

Usefulness and self-expressiveness: extending TAM to explain the adoption of a mobile parking service

Abstract

Research on the adoption of mobile services in everyday life contexts have shown how important entertainment and self-expressiveness are to the users' adoption of these services. However, as illustrated by the variables of the much applied TAM model, utilitarian motivations are still focused in ICT-adoption research. Mobile parking services may be used as a "crucial test" of the importance of utilitarian versus non-utilitarian motivations in the adoption of mobile services. In a field study, 459 trial users of mobile parking services were studied using a TAM model extended with the motivational influence of self-expressiveness. The results show that even if mobile parking services have been designed to meet the functional needs of the parking car driver, both the derived motivations of self-expressiveness and the extrinsic motivations of usefulness are important in explaining trial users' adoption of the services.

1. Introduction

Previous studies in uses and gratifications and domestication research have emphasized the importance of non-utilitarian motivational factors in mobile service adoption and use (Leung and Wei, 2000, Kaseniemi and Rautiainen, 2002, Skog, 2002, Taylor and Harper, 2001a, b). Recently, we have also conducted a series of studies investigating the adoption of mobile services from an ICT-adoption research perspective (Pedersen et al., 2002). Our findings so far indicate that the adoption of a variety of mobile services is influenced by non-utilitarian motivational factors, and that both current users and non-users are influenced by these factors. In particular, derived motivations of self-expressiveness seem to consistently influence adoption of these services.

To further investigate the relationship between different motivational and attitudinal influences, a study of new users exposed to functional services may provide a kind of "crucial test" of the importance of utilitarian versus non-utilitarian motivations in mobile service adoption. To provide such a "crucial test", mobile parking services were chosen as an appropriate functional mobile service, and an empirical study of trial mobile parking services users was conducted.

Mobile parking services are used to pay for car parking at selected parking sites. Such services are typically used by calling or texting the starting and stopping of parking time to a central server. In the car window, a bar-code identifying the customer is placed so that parking site personnel scan the bar code, and check online if parking has been paid for. Alert services are also typically provided so that customers may prolong their parking time without having to return to their car. Except from alert services, very few other value added services are currently provided. When compared to other mobile data services, mobile parking services of this kind provides no communication or coordination support typical of many successful mobile data services. The service investigated here also provides very limited informational content both directly and in the form of value added services. As such it is well suited as a purely functional transactional service often believed to be adopted purely for utilitarian or instrumental reasons of ease of use, usefulness, relative advantage, availability and flexibility.

2. Theory and model

In ICT-adoption research, rational, social and symbolic, as well as situational and resource based explanations of adoption have been suggested (see e.g. Rice and Webster, 2002; Trevino et al., 2000). Because functional services are believed to be adopted for utilitarian reasons primarily, rational adoption models are typically suggested when explaining their adoption. This represents one way of using the properties of the ICT-artifact investigated to more carefully limit the set of relevant explanations of its adoption, uses and effects (Orlikowski and Iacono, 2001). Because mobile parking services were believed to be functional services adopted for utilitarian reasons, the well-known technology acceptance model (TAM) of Davis (1989) was chosen as an appropriate model with an outstanding record of explaining the adoption of functional ICT applications, systems and services adopted for utilitarian reasons primarily. Recently, this model has also been applied to the adoption of mobile services with mixed results (Hu et al., 1999; Kwon and Chimbaram, 2000, Lee et al., 2002). One of the main suggestions from these studies is that the model should be extended when applied to these services.

Uses and gratifications and domestication research have investigated the adoption and uses of mobile services in everyday life contexts. Uses and gratifications research has identified motivations for adopting mobile services that go far beyond the instrumentality of usefulness, flexibility and availability suggested by rational ICT-adoption theory. For example, Leung and Wei (2000) identified the gratifications of mobile phones to be "fashion/status", "affection/sociability", "relaxation", "mobility", "immediate access", "instrumentality" and "reassurance". In Leung and Wei (1999), the general gratifications from pager use were identified as "sociability", "information seeking", "entertainment", "utility", and "fashion/ status". In Germany, Höflich and Rössler (2001) investigated mobile text messaging services in the form of SMS and identified the gratifications of "reassurance" (rückversicherung), "sociability" (kontaktpflege), "immediate access /availability" (verfügbarkeit), "instrumentality" (lebenshilfe) and "entertainment/enjoyment" (nutz-spaz).

