

EFFECTS OF CONTEXT RELEVANCE AND PERCEIVED RISK ON USER ACCEPTANCE OF MOBILE INFORMATION SERVICES

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Abstract

Mobile information services differ from traditional, office information systems in their focus on entertainment value, their ability to be exposed to shifting social contexts, and the increased reliance of people (especially teenagers) on mobile telephones as important parts of their lives. This paper introduces a user acceptance model that addresses each of these differences: it includes hedonic value, context relevance, and perceived risk as major drivers of user acceptance. Our empirical research was conducted entirely online with the 'context' operating as an experimental treatment, and the other constructs measured using an online survey instrument. The research (N = 123) confirms that a consumer's utilitarian value and hedonic value of a mobile information service are strongly correlated. Further, utilitarian value had a significant impact on intentions to use a service, whereas hedonic value had no such impact. There was a significant negative influence of perceived risk on utilitarian value, implying that those who considered the service to be a greater risk also perceived it to be less useful. There was no significant influence of perceived risk on hedonic value. Finally, a change in context caused a significant change in utilitarian value, implying that people exposed to more relevant contexts found the service more useful than the people with less relevant contexts.

Keywords: Mobile services, user acceptance, utilitarian value, hedonic value, perceived risk, context relevance

1 INTRODUCTION

As the number of people using mobile devices continues to grow, so too does the number of mobile information services that companies are making available to their customers. Examples include text messaging services (e.g., SMS, MMS) with information about weather, sports, news, horoscopes, and so on. While some of these information services are very successful, others are much less so, and have been withdrawn from the marketplace shortly after their introduction. How consumers respond to these services continues to be a matter of great interest for electronic commerce researchers and practitioners alike.

User acceptance of mobile information services appears to be similar to user acceptance of office information systems, and consequently, our existing theoretical models for user acceptance would seem sufficiently appropriate. The use of a mobile service, however, is distinct from the use of an office information system in several respects. Among these is the focus on entertainment value of many mobile services (Ogertschnig and van der Heijden, 2004), their ability to be exposed to shifting social contexts (Lyytinen and Yoo, 2002), and the increased reliance of people (especially teenagers) on mobile telephones as important parts of their lives (Carroll, Haward, Peck, and Murphy, 2002).

These characteristics question the assumptions underlying current technology acceptance models, notably the Technology Acceptance Model (TAM, Davis, 1989) and the Unified Theory of User Acceptance of Technology (UTUAT, Venkatesh, Morris, Davis, and Davis, 2003). These models assume that 1) efficiency and not entertainment is the prime purpose for using technology, 2) the systems are used in one setting only (the office setting), and 3) users do not have much to lose if they do not accept the technology. Therefore, work on new theory that extends these models but somehow incorporates the above characteristics seems desirable and timely.

In this paper we introduce a theoretical model that attempts to address each of these shortcomings. First, we focus on the entertainment aspect by including *hedonic value* as an important predictor of user acceptance in our model. We examine the shifting context issue by looking at *context relevance*. Finally, we explore the increased reliance of people on mobile devices by looking at the notion of *perceived risk*. The resulting model is then empirically tested with a mobile information service invented specifically for this research project.

2 THEORY

User acceptance of technology is typically operationalised by looking at the intentions of an individual to use technology after being exposed to it for some period of time (see e.g., Venkatesh, Morris, Davis, and Davis, 2003). The stronger the intention to use a technology, the more that user is said to accept the technology. In line with this viewpoint, we focus on the intentions to use a particular mobile service, and we also assume that the user has had some exposure to that mobile service, either through a verbal explanation or through a brief demonstration.

The proposed factors that shape intentions to use a mobile service are graphically depicted in Figure 1.

