronbach's alpha (Table III). Nunnally (1978) suggests that a reliability value of 0.8 or above is acceptable. Hence, all factors are deemed reliable [12].

Table III. Reliability

Constructs	Items	Reliability
Amount of General Advertisements	2	0.8772
Ease to Locate Useful General Advertisements	4	0.9523
Perceived Usefulness of Personalization	5	0.9467
Privacy Infringement from Personalization	2	0.8898

Convergent validity is achieved when there are high correlations between items in the same factor. To assess this validity, Pearson correlation coefficients were computed with the two-tailed t-statistic test. Appendix III provides the correlation matrix. All correlations between pairs of items within the same factor are statistically different from zero at the 0.01 significance level. Consequently, convergent validity is demonstrated.

Discriminant validity is demonstrated if an item correlates more highly with items within the same factor than with items in a different factor. Validity is determined by counting the number of times an item has a higher correlation with an item from another factor than with items in its own factor. Campbell and Fiske (1959) suggested that a count of less than one-half is acceptable. More than 150 comparisons were made by examining the correlation matrix of items (Appendix II). Only 2 correlation values between items from different factors are higher than those between items within the same factors. Based on this assessment, the items in each factor can be discriminated from items in another factor.

4. RESULTS

Descriptive statistics on the four latent factors are depicted in Table IV below. 27 respondents reported that they had not received any SMS from the mobile service providers; hence, they did not comment on the two constructs, the Amount of General Advertisements (FX1), and Ease to Locate Useful General Advertisements (FX2).

Table V depicts a regression model, with the Likelihood to Switch Mobile Services Providers as the dependent variables respectively.

Table IV. Descriptive Statistics

	N	Max	Min	Mean	S.D.
Amount of Generalized Messages	178	7.57	.00	6.1307	.8363
Ease to Locate Useful Generalized Messages	178	5.21	.00	2.6210	.9209
Perceived Usefulness of Personalization	205	6.07	1.31	3.5570	1.0465
Privacy Infringement from Personalization	205	5.95	1.21	2.9646	1.0967

Table V. Regression Model (Y=Likelihood to Switch Mobile Service Providers)

		Std. Error	Std. Coeff.	T	Sig.
	(Constant)	.461		3.995	.000
From Old Service Providers	Amount of Generalized Messages	.037	.206	2.582	.011
	Ease to Locate Useful Generalized Messages	.054	-.131	-1.986	.048
From New Service Providers	Perceived Usefulness of Personalization	.049	.674	13.591	.000
	Privacy Infringement from Personalization	.048	-.248	-4.912	.000

According to Table V, with a critical value 5%, all the four hypotheses have not been rejected. The regression model is:

$$Y = 0.206 \times FX_1 - 0.131 \times FX_2 + 0.674 \times FX_3 - 0.248 \times FX_4$$

The amount of generalized messages is a significant factor to make a consumer switch to a new service provider with personalized services (p=0.011). Both H2

($p<0.001$) and H3 ($p<0.001$) are not rejected. It implies that when the personalized services are perceived to be useful, a customer will switch to a new service provider with personalized services. Also, privacy infringement from personalization impacts negatively on the customers' decision to switch to a new service provider (H4<0.001).

5. DISCUSSION

There are three interesting implications. First, the clients think that there are too many broadcast advertisements from the service providers (mean=6.1307) and they found that it was very difficult to locate a piece of useful information (mean=2.6210). The level of annoyance from the broadcast messages and the difficulties in locating a piece of useful advertisements are sufficiently serious reasons for the customers to switch to a new company with personalized services. That is, nowadays, more advertisements do not imply better chances for the business. It is a strong and critical signal to all mobile phone service providers. Market differentiation and personalization gives firms competitive advantages [16].

Second, the regression model shows that *Perceived Usefulness of Personalization* (FX3) is statistically significant in affecting subscribers' decisions to switch to a new mobile company (mean=3.5570, $p<0.001$). Hence, the marketing campaign of the mobile phone service providers can focus on the functionality of personalized technology, such as location-based services and multimedia applications, to attract more businesses rather than sending more and more general advertisements.

Third, *Privacy Infringement from Personalization* (FX4) is statistically significant in the regression model and it negatively affects subscribers' decisions to switch to a new mobile company (coeff=-0.248). Yet, the standardized coefficient of *Perceived Usefulness of Personalization* is triple than that of *Privacy Infringement from Personalization.* It implies that customers have more concerns regarding the usefulness, and likely the accuracy, of useful personalized messages than for the privacy issues. If mobile phone service phones fully explain the benefits of personalized services, the customers might be willing to allow the service providers to use the customers' profiles for analysis.

6. CONCLUSIONS AND FUTURE RESEARCH

The rapid evolution in wireless technology has expanded the possibility of more mobile service business. The present paper addressed the importance of providing personalized services to attract more subscribers. Four main constructs were studied. It was found that the huge amount of general advertisements makes it difficult for the user to locate the useful messages. Also, consumers will switch to a new service provider if they find personalized advertisements are useful. Privacy is a concern, but it is not as important as the usefulness of personalized services.

