Understanding mobile commerce end-user adoption: a triangulation perspective and suggestions for an exploratory service evaluation framework

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Abstract

In the literature on mobile commerce service adoption, aggregate diffusion issues or technology issues are usually focused. However, a comparison of the slow adoption of WAP services in Europe with the successful adoption of comparable I-mode services in Japan and technologically simple SMS-based services in Scandinavia, suggests that aggregate and technology-based models are insufficient to explain the mobile commerce adoption process. We suggest that alternative explanations may be found in both the business models at the supply side and in the individual end-users behavior at the demand side of the mobile commerce value chain. Here, we focus on this demand side issue, and consider the adoption requirements of mobile commerce end-users. A triangulation of three perspectives on the mobile commerce end-user is suggested to understand and explain the end-user adoption process. The three perspectives view the end-user as a technology user, a consumer and a network member, respectively. The three perspectives are combined in a common framework. With each perspective follows relevant theories, models and methodologies. We also suggest applying the framework to design evaluation guidelines that can be used by service providers, operators and terminal producers to evaluate and predict end-user adoption of mobile commerce services in 3G and later mobile technologies.

1. Introduction

In October 2000, The Wireless World Research Forum (WWRF) presented their "Book of Visions" on the future of wireless networks stating: "It will become more and more important how the users perceive the service and the emotional impact and pleasure that the service creates and maintains" [7, p. 9]. However, little is said about how those perceptions, emotions and pleasures are created at the service and end-user level. As in most vision documents on the wireless future, technological requirements are elaborated and specified without further discussion of these important end-user issues. In demand side studies of telecommunication services adoption, individual end-user adoption requirements are also left out. Instead, adoption is typically studied at the aggregate level using diffusion models [10].

Aggregate diffusion models and technological requirement models are insufficient as bases for understanding the end-user requirements for adopting 3G services. In our opinion, the adoption decisions of individual end-users must be better understood to predict and explain the adoption of 3G services in general, and mobile commerce in particular. We suggest that the end-user context provides a set of context specific adoption requirements.

To understand these requirements, three different perspectives are suggested here: 1) The end-user as a technology user; 2) The end-user as a consumer; and 3) The end-user as a network member. Each perspective suggests a set of specific theories, models and methodologies. We briefly present the three different perspectives, and suggest that a triangulation of perspectives is useful in the development of end-user models and customer scenarios [14]. By combining the three perspectives in a demand side adoption framework, operators, service providers and application developers may improve their understanding of the end-users and their usage scenarios. This will make them perform better evaluations of the likelihood of adoption, and will improve their foundation for designing, evaluating and timing mobile commerce end-user services.

2. Theory and perspectives

Adoption of end-user services in mobile commerce may be treated as technology adoption. Several perspectives have been applied to understanding technology adoption from the individual end-user perspective. Among these are the TAM (Technology Acceptance Model) model of Davis [2, 3] and the TPB (Theory of Planned Behavior) model of Ajzen and Maddon [1]. Applying the TAM model means investigating the requirements of end-users regarding usefulness and user friendliness. In the TAM model, usefulness and user friendliness affect users' attitudes towards services.

By including the attitude concept, Davis [2, 3] stresses the importance of user requirements being based upon perceived usefulness and user friendliness rather than some "objective" measure. However, when compared to the TPB model of Ajzen and Maddon [1] the TAM model lacks sufficient consideration of the importance of expectations. For services with strong network effects, the importance of expectations should not be underestimated [15]. Expectations are communicated both through other users and through mass media. Two important lessons can be learned from prior studies using the TAM model when applying it to the adoption of mobile commerce. First, merely instrumental usefulness is insufficient to obtain widespread adoption of end-user services. Second, the divergence between communicated expectations and user perceptions may seriously affect end-users' long term attitudes towards these services and delay individual end-user adoption.

Even though the user may be perceived as a technology user, mobile commerce end-user services are applied in a consumer context. Adoption models with a consumer orientation traditionally focus what is termed the "first-purchase decision" [9]. These models are well suited for understanding the adoption of separate consumer goods. However, most end-user services in mobile commerce will be integrated services closely related to the consumption of other physical or informational goods. For example, in addition to traditional complementarity, many end-user services in mobile commerce will be added value services suited to serve post-decisional phases of the consumer life cycle. Examples of such services are interactive manuals, user-group interaction services and services for the social marketing of goods (e.g. coordinating social restaurant visits or social travel).