In domestication research similar findings have been made suggesting that mobile service adoption and use may be explained by a "theory of fashion" (e.g. Ling, 2001), by the use of services as "ritual gift giving" (e.g. Taylor and Harper, 2001a.), by treating the mobile phone as "symbolic capital" (e.g. Skog, 2002) or as an instrument in "family differentiation and symbol of individuality" (e.g. Taylor and Harper, 2001b), and by the use of services as a "group marker or social identifier" (e.g. Weilenmann and Larsson, 2000), or as a "self identifier" (e.g. Hume and Peters, 2001). Thus, intrinsic motivations of enjoyment seem to be most consistently identified in uses and gratifications research, whereas derived motivations of self-expressiveness, social-identity and self-identity seem to be most consistently identified in domestication research. Because mobile parking services include few elements of relevance to intrinsic motives not already included in the concept of ease of use, we chose to focus on the importance of self-expressiveness identified in domestication research, and included this as an additional concept in our extended TAM model. The extended model is illustrated in figure 1.

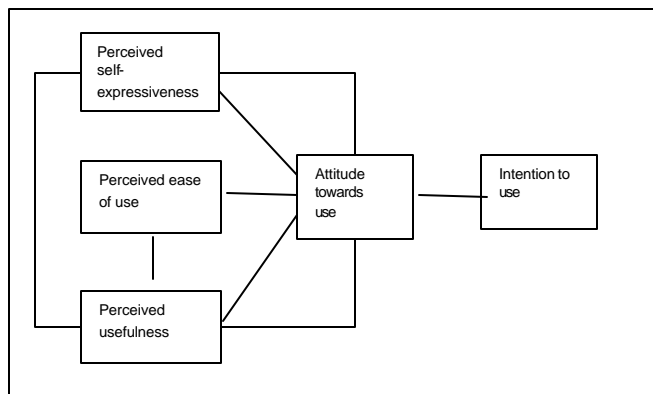


Figure 1. Extended TAM

The traditional TAM includes four concepts; ease of use, usefulness, attitudes towards use and intention to use. Two issues are of relevance with respect to *ease of use* in the model. Because many early adopters of mobile services are expected to be younger, more skilled and more innovative, the higher competence of these users and their more exploratory and advanced use of service functionality suggest ease of use should have less influence in adoption models of new mobile data services. However, studies also report a more playful use of mobile phones among younger and innovative users and consequently they are more focused on exploring the functionality of a service (Oksman and Rautiainen, 2001). Studies have also indicated a relationship between digital capital and symbolic capital suggesting that services designed for young users should not be too easy to use (Taylor and Harper, 2001b) because then, no status would stem from being able to handle the device, application or service. This explanation may also generalize to innovative users. The other issue is that of service differences in the importance of ease of use. For example, studies applying the perspectives of "flow" and "telepresence" have shown that to provide intrinsic motivation, some services must represent a certain challenge to the user. Challenge positively influences flow through increased telepresence (Novak et al, 2000; Hunter and Kalafatis,

2001). This, in turn, implies that we might expect a negative effect of ease of use (challenge inverted) on perceived enjoyment for highly involved users and for services which are used for reasons of intrinsic motives.

Perceived *usefulness* was originally seen as a fairly simple concept including components of effectiveness and efficiency that are mainly related to extrinsic motivation in work contexts. As seen from uses and gratifications studies, the extrinsic motivations of mobile services are not limited to effectiveness and efficiency. Motivations of accessibility, flexibility, sociability and security typical of communication (as opposed to information or transaction) services have all been mentioned in these studies. In addition, motivations of enjoyment, fashion, and status and expressiveness have been mentioned (Leung and Wei, 1999, 2000; Höflich and Rössler, 2001). Some of these motivations are intrinsic, but other may perhaps best be characterized as derived, meaning that they provide an instrumentality or gratification that was not intended by or anticipated during design, and that perhaps also was not considered or anticipated by the user at the time of the adoption (Pedersen, 2002, Pedersen et al., 2002, Anderson et al., 2002).