This study, however, has three limitations. First, although the survey subjects had knowledge of personalization in m-commerce, some did not experience actual personalized mobile services. They used their knowledge and perceptions to comment on the personalization. After the mobile phone subscribers experience personalized mobile services, and a study on their opinion on personalization is appealing. Second, it studies the intention of a mobile service subscriber to change to a new mobile service provider with personalized offerings because the original service providers broadcast general messages. M-commerce personalization is a promising way for the service providers to attract many customers. However, the study does not address the issue of commitment to the new service provider. This is a crucial problem that most marketing strategists want to resolve. Third, this paper only addressed the customers' decision to switch to a new

company. Studies on the difference in response rate between personalized advertisements and general advertisements could provide interesting topics for future research.

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APPENDIX I. ITEMS FROM THE QUESITONNAIRE

DEMOGRAPHICS:

Email: _____

Gender:
- o Male
- o Female

Age:
- o Under 20
- o 21 to 25
- o 26 to 30
- o 31 to 35
- o 36 to 40
- o Above 40

Education Level:
- o Form 3 or below
- o Form 4 to Form 7
- o Diploma / High-Cert
- o Undergraduate
- o Postgraduate or above
- o Others

How many years have you used WWW browser?
- o < 1
- o 1
- o 2
- o 3
- o 4
- o 5
- o 6
- o 6

How many years have you used mobile phone for communication?
- o < 1
- o 1
- o 2
- o 3
- o 4
- o 5
- o 6
- o 6

(1 = Disagree, 5 = Agree)

(1) Service providers send many SMS advertisement messages
(2) My mobile service provider sends me too many SMS advertisements to read.
(3) It is easy to locate a useful advertisement.
(4) The advertisements from mobile phone SMS are useful to me.
(5) The advertisements from mobile phone SMS match my needs.
(6) I like general advertisements from mobile service provider.
(7) Personalized advertisements suit my needs.
(8) Personalized advertisements match my needs.
(9) Personalized advertisements reduce my time of information searching.
(10) Personalized advertisements increase my searching efficiency.
(11) Personalized advertisements save my time of reading irrelevant advertisements.
(12) Personalization technology infringes my privacy.
(13) I don't want my personal information to be used for personalization analysis.

APPENDIX II. ITEMS SCALING

FX1: Amount of Generalized Messages (1=Disagree, 5=Agree)

	Mean	S.D.
X1	3.3778	.8597
X2	3.4056	.7300

FX2: Ease to Locate Useful Generalized Messages (1=Disagree, 5=Agree)

	Mean	S.D.
X3	1.25	1.0511
X4	0.9833	.8083
X5	0.8333	.7659
X6	0.9611	.8546

FX3: Perceived Usefulness of Personalization (1=Disagree, 5=Agree)

	Mean	S.D.
X7	2.4098	.8900
X8	2.439	.9248
X9	2.4878	.9782
X10	2.3902	.9771
X11	2.6878	.9075

FX4: Privacy Infringement from Personalization (1=Disagree, 5=Agree)

	Mean	S.D.
X12	2.4439	1.0905
X13	2.5415	1.0912

APPENDIX III. CORRELATIONS AMONG VARIABLES

		X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13
X1	Pearson Correlation	1.000												
	Sig. (2-tailed)	.												
X2	Pearson Correlation	.690	1.000											
	Sig. (2-tailed)	.000	.											
X3	Pearson Correlation	-.270	-.269	1.000										
	Sig. (2-tailed)	.000	.000	.										
X4	Pearson Correlation	-.231	-.200	.625	1.000									
	Sig. (2-tailed)	.002	.008	.000	.									
X5	Pearson Correlation	-.271	-.220	.660	.852	1.000								
	Sig. (2-tailed)	.000	.003	.000	.000	.								
X6	Pearson Correlation	-.353	-.355	.540	.549	.599	1.000							
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.							
X7	Pearson Correlation	-.213	-.325	.449	.361	.358	.477	1.000						
	Sig. (2-tailed)	.004	.000	.000	.000	.000	.000	.						
X8	Pearson Correlation	-.180	-.290	.428	.366	.368	.418	.926	1.000					
	Sig. (2-tailed)	.016	.000	.000	.000	.000	.000	.000	.					
X9	Pearson Correlation	-.181	-.307	.373	.355	.363	.373	.827	.804	1.000				
	Sig. (2-tailed)	.016	.000	.000	.000	.000	.000	.000	.000	.				
X10	Pearson Correlation	-.209	-.232	.311	.230	.270	.302	.694	.686	.880	1.000			
	Sig. (2-tailed)	.005	.002	.000	.002	.000	.000	.000	.000	.000	.			
X11	Pearson Correlation	-.196	-.219	.373	.229	.235	.369	.727	.713	.792	.758	1.000		
	Sig. (2-tailed)	.009	.003	.000	.002	.002	.000	.000	.000	.000	.000	.		
X12	Pearson Correlation	.091	.254	-.191	-.140	-.056	-.323	-.303	-.231	-.187	-.102	-.125	1.000	
	Sig. (2-tailed)	.227	.001	.011	.065	.461	.000	.000	.001	.007	.144	.073	.	
X13	Pearson Correlation	.192	.321	-.298	-.141	-.085	-.421	-.472	-.376	-.322	-.209	-.287	.803	1.000
	Sig. (2-tailed)	.010	.000	.000	.061	.256	.000	.000	.000	.000	.003	.000	.000	.