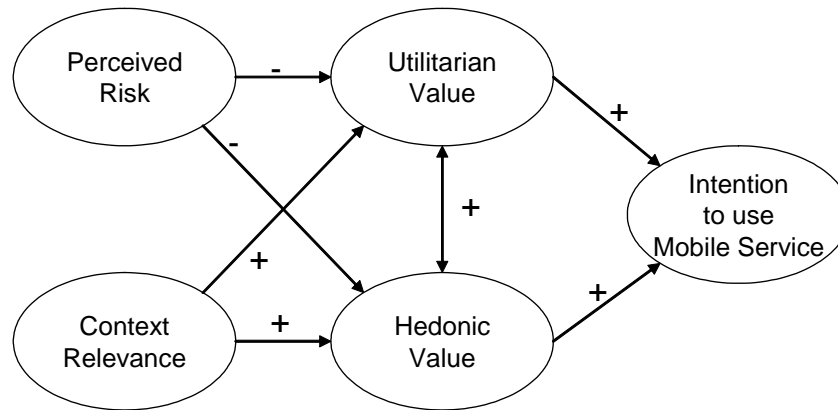


Figure 1. Factors influencing intentions to use mobile services

The Theory of Reasoned Action (TRA, Fishbein and Ajzen, 1975) postulates that intentions are shaped through attitudes, which are defined as relatively transient summary evaluations of specific attitudinal objects (Ajzen, 2001). An individual first reasons about acting, then evaluates the consequences of these actions, and then intends to perform the action. According to this theory, one would expect a user to reason about using the mobile service, to evaluate the consequences of using the mobile service, and then, should the service be regarded favourably, to intend to use it. This is also in line with TRA derivatives, notably TAM and UTUAT.

In the social psychology literature, attitudes towards specific objects are separated into two categories. The first category is the utilitarian value, which focuses on the instrumental value of using an object (e.g., a product or a service). The second category is the hedonic value which focuses on the self-fulfilling value of using the product or service (Hirschman and Holbrook, 1982). In the context of the TAM model, utilitarian value is the conceptual equivalent of perceived usefulness, and hedonic value is the conceptual equivalent of perceived enjoyment. Perceived enjoyment is generally regarded important only if the information system serves hedonic purposes (Van der Heijden, 2004). Because some mobile services tend to have a strong hedonic component, both hedonic value and utilitarian value are included in the specification of the model.

Although hedonic and utilitarian value can be meaningfully distinguished as two separate theoretical constructs, they are expected to influence one another. In other words, a user is likely to enjoy a service that is useful, and at the same time, he or she is likely to find a service useful that he or she enjoys. A user may consider an enjoyable passing of time with the mobile service useful, in that it is a better means of spending time than other ways of doing so. Similarly, a user may be pleased with the usefulness of a mobile service, and become affective towards it because of its effectiveness. We are hypothesising a positive correlation between hedonic and utilitarian attitude towards a mobile service. Because both types of attitudes can be shaped more or less at the same time, no temporal precedence of one versus the other is expected.

H1. There is a positive correlation between hedonic value and utilitarian value

Based on the discussion above we also hypothesise that each attitude category individually contributes to the shaping of intentions to use the mobile service. The more favourable the perceptions regarding utilitarian value or hedonic value, the stronger the intention to use. In line with the TRA, these are unidirectional hypotheses.

H2a. Utilitarian value positively influences intention to use a mobile service

H2b. Hedonic value positively influences intention to use a mobile service

It should be noted that the nature of the mobile service is likely to moderate the influences of these components on intentions to use. For mobile services that are squarely hedonic (e.g., mobile games), people are less likely to care about perceived usefulness. For mobile services that are squarely

utilitarian (e.g., translation services), people are less likely to care about perceived enjoyment (see also Van der Heijden, 2004).

In this paper we consider two antecedents of attitude towards using a mobile information service: perceived risk and context relevance. In consumer research, perceived risk has been defined as the user's subjective function of the magnitude of adverse consequences and the probabilities that these consequences may occur if the product is acquired (Dowling and Staelin, 1994). Risk has also been studied before in the online consumer field, in particular related to business to consumer electronic commerce (e.g., Jarvenpaa, Tractinsky, and Vitale, 2000; Van der Heijden, Verhagen, and Creemers, 2003). In this strand of research, strong negative relationships were found between perceived risk and attitudes towards buying at a particular online store.

In line with the consumer research definition of perceived risk, we define perceived risk here as the user's subjective function of the magnitude of adverse consequences of using the mobile information service and the probability that these consequences may occur if the service is used. Consider for example, the probability that a financial news service provides incorrect or wrong information, and the adverse consequences this has for a user, when he or she decides to act upon this information. We can expect users to regard this service less favourably if they perceive the risk of using it to be high. We can furthermore expect this to hold for both components of attitude, e.g., such a service would be less useful, but it would also be considered less enjoyable to use.

H3a. Perceived risk negatively influences utilitarian value

H3b. Perceived risk negatively influences hedonic value

The second determinant of user attitudes focuses on the context of use. Context is defined rather loosely in this paper as the social setting in which a user is able to use an information system. We use the term in a similar fashion as Lyytinen and Yoo (2002) who speak about sample contexts such as the office, a meeting, and the home (p. 382). As they too acknowledge, there is very little conceptual and empirical work done on the effects of contexts in user acceptance theories (a notable exception being Junglas and Watson, 2003).

The line of reasoning adopted in this paper is to look at context in the same way as people have done with respect to the task that the technology is intended to support. Task-Technology-Fit (TTF, see Goodhue, 1998; Goodhue and Thompson, 1995) has been proposed as a way of explaining how only a fit between tasks and technology can contribute to user satisfaction. As the name suggests, central is the *fit* between task and technology: a technology that underfits or overfits would result in a negative attitude, and a positive attitude can only come from an exact fit.

In line with this argument, we can reason that there must be a fit between the context, or social setting, and the mobile information service. If there is no perceived fit (e.g., playing a mobile game in an office setting) then a user may not evaluate the service favourably. If people think the setting and the service fit together, then and only then may a user find the service useful and enjoyable.

The fit concept has been operationalised in many ways (Goodhue, 1998). One way to do it is to the manipulate the *relevance* of a technology in a particular setting. The more relevant people believe a system to be in such a setting, the more perceived fit there must be. For example, the TAM2 model included a construct called "job relevance" (Venkatesh and Davis, 2000), defined as 'an individual's perception regarding the degree to which the target system is applicable to his or her job.' Likewise we could argue that individuals may have a sense of 'context relevance', a construct that for the purposes of this paper could be defined as the user's perception regarding the degree to which a mobile information service is applicable to a particular social setting. The better the fit between context and service, or, in other words, the more relevant a particular context, the more favourably a user may respond to a particular mobile information service.

H4a. Context relevance positively influences utilitarian value

H4b. Context relevance positively influences hedonic value

The following paragraphs cover the empirical research that supplements the theory advanced in this section. We will first discuss the research method, and then proceed with results and a discussion of the findings.

3 METHOD

Research design

The research design was a combination of an experimental and correlational design. The research was conducted entirely online with the ‘context’ operating as an experimental treatment (the experimental part), and the other constructs were measured using an online survey instrument (the correlational part). The mobile information service of choice was an SMS navigation service, and it was supposed to be used in a tourism context. In this section we expand on the nature of the participants, the measures used, and the general procedure.

Participants

Participants were recruited by advertising on a number of Dutch internet forums related to tourism and mobile technology. The incentives for participation were a lottery prize of 50 euro and a summary of the results if they left their e-mail addresses at the end of the questionnaire. Because this resulted in a less than expected number of responses, we supplemented the sample by sending out additional invitations by e-mail to a number of students and non-students in the Netherlands. This resulted in a sample of $N = 123$.

Measurement

The survey included measures for all constructs except context relevance along with a set of questions to measure individual differences. The principal researchers translated the measures from English to Dutch. The Dutch survey was then back-translated by an independent translator and the two English versions were double checked, independently, by an English teacher. With respect to individual differences, age and gender were measured, along with an ordinal measure of self-reported text frequency, ranging from “multiple times per day” to “never.”

The measurement scale for intention to use was taken from the UTUAT model (UTUAT, Venkatesh, Morris, Davis, and Davis, 2003) and adapted slightly to be in tune with mobile information services. The measure for perceived risk was taken from Shimp and Bearden (1982).