In our extended model, self-expressiveness is added as an independent variable in TAM. In CMC-research, *expressiveness* is compared to instrumentality as two styles of communication (Boneva, et al. 2001). Expressiveness is used of communication in relationships of emotional intimacy and sharing, while instrumentality is used of communication in relationships based on common activities. For example, Boneva et al. (2001) believes female communication to be more expressive, whereas male communication is believed to be more instrumental. Based on these assumptions, services that communicate expressiveness in this form are more likely to be appreciated by female users. In social psychology, recent contributions have suggested replacing the well known concept of self-identity as a determinant of intended behavior with self-expression (Mannetti et al., 2002). The research on the influence of self-identity on intended behavior is however, still relevant. Typically, the relationship between behavior and self-identity is given a social interpretation based upon Mead's and Goffman's theories of the social construction of the self (Mead, 1934, Goffman, 1959), a structuration interpretation based upon Giddens's theories (Giddens, 1991), or a role-oriented personality interpretation. In the first case, self-identity is the result of social identification, in the second case it is the results of the interaction of social identity and repeated actions maintaining a "personal biography", and in the final case it is a more rational frame of reference for behavioral decisions. When applying the term self-expressiveness we focus the importance of behavior as something that may be interpreted by others in the social construction of identity and by oneself in the repeated self-construction of identity. Thus, self-expressiveness is a more operational concept applied to the use of technologies or services or the consumption of products and services that are important to both social identity and role-oriented self-identity. Consistent with this conception of self-expressiveness, consumer psychology characterizes value-expressive products as expressing the consumer's identity both in social networks and to oneself. We suggest that expressiveness in terms of both the social expression of identity and self-identification are important elements in the adoption and use of mobile services.

Attitudes are generally believed to be the results of personal and social influences. However, in the technology acceptance model (TAM), attitudes towards use are determined by personal influences only. However, the attitude formation process is believed to be similar for usefulness, ease of use and self-expressiveness in that the individual sees a service as instrumental in fulfilling extrinsic, intrinsic and derived gratifications, and consequently develops a positive attitude towards using it. The relationship between attitudes and intentions may be different for different service categories. For example, for services that are widespread and well known, it is easy to obtain information on other users' experience and also to gain experience from actually using the service oneself. This indicates that for established services, instrumental and experiential motives are the most important explanations of user intentions. On the other hand, if services are new and unknown, intentions to use services may be based on general attitudes and less on experientially derived motives.

Adoption models are mostly applied to explain behavior in the initial phase of a domestication process, and thus, *intention to use* a service is believed to be the primary determinant of actual behavior.

3. Method

To test the extended TAM, a study of mobile parking services trial users was set up as a simple one-group posttest design. A quasiexperimental setting was applied by selecting subjects that had recently signed up for a free test trial of the service. The trial service was announced using large posters at major parking areas including individual folders explaining how users could phone or SMS the provider to obtain a free one hour parking service. A total of 2550 respondents were identified in the population, and a list of these users was used as a sample frame.

Subjects were given the opportunity to visit a web-site to answer a post trial questionnaire online, or use a pre-paid postal version attached to the introductory letter and procedure material. 47 subjects chose to answer the questionnaire online and 418 offline using the postal alternative. Thus, a total of 465 questionnaires were returned. Six of the questionnaires were excluded from the analysis due to late arrival. The final response rate obtained was 18.2%. Sample demographics of the subjects are shown in table 1.

Table 1. Sample demographics

| Age | N=452 | Income (~ US\$) | N=454 |
|----------------|-------|-----------------|-------|
| 0-19 | 2.4 | <30' | 13.7 |
| 20-29 | 24.1 | 30'-59' | 44.9 |
| 30-39 | 33.8 | 60'-89' | 24.4 |
| 40-49 | 23.0 | >90' | 17.0 |
| 50-59 | 11.3 | Sex | N=456 |
| 60 and above | 5.3 | Male | 72.1 |
| Education | N=457 | Female | 27.9 |
| Primary | 2.2 | | |
| Secondary | 23.6 | | |
| University <3 | 37.0 | | |
| University >=4 | 37.2 | | |

The sample included a larger proportion of men than women, a larger proportion of subjects with university education and a larger proportion of subjects with higher level income when compared to the general country population. However, these differences were not very large and the differences in the distributions were according to what one could expect of new users of a mobile parking service. Thus, we assume that the sample demographics correspond well to the population demographics of new mobile parking service adopters.

The model suggested in section 2 includes 5 concepts: Ease of use, usefulness, self-expressiveness, attitudes towards use and intention to use. Most of these concepts are well founded in adoption research literature. In general, the concepts were measured by the subjects indicating their agreement with a set of statement items using a seven-point scale ranging from "strongly disagree" to "strongly agree". Attitude towards use was measured using seven-point scales of bipolar adjectives. For each measure, standard items were adapted to the mobile parking service context of the study. The reliabilities of the measures when using Cronbach's α were 0.94 for ease of use, 0.84 for usefulness, 0.80 for self-expressiveness, 0.86 for attitudes towards use and 0.84 for intention to use.