To understand the adoption processes of these services, traditional decision based models of the "first-purchase decision" should be supplemented with models of the consumers' post-decisional buying behavior [4]. Two important lessons can be learned by applying this perspective on the adoption of mobile commerce end-user adoption. First, mobile commerce end-user services are not context independent services that will have their separate adoption process. Instead, the adoption of these services will depend upon the adoption of complementary and integrated physical goods and services. Second, consumption context and consumer history will be important in the adoption of mobile commerce. For example, adoption of these services should be treated rather as a transition between stages of increasing consumer sophistication than as "first-purchase adoption". In this perspective, consumer learning history and stage in the consumer life cycle should be parts of the applied adoption model [4].

A second consequence of taking the end-user context seriously into consideration is taking the role of end-users as network members seriously. The network perspective is focused in network theories of diffusion [18]. In these aggregate diffusion theories, the importance of communication between network members and the social position of network members are taken into consideration.

Even though these issues are important to understand adoption, they apply equally well to all innovations that are communicated through social networks. It does not focus the unique functionality of mobile commerce end-user services as services for mediating and coordinating communication in consumer oriented networks. To understand these functionalities, the different network contexts of individual end-users must be understood. There is no single authoritative typology of networks or social groupings that may be applied to categorize network contexts [19].

We suggest a typology of networks with increasing complexity - from the simplest personal and relational networks to the networks of networks. The typology of networks closely resembles the levels of the MultiSphere model suggested by the WWRF [7]. When considering the network member's participation in several networks of different complexity, the importance of mobile end-user services as a mediating and coordinating technology is better understood. For example, end-user services may be applied to maintain the virtual home environment (VHE) of the user across network contexts. They may further be applied to maintain and coordinate network relationships between brands and individual consumers, and they may be applied to coordinate the traditional social networks of families or friends in consumer contexts [8]. Without taking these different network contexts into consideration, analysts of mobile commerce services may lack a very important explanatory element in their adoption models.

3. Triangulation of perspectives in customer scenario development

Most of the projects studying the end-user in telecommunication services have taken a sociological

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perspective (e.g. Eurescom P-903, Cost 248 and Cost 269). In these projects, we find few references to the traditional information technology adoption literature [2, 3]. We find almost no references to the consumer behavior literature, and the consumer perspective is almost absent. Even though this perspective is often applied in behavioral studies of end-users in traditional electronic commerce and Internet service studies, it does not seem to have been widely applied to studies of 3G services and mobile commerce. This is particularly disturbing because many of the services introduced in 3G networks will be consumer oriented services and value added services supporting the consumption of physical goods and services. Finally, few of the sociological studies mentioned above apply a social network perspective on the end-user.

Traditional sociology frameworks are used to describe users by their demographic and social characteristics [6], or by the usage in public and private spaces [5], or how access to services represents social and symbolic capital [16]. A few exceptions that take the user as network members more seriously are found [8], but social network analysis is not applied in these studies, and like most of the other studies the results are of little direct help to service providers, operators and terminal producers trying to understand critical end-user adoption requirements.

We suggest that the three perspectives presented in section 2 may be combined in a theoretical triangulation of perspectives. However a triangulation of perspectives requires an underlying common framework in which each of the perspectives may be applied. Our suggestion for such a framework is illustrated in figure 1.

Figure 1 illustrates end-user adoption as a demand side issue of 3G service adoption. When studying demand side issues a specific end-user context is always, explicitly or implicitly, considered. The context may consider the end-user as an individual, focusing emotional or cognitive issues. It may also consider the individual as a social end-user, focusing social and network communication issues. Finally, it may consider the individual as an end-user within a specific cultural context, focusing cultural rituals and ethnographic issues. An example of the latter may be found in a recent study by Taylor and Harper [17] treating mobile phone usage as "ritual gift giving".

With the choice of a specific end-user context follows the choice of a perspective, of relevant models and theories, of end-user services or applications of interest, and the choice of appropriate methodology. In most cases these choices are implicitly made when choosing a specific end-user context. We argue that instead of choosing one specific end-user context, the combination or triangulation of contexts may be appropriate to more fully understand the adoption requirements of end-users.

The framework presented in figure 1 may be applied to make the underlying assumptions of the perspective, models, applications and methodologies more explicit in such a combination or triangulation of contexts.