The scale for hedonic value and utilitarian value of the mobile service was derived from the HED/UT scale, a general purpose scale measuring attitudes towards consumer products (Spangenberg, Voss, and Crowley, 1997; Voss, Spangenberg, and Grohmann, 2003). Rigorous scale purification was necessary to apply the measure successfully to the domain of mobile services. This purification is beyond the scope of this paper, but is described in detail elsewhere (Ogertschnig and van der Heijden, 2004; Van der Heijden and Sørensen, 2003). The items we adopted eventually for utilitarian value were: useful, functional, helpful and practical. The items we adopted eventually for hedonic value were: exciting, fun, thrilling, and amusing.

Context relevance was measured using two vignettes, also known as scenarios. One scenario represents a situation with *low* context relevance, and the other a situation with *high* context relevance. Vignettes represent hypothetical situations and call on the respondents’ imaginative powers to picture a future situation in their heads. Respondents are then asked to make an assessment of that situation. In our case, we introduced to the respondent the specific mobile information service, and then presented a randomly selected context in which the mobile information service could be used.

The two vignettes are presented here (English translations of the Dutch originals):

Treatment 1 (High context relevance): “Imagine that you are spending your summer holiday in a foreign country. You have been travelling all day to get to your final destination. Eventually you get dropped off with your luggage somewhere near your hotel. Unfortunately, your hotel is nowhere to find. You have no idea where you are and there is nobody to ask.”

In this situation an SMS navigation service could be applicable. It would work as follows: using your mobile phone you can send an SMS message to your navigation service. This message must contain the exact address of your hotel. Depending of your current location the navigation service calculates your route. That route is then shown within seconds on your mobile.”

Treatment 2 (Low context relevance): “Imagine you are on holiday in a foreign country. After a day at the beach in the sun you are planning to have dinner at the boulevard. The boulevard has lots of different restaurants, but to which one are you going?

In this situation an SMS navigation service could be applicable. It works as following: with help of your mobile phone you can send an SMS message to your navigation service. The message must contain your preferences. Depending of your current location the navigation service calculates the route to the most preferred restaurant. That route is then shown within seconds on your mobile.”

The first treatment was written to appeal to *goal-directed* travelling behaviour, as it described a context in which tourists are systematically and purposefully looking for something. A navigation service was expected to fit this context. The second treatment appealed to *wandering* behaviour, as it described a context in which tourists wandered around and where the travelling itself would be part of the tourism experience. The colloquial saying ‘getting there is half the fun’ describes what we sought to manipulate here, and a navigation service was expected *not* to fit this context.

Procedure

The procedure that respondents went through is displayed in a flow chart in Figure 2.

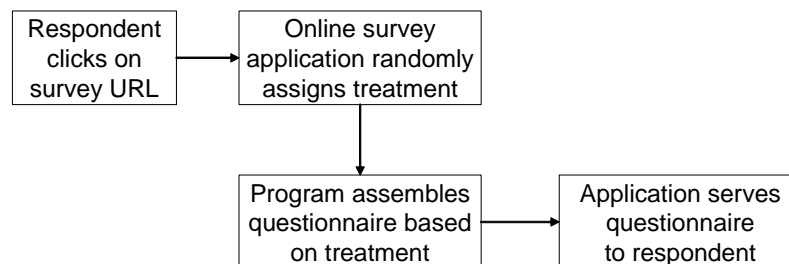


Figure 2. Four step procedure for experimental surveys

As soon as a respondent clicked on a link (e.g., on the forum or in the e-mail), this let the server application know that an online survey was requested. The application then assigned one of the two treatment (‘scenarios’) to the respondent. The assignment followed a ‘random without replacement’ procedure, which is common to experiments in laboratories with an open door policy (Keppel, 1991). This procedure implies that a treatment is no longer eligible for assignment until all treatments are being served, and it ensures equal sample sizes for each cell in the experimental assignment as respondents come in.

As soon as the application had identified a treatment for the respondent, it assembled a questionnaire that contained the appropriate scenario (this was different for each treatment) and the other variables (this was the same for both treatments). One of the authors specifically designed and programmed the online survey program specifically for this purpose.