Ease of use was measured using four items developed from adapting the original items of Davis et al. (1989) to our setting. Similar operations are found also in Taylor and Todd (1995) and in Battacherjee (2000). Usefulness was measured using three items covering the original dimensions of time saving, productivity/simplicity and usefulness suggested by Davis (1989). Attitude towards use was measured using four bipolar adjectives indicating different aspects of the subjects' attitude towards use. The items were very similar to those used by Davis (1989), Taylor and Todd (1995) and Battacherjee (2000).

The choice of a particular concept - "self-expressiveness" - as a perceived attribute of a service or technology is unique in our model. The term expressiveness has been used in social psychology of individuals' general ability to express their emotions or identity. For example, in family relationship studies it is used as a measure of how well emotions are expressed by parents and children and how this influences family relationships (Cassidy et al., 1992). In research on identity formation and personality, it is used as a measure of the relationship between what a person believes about herself (what her potentialities are, see

Schwartz et al., 2000, p. 507), and how she expresses herself, using the concept of "personality expressiveness" (Waterman, 1993). In this line of research, a person expresses herself through activities, and expressiveness is measured by subjects indicating how important these activities are in expressing their identity. In social psychological research on the prediction of behavior, expressiveness is closely related to self-identity which has been found to be a significant predictor of intention to perform specific behaviors (Sparks and Guthrie, 1998). In this literature, self-identity is typically measured using statements challenging the relationship between behavior and the subjects' perceptions of their own personality. In consumer research, the expressiveness concept has been extended from individuals to products indicating how well a product expresses values beyond instrumental utility (Mittal, 1994). Thus, value-expressive products are seen as expressing the consumer's identity. While the expressiveness concept in consumer research also covers gratifications of prestige, fashion, pride and mood stimulation, it primarily focuses issues of how products are used to "express my personality" and are "compatible with how I like to think of myself" (Mittal, 1994, p. 258). Thus, items focusing the self-expressive elements of the service have been focused here. In addition, expressive explanations have been identified in domestication research. Studies of mobile services have shown how one of the most important ways of expressing ones service use is to discuss the service with others and to share it with others (Larsson, 2000; Grinter and Eldridge, 2001; Kaseniemi and Rautiainen, 2002). Thus, an item referring to this particular form of self-expressiveness was included. The items of the independent variables are shown in table 2.

Table 2. Confirmatory factor analysis (Varimax rotation) (loadings below 0.4 not shown).

| Item ¹ | Factor 1 | Factor 2 | Factor 2 |
|---|----------|----------|----------|
| It is easy to learn to use "the service" | 0.892 | | |
| It is easy to make "the service" do what I want it to | 0.835 | | |
| My interaction with "the service" is clear and understandable | 0.924 | | |
| It is easy to use "the service" | 0.904 | | |
| "The service" makes me save time when parking | | | 0.754 |
| It is more simple to park when using "the service" | | | 0.754 |
| "The service" is useful when parking | | | 0.675 |
| I often talk to others about "the service" | | 0.693 | |
| Using "service" is part of how I express my personality | | 0.879 | |
| Other people are often impressed by the way I use "service" | | 0.875 | |

Finally, intention to use was measured by presenting a list of mobile services organized by user context and complexity to the subjects. The subjects were asked

¹ The term "the service" is used to keep the service provider of the mobile parking service investigated here anonymous.

to indicate how much they had used and intended to use these services on a 7-point scale ranging from "very little or not at all" to "very much". Intention to use was aggregated over the items presented on the list. To comply more fully with the traditional measures of adoption research, intention to use was also measured with a two item scale adapted from Battacherjee (2000) and Mathieson (1991).

All our traditional measures are based upon previously validated measures (Venkatesh and Morris, 2000), and all reliabilities were considered very good. To test the discriminant and convergence validity of the independent variables in our model, the items of usefulness, ease of use and self-expressiveness were included in a confirmatory factor analysis. The results of this analysis are shown in table 2 indicating acceptable convergence and discriminant validity.

4. Results

Using the data from the parking services study, the extended TAM model was estimated. The results of this estimation are shown in figure 2.