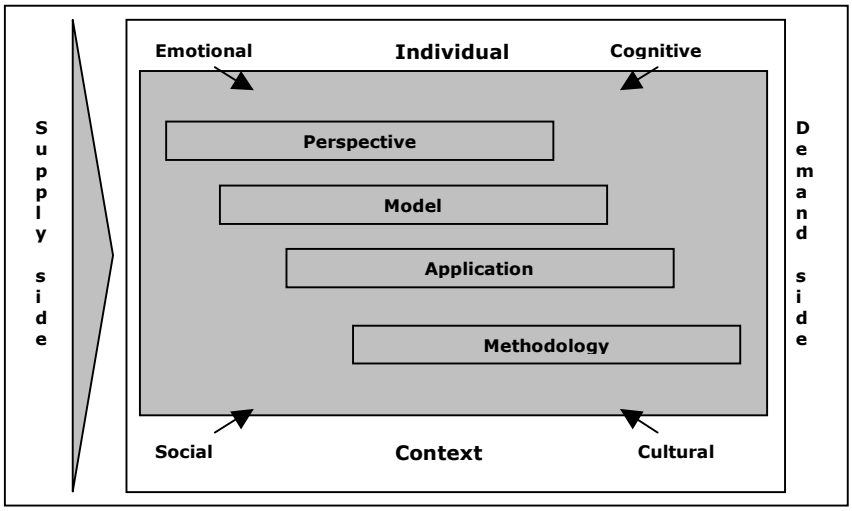

Figure 1. The framework of perspectives

Among the supply side requirements are technological and business strategic requirements, such as the requirements of technology platforms and business models of the participants in the 3G value chain. Even though the supply side requirements must also be met [12], such as designing business models that lead to widespread adoption of technology- and service platforms

among end-user service developers or designing revenue models that take QoS-issues into consideration, this part of our framework elaborates on the demand side requirements of end-users. The demand side requirements consist of individual and context dependent requirements as introduced in section 2.

A comprehensive understanding of the individual requirements must include both cognitive and emotional aspects. In our framework, these aspects are included in a modified technology acceptance model. To understand the context of the individual, both social and cultural models may be applied as well. In our framework, these issues are treated in a consumer life cycle model and in a social network member model. Each perspective brings their own model of end-user service adoption including how those adoption requirements must be met. The models are, however, rather general, and must be applied to the analysis of specific services, such as mobile commerce services, multimedia messaging services etc. With each perspective also follows a methodology that can be used to empirically test if the adoption requirements are met by a specific service.

Instead of just applying the three different perspectives separately to understand the end-user service adoption requirements, the perspectives should be combined in a triangulation of perspectives. In figure 2, one of the ways to triangulate the perspectives is illustrated.

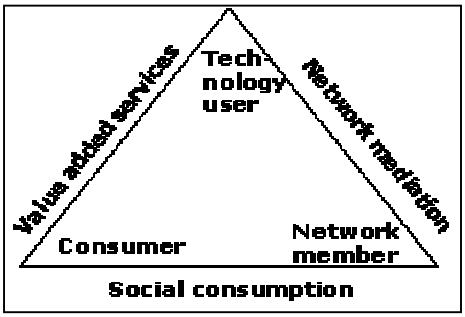

Figure 2. Suggested triangulation of perspectives

As shown in figure 2, combining the three perspectives on end-users two by two is useful for focusing important end-user adoption requirements. For example, combining the technology user and consumer perspectives is useful for understanding how many mobile commerce services will be value added services supporting decision making and post-decisional consumption activities. Examples of such services are location based advertising, location based directory services and multimedia user supervision services. Many of these services will add value to products and services that are already consumed by end-users. For example, many end-users services in mobile commerce may provide added value to the post- or pre-decisional stages of the consumer life cycle of already existing products, and may not be consumed as separate end-user services. Consider, for example, access to consumer forums or service manuals using mobile terminals while actually consuming physical products in physical settings.

Furthermore, combining the consumer and network member perspectives is useful for understanding consumption as a social activity. Mobile commerce services that support social marketing may be social evaluation services, shoputainment and multi-channel consumer support services. The use of such end-user services are best understood not by separately considering the end-user as a network member or as a consumer, but by combining the two contexts and models. For example, end users may participate in different social networks in different stages of the consumer life cycle. In the pre-decisional stages of buying a travel package, the social network of consumers having destination experience may be important, while in the post-decisional stages social networks of inexperienced travelers may be most important when using the performed trip as a means for improving social status. For a service developer, an understanding of the importance of discussing a travel destination in different social networks for different purposes may be important in obtaining widespread adoption of e.g. a travel destination forum that can be accessed using mobile terminals.