4 RESULTS

Sample

The research sample ($N = 123$) consisted of 67,5% males and 32,5% females. The average age of the respondents was 25,5 years. Other sample data can be found in the table below.

	<i>N</i>	%
Highest education level completed		
Pre-vocational	1	0.8
Vocational	17	13.8
Professional	60	48.8
Academic	43	35
Missing	2	1.6
Current employment situation		
Student	69	56.1
Non-student (e.g., employed)	51	41.5
Missing	3	2.4
Frequency of sending text messages		
Multiple times a day	53	43.1
Once a day	21	17.1
Multiple times a week	23	18.7
Once a week	11	8.9
Multiple times a month	5	4.1
Once a month	4	3.3
Multiple times a year	3	2.4
Never	3	2.4

Table 1. Demographic characteristics of participants (*N* = 123)

Reliability and validity of constructs

The reliability coefficients of the constructs are displayed in the table below. All resulting scales are unidimensional and sufficiently reliable. It should be noted that the reliability of perceived risk is relatively weak. Further data analysis demonstrates that it could be improved by pruning the third item, however this was not pursued for the sake of scale integrity and the ability to compare our findings with other research that used this scale.

<i>Construct</i>	<i>Number of items</i>	<i>α</i>
UT	4	0.91
HED	4	0.85
PR	4	0.63
INT	3	0.96

Table 2. Reliability coefficients for each construct

To examine the convergent and discriminant validity of the four multi-item constructs, an exploratory factor analysis was conducted. Table 3 presents the factor loadings and the communality (variance explained) for each item. The loadings display high convergent validity and discriminant validity of the constructs, implying that we can proceed with the analysis.

Item	Factor loading				Communality
	1	2	3	4	
UT1	.83				.82
UT2	.77				.78
UT3	.75				.66
UT4	.82				.82
HED1		.84			.75
HED2		.67			.64

HED3		.85			.75
HED4		.81			.71
PR1*			.64		.60
PR2			.79		.65
PR3*			.79		.37
PR4			.73		.55
INT1				.86	.89
INT2				.89	.93
INT3				.89	.90

Table 3. Summary of items and factor loadings for varimax orthogonal four-factor solution. UT1-4 = Utilitarian value, HED1-4 = Hedonic value, PR1-4 = Perceived Risk, INT1-3 = Intention to use. * indicates item is reverse scored.

Descriptives

Table 4 presents an overview of the means, standard deviations and product moment correlations of utilitarian and hedonic value.

	<i>M</i>	<i>SD</i>	1	2	3
1. Utilitarian value	3.2	1.0	-	-	-
2. Hedonic value	2.1	.9	.47***	-	-
3. Perceived risk	4.1	1.1	-.38***	-.17	-
4. Intention to use	3.3	1.2	.60***	.40***	-.26***

Table 4. Means, standard deviations, and product moment correlations of utilitarian and hedonic value, perceived risk, and intention to use ($N = 123$). Note: *** $p < .001$

There is a significant positive correlation between the two components of attitude, utilitarian and hedonic attitude ($r = .47$). Hypothesis 1 is therefore supported.

For the consequences of utilitarian and hedonic value, a multiple regression analysis was conducted. Table 5 presents a summary of the analysis in which utilitarian and hedonic value were regressed on intentions to use the mobile service.

Variable	<i>B</i>	<i>SEB</i>	<i>Beta</i>	<i>t</i>	<i>p</i>
Utilitarian value	.65	.10	.53	6.58	.000
Hedonic value	.21	.11	.15	1.90	.060

Table 5. Regression Analysis Summary for Variables Predicting Intention to Use Mobile services. R^2 is 38.3%, $F = 37.22$, $p < 0.001$.

The summary shows that utilitarian value significantly explains variance in intention to use, and hedonic value does not, at least not at the conventional cut-off point of alpha (.05). However, it would do so with a slightly relaxed rejection region. This notwithstanding, on the basis of this analysis hypothesis 2a is supported and hypothesis 2b is rejected.