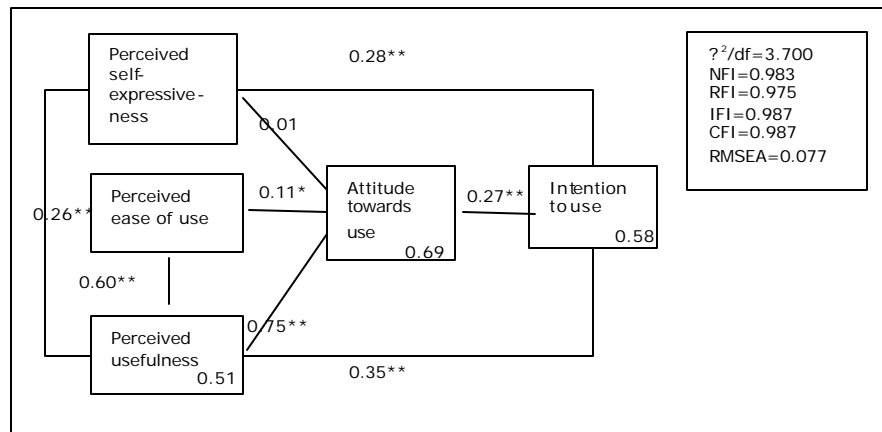


Figure 2. Estimated extended TAM

From figure 2, we see that model fit is acceptable when evaluated by all fit indexes². The model explains 58% of the variance in intention to use the parking service. This is generally considered a large proportion of the variance, so the explanatory power of the model is very good.

Furthermore, we find that intention to use mobile parking services is explained by the direct extrinsic motivational influence of usefulness, the derived motivational influence of self-expressiveness, and the attitudinal influence represented by attitudes towards use. When removing the derived motivational influence of self-expressiveness, model fit is reduced to $\chi^2/df=4.102$ and RMSEA=0.082. In addition, the explained variance in intention to use mobile parking services is

² We generally employ parsimony adjusted measures of fit only. According to Browne and Cudeck, cited in Arbuckle and Wothke (1999), a RMSEA less than 0.08 is acceptable. According to Bentler, cited in Battacherjee (2000), χ^2/df should be less than 5, preferably less than 2, and all other indexes should be close to 1 (Taylor and Todd, 1995).

reduced to 50%. Thus, the simpler, traditional TAM suffers from reduced fit as well as reduced explanatory power. Thus, self-expressiveness contributes considerably to the good fit and high explanatory power of the extended model. Consequently, we conclude that self-expressiveness is an important determinant of the intention to use mobile parking services. This is rather surprising given the functional characteristics of these services.

We also find that attitudes towards use are determined by usefulness and, to some extent, ease of use. Self-expressiveness seems to have no role in the attitudinal process of the trial users. On the other hand, usefulness is significantly influenced by both ease of use and self-expressiveness, so that mobile parking services are perceived as more useful if being more self-expressive³. This means self-expressiveness has both an indirect and a direct influence on intention to use mobile parking services.

5. Discussion

This study was based on the developed procedures, measures and results of five previous studies of mobile service adoption. In general, all theoretical concepts have been discussed in section 2 and 3 or in previous work (Pedersen, 2001, 2002, Pedersen et al., 2002), and are well founded in adoption, uses and gratifications and domestication research. Thus, the construct validity is considered acceptable. Furthermore, analyses of measurement items showed that measures were reliable and that constructs had acceptable convergence and discriminant validity. However, there are still issues of relevance to the internal and external validity of this particular study that requires further discussion.

With respect to internal validity, the procedure used to recruit subjects in this study may have resulted in subjects with a more positive attitude towards the service than the general population of trial users. To obtain respondents with some experience of the services, we only recruited subjects participating in a user trial. Thus, our first validity issue is if the results generalize to other potential users of the mobile parking services. Even though we may have recruited subjects with positive attitudes, many of the comments found in the survey questionnaire were also negative, and an equally important motivation for participating in the survey may have been to express bad experiences from using the trial services. Thus, we assume the recruitment and experimental procedures have not made the sample systematically different from the sampling frame representing the population of trial users. Another advantage of the procedure was that it provided a large sample of trial users further reducing the threat of self-selection to internal validity. The discriminant validity of our original usefulness and self-expressiveness measures were somewhat lower in this study than in previous studies. When investigating the items further we found that one of the usefulness items brought the mobile parking services into the driver context (“makes me a better car driver”) – a context perceived as different from the parking context of the service. We also

³ If removing the influence of self-expressiveness on perceived usefulness, explained variance drops from 58% to 55% and model fit is lower than for the traditional TAM not including self-expressiveness.

found that one of the components of social identity in self-expressiveness was not as well integrated when exposed to the parking contexts as for the other service contexts previously studied. Thus, individually oriented self-expressiveness seems more relevant to mobile parking services than *social*-expressiveness.