Finally, combining the technology user and network member perspectives is useful for understanding how many 3G services will represent mediation and coordination services directed at the different networks of

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which the end-user is a member. Such networks range from the personal area networks of mediating devices to the networks of networks in which end-users take different formal and informal roles. Examples of such services are VHE services, profiling and personalization services, and mobile versions of traditional PIM (Personal Information Management) services.

For example, mobile commerce services may intermediate communication in families, and provide services for the planning and maintenance of social activities within the family. Understanding the requirements of different family members for adopting such services, service developers will have to understand both the technological usability requirements of users with very different qualifications and the particular communication patterns of families (which are often very different from other social networks). In Scandinavia, teens are extremely qualified mobile service users applying SMS-services for social coordination in networks outside the family, while parents often are less qualified and show little interest in adopting SMS-based services. In addition, teens and parents have very different experience and use very different tools for coordinating the activities of social networks other than the family network. While parents may be experienced users of PIM-services and systems, teens may apply the principles of "micro and hyper-coordination" typical for experienced SMS-users for social coordination outside the family [8]. Merging the requirements of so different users may represent a serious challenge to service developers. In such a situation, a triangulation of perspectives may prove useful.

Thus, one of the important results of using perspectives triangulation is that it leads to a better understanding of how the adoption requirements differ among the different types of services and among different customer scenarios.

The triangulation approach presented here will be applied in a study of the adoption of mobile commerce services among early and late adopters in Scandinavia. The purpose of this study is to refine the triangulation framework and the individual models based upon empirical adoption data. Both early and late adopters will be studied to generalize the triangulation approach. In addition, adoption of mobile commerce end-user services as well as adoption of traditional electronic commerce services (traditional Internet and digital-TV) will be studied to refine the approach for handling multi-channel services.

4. Developing an evaluation framework

The triangulation of perspectives can also be used to develop evaluation guidelines for service providers, operators and terminal producers. Results from an empirical study of end-user adoption within each of the three perspectives can also be combined in a service evaluation framework. Service providers, operators and terminal producers can apply this framework to evaluate and predict end-user adoption of mobile commerce services in 3G and later mobile technologies.

Each of the perspectives introduced above raises a number of context relevant adoption requirement issues. Even though the final evaluation framework must be based upon empirical findings, the models can in a preliminary stage be used to raise critical issues and questions. In table 1, some of these issues are listed as an illustration of how the service evaluation framework may be designed.

Applying the TAM-model to the technology user perspective raises a number of general end-user adoption issues. Among these are the importance of perceptions, attitudes and expectations. In table 1, a selection of these issues is listed. From each issue, a number of questions may be formulated that the evaluator can use to make sure all relevant end-user requirements are taken into consideration before designing or introducing a given mobile commerce end-user service.

Table 1. Issues raised in a service evaluation framework

Perspective	Evaluation issues	Evaluation questions
Technology user	Expected user friendliness	How will user friendliness be communicated? Does the user have transferable experience?
	Expected usefulness	How will usefulness be communicated? Can usefulness experience be transferred?
	Perceived user friendliness and usefulness	Can perceived user friendliness and usefulness be measured and have these user perceptions been measured and/or evaluated with representative user groups?
	Attitudes	Has the relationship between user friendliness and usefulness been evaluated? Have user attitudes been measured and/or evaluated? Are user attitudes specific to the evaluated service or can user attitudes be transferred?
	User intentions and actual use	Are user intentions and actual use only instrumentally grounded? Has the relationship between instrumental and attitudinal intentions been evaluated?
Consumer	Value added services	Has the relationship between the basic goods and services and the mobile commerce end user service been evaluated? How is the service complementary to the basic goods or services consumed?
	Decision phase	How does the service support the decision phases of the consumer life cycle? How does the service support the post-decisional phase of the consumer life cycle? Does the service add mobility-specific functionality to any specific phase (information search, localization and personalization functionality)? How does the service affect the consumer buying process, consumer satisfaction and customer loyalty?
	Post-decisional phase	
	Channel integration	Is the service complementary to other, channel integrated services? Is the service integrated with other electronic commerce or physical channel services? Does the service integrate the user experience across multiple channels?
Network member	Mediating service	How does the service mediate, coordinate or contribute to interactivity in networks? How is the service complementary to other mediating, coordinating or communication services?
	Communication	Has the mobile terminal's importance as a communication terminal been explicitly evaluated and utilized?
	Network types	What network type does the service mediate or coordinate? What user roles are relevant and how does the service support multiple roles?
	Network effects	What network effects are obtained in this kind of network – direct or indirect? Has the importance of critical mass been evaluated? How is the relationship between increasing and decreasing return effects in the network?