The effects of perceived risk were captured by hypotheses 3a and 3b, and the effects of context relevance were captured by hypotheses 4a and 4b. A Multivariate Analysis of Covariance (MANCOVA) that tests all four hypotheses is presented in Table 6. The assumptions underlying a MANCOVA analysis were met. Box's $M = 6.07$, $p = .113$, which implies that the covariances of the dependent variables are equal across the groups, and F -values for Levene's test for equality of error variances across groups were 2.3 ($p = .131$) and .3 ($p = .572$) for utilitarian and hedonic value respectively.

Source	Multivariate		Univariate	
	<i>df</i>	<i>F</i>	Utilitarian value	Hedonic value
Perceived risk (covariate)	2	119***	26.80***	3.50
Context (factor)	2	119***	33.77***	0.25

Table 6. *Multivariate and Univariate Analyses of Covariance for Utilitarian and Hedonic Value. Multivariate F ratios were generated from Pillai's statistic. *** $p < .001$.*

The MANOVA supports hypotheses 3a and 4a, and rejects the hypotheses 3b and 4b. In other words, there is a significant negative effect of perceived risk on utilitarian value but not on hedonic value. There is also a significant positive effect of context relevance on utilitarian value, but not on hedonic value.

5 DISCUSSION

With this research study we have shown that a consumer's utilitarian value and hedonic value of a mobile information service are strongly correlated. Further, utilitarian value had a significant impact on intentions to use a service, whereas hedonic value had a positive impact, but not significant. There was a significant negative influence of perceived risk on utilitarian value, implying that those who considered the service to be a greater risk also perceived it to be less useful. There was no significant influence of perceived risk on hedonic value. Finally, a change in context caused a significant change in utilitarian value, implying that people in more relevant contexts find the service more useful than the people in less relevant contexts.

With respect to perceived risk, these findings are consistent with the results reported on perceived risk in the electronic commerce literature (Jarvenpaa, Tractinsky, and Vitale, 2000; Van der Heijden, Verhagen, and Creemers, 2003). The findings regarding the influence of utilitarian value on intentions to use are also consistent with the TAM and UTUAT literature (Davis, 1989). Finally, the findings regarding the relevance of the context suggests that fit between context and technology operates in the same way as fit between task and technology. This would be consistent with the TTF literature (Goodhue and Thompson, 1995).

These findings have practical relevance for designers of new mobile services. It suggests that designers should first and foremost concentrate on minimising the risk of using their services. For marketing managers, these findings clearly advocate market introduction strategies that target consumers who are willing to accept the risk involved.

The theoretical contribution of this paper is directly related to the inclusion of three relatively unexplored concepts: perceived risk, context relevance, and hedonic value. All three constructs had significant correlations with utilitarian value, yet to the best of our knowledge, this is the first time that they are all combined into one model, and unite to explain the user acceptance of mobile information systems.

Some of the hypotheses were not supported in our empirical study, and all involve the hedonic value construct. A careful look at this construct is therefore in order. Our study found a nearly significant effect of hedonic value on intention to use. This may have to do with the utilitarian purpose of the navigation service. If the purpose of an information system is utilitarian, perceived enjoyment is a weak predictor of user acceptance (Van der Heijden, 2004). In addition, effects of context and perceived risk on hedonic value were not significant. In other words, those who considered the service to be risky did not find it more or less enjoyable and neither is this the case for those who considered the context to be more or less relevant. This may have to do with the fact that both constructs refer to consequences of use, rather than use itself. Enjoyment focuses on the joy of usage per se, which can be evoked no matter if there would be any risk involved or no matter if this would be in an inappropriate context.

The limitations of this study lie in its specific focus on one particular mobile service, which was utilitarian in nature. It would be interesting to see how the model would fare against the use of a hedonic mobile service, such as a service that provides information about sports (e.g., goals in a soccer

match). Also, we have limited ourselves to two specific contexts. It would be interesting to see how the model would fare against different contexts. Future research is recommended in these areas. In particular, one can envision a taxonomy of contexts and a taxonomy of mobile services. Each dimension of the two taxonomies can then be examined to see to what extent it moderates the relationships in our current theoretical model.

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