The issue of external validity may be discussed with reference to subject-, setting- and time-specific threats. Even though we argue that internal validity was not threatened by the self-selection procedures applied to recruit subjects, external validity may have been. Thus, one should be careful in generalizing our findings to users not having tried mobile parking services. For example, consumers with no experience in trying this kind of service may perceive service characteristics as different and their intention to use mobile parking services may be based upon different judgments. Still, users are not likely to adopt these kinds of services without some initial trial, making our findings externally valid anyway. In a recent survey of mobile users versus shoppers in Finland, Germany and Greece, Vrechopoulos et al. (2002) found few demographic differences between the two user categories in the three countries. However, mobile shoppers were less focused on price and more on ease of use than mobile users but these differences were not consistent across countries. Thus the findings may indicate that the early adopters of mobile data services and adopters of traditional mobile services are not that different. Another issue with respect to the subjects recruited is the skewed distributions of demographic variables such as age, gender and income. However, we have investigated model differences and perception differences by age, gender and income. Some differences were revealed between different demographic segments, but in general, our extended TAM model was surprisingly consistent across user segments (see Pedersen and Nysveen, 2002).

Another issue threatening external validity is the stimulus context used in this study. One may suggest that the mobile parking services investigated in this study were unique in some way that make our results less valid to the adoption of other mobile parking services or other functionally oriented mobile data services. Furthermore, one may argue that the free trial campaign used as a basis for recruiting subjects to this study was unique and thus, the results are unique to this particular trial setting. With respect to this issue, the free trial period was limited to one hour free parking. It is not likely that this has generated any situation specific threats to external validity. Besides, it is not likely that this affected our findings of usefulness, self-expressiveness and attitudes towards use as determinants of intention to use the services in any systematic way that threaten the external validity of the setting. The mobile parking services investigated was a fairly simple and general mobile parking service, and most other mobile parking services are very similar to this service. Generalizing our findings to other functionally oriented mobile data services is, however, another issue. We argue that the selection of mobile parking services represents a “crucial test” of the external validity of our extended TAM model. We argue that if finding self-expressiveness to be influential in the adoption of this service, we may well generalize this to most other functionally oriented data services. Thus, we conclude that our finding of self-expressiveness as influential in the adoption of mobile parking services makes it very likely that self-expressiveness is a unique gratification of most mobile data services, and that developers should take this adoption determinant into consideration when designing and marketing their

services. This suggestion is also supported by consistent influence of self-expressiveness in all our studies of mobile data services (see Pedersen et al., 2002). There were no particular media events, campaigns (other than the free trial campaign) or service defects during the trial and data collection period of the study. Consequently, time has not threatened the external validity of our results during the study. Still, our findings should be interpreted with care because more attention was given to internal than to external validity in the design of the study.

This study represents a “crucial test” of non-utilitarian influences on adoption of functionally oriented mobile services. Given this setting, it is surprising to see such a consistent influence of self-expressiveness. This indicates the motivational process of adoption is more complex than previously assumed suggesting this process should be further elaborated on. For example, the relationship among intrinsic, extrinsic and derived motivations requires further analysis. The influences of the self-identity elements of expressiveness is particularly interesting. In applied social psychology and consumer psychology, the element of self-identity in consumption has been given some attention (Mannetti et al., 2002, Sparks and Guthrie, 1998). The conceptions of self-identity in many of these contributions are different from the socially constructed self-identity of Mead and Goffman (Mead, 1934, Goffman, 1959) and that of the structuration theory of Giddens (1991). Instead, this line of research has mainly been applied to the consumption of value expressive products (Mittal, 1994) such as objects of display or style and products related to personal life-styles, such as environmentally relevant products (Cook et al., 2002). In IS-research, these conceptions of self-expressiveness have been given little attention. Instead, symbolic elements of media choice and use have been investigated, focusing more on the symbolic effects of using specific technologies and services rather than their role in the development and expression of users’ self-identity. As mobile services are introduced in work contexts, the influences of social-identity and self-identity in the process of adopting these services should be given more attention. The development of the self-expressiveness concept in this study, our evaluation of the validity and reliability of the concept, and our demonstration of its relevance in a “crucial test” of a functionally oriented mobile service believed to be adopted for utilitarian reasons represent significant contributions to this research.

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