Applying the customer life cycle model to the consumer perspective raises a number of context specific issues relevant to the customer scenarios of mobile commerce. Among these issues are the importance of understanding mobile commerce end-user services as value added services, the change in user requirement from one phase of the life cycle to the next, and the importance of channel integration in mobile commerce end-user services.

Applying social network analysis to the network member perspective raises a number of network member specific issues relevant to the customer scenarios of mobile commerce. Among these issues are the importance of understanding mobile commerce end-user services as mediating or coordinating different types of networks, the change in users' requirements depending on their network role, and the network effects of mediating, coordinating and interactive end-user services.

Here, we illustrated only how one specific model could be applied to produce evaluation questions within each of the three perspectives. Other theories or models representing relevant issues within each perspective may be applied as well. For example, the evaluation issues and questions of the technology user perspective may be extended applying e.g. the TPB model of Ajzen and Madden [1], and issues and questions of the consumer perspective may be extended applying e.g. attitudinal consumer behavior theory of customer satisfaction and loyalty [11]. However, together the three perspectives should represent a solid basis for designing a framework for evaluating mobile commerce end-user services. We are in the process of applying this approach to the design of an adoption evaluation framework particularly suited for the service evaluations of mobile operators.

5. Conclusions

We argue that technology oriented or aggregate diffusion models are insufficient to explain the adoption process of mobile commerce end-user services. Even though supply side issues are relevant, we suggest that focusing on the end-user behavior in different contexts is necessary to understand and explain the observed differences in the adoption of mobile commerce between countries (Europe vs. Japan), and between technologies (WAP vs. SMS). Furthermore, we argue that applying one single or general perspective on understanding the end-user is insufficient, and that a triangulation of theoretical perspectives is necessary. In particular, we suggest applying three specific perspectives: the end-user as a technology user, as a consumer and as a network member.

By applying these context dependent perspectives, the issues relevant to the unique context of mobile commerce end-user services can be taken into consideration. Even though general technology user models like the TAM-model is important, they do not take the specific context of the mobile commerce services into consideration. This context is characterized by the user being partly in a consumption situation and partly in a communication situation. Thus, the roles of the end-user as consumer and network member, communication with other network members, must be explicitly focused. To combine these context dependent models with a general technology user perspective, we suggest a triangulation framework that may be used to combine perspectives and unify empirical studies based upon each perspective. In addition, the framework may be used to produce evaluation guidelines relevant to mobile commerce service providers, operators and terminal producers.

Triangulation of theoretical perspectives is often difficult because of differences in theoretical concepts, levels of analysis and methodological principles. However, the theoretical perspectives suggested here can be applied using specific models with similar theoretical concepts, the individual as the level of analysis[1], and well established measures and methodological procedures.

While other research projects, such as the Eurescom and Cost projects have also suggested focusing behavioral issues to understand 3G mobile network services, these projects apply a more general, sociological approach to the end-user. We argue that the consumption context of mobile commerce suggests other perspectives should supplement the sociological perspective of these projects. In particular, we argue that many mobile commerce services will be services integrating different commercial channels and mediating and coordinating the social networks of consumers. The adoption of such services is not easily understood and explained without explicit focus on the role of the end-user as a consumer and as a network member, for example using mobile commerce services for social marketing.

The approach and studies suggested above will contribute to a better understanding of the requirements of end-users in adopting 3G services in general and mobile commerce services in particular. It is our opinion that the suggested approach will produce general knowledge needed to improve operators', service providers' and terminal producers' understanding of end-user perceptions, specific knowledge of consumer oriented issues in end-user service adoption not covered by the sociological studies, and evaluation guidelines required by service providers, operators and terminal producers in their effort to predict adoption and introduce the right mobile commerce services in 3G networks at the right time.

[1] Social network analysis may be performed as "ego-centric analysis", maintaining the individual as the level of analysis [13].

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