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Bill Anckar
Institute for Advanced Management System Research IAMSR, Abo Akademi University

Pirkko Walden
Institute for Advanced Management System Research IAMSR, Abo Akademi University

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Bill Anckar, Christer Carlsson, Pirkko Walden

Institute for Advanced Management System Research IAMSR, Abo Akademi University, Finland
Bill.Anckar@Abo.fi, Christer.Carlsson@Abo.fi, Pirkko.Walden@Abo.fi

Abstract

Mobile commerce (m-commerce) is marking the start of new era of innovation in business. M-commerce will continue to extend the way organizations conduct business – and change the relationships between companies, customers, suppliers and partners. Mobility means freedom *– say Keen and Macintosh – and freedom creates choice and value, something much more than convenience as it may revolutionize the way companies work, buy, sell and collaborate.*

Although the TAM is widely accepted as a pertinent model – on a general level - to explain the acceptance of information technology and information systems, it is questionable whether the model is applicable to consumers' choice of commercial channels, which makes its use questionable to explain the adoption of mobile and e-commerce. This proposal was tested with the material derived from a 1000 consumer survey in Finland and we found other drivers/inhibitors than perceived usefulness, perceived ease of use and perceived enjoyment.

1.   Introduction

In the last few years we have witnessed remarkable fluctuations in the society's confidence in the Internet as a commercial medium, with connotations of concepts such as Internet and electronic commerce rapidly changing from positive to negative not only in the minds of investors, but also among managers and the general public. The changing attitudes, or rather sentiments, have predominantly originated from the fact that Internet commerce has not proliferated to the extent that was commonly predicted less than a decade ago, with a low volume and adoption rate of electronic shopping methods among consumers. In spite of the fact that e-commerce has not reached the explosive growth figures commonly, yet unrealistically, predicted in the mid-1990s, scholars and industry representatives are now turning their attention towards the promise of electronic wireless media, envisaging that the next - or the real phase of e-commerce growth will be in the area of mobile commerce (see e.g. Hampe *et al*., 2000; Varshney *et al.,* 2000; Kalakota and Robinson, 2001; Varshney and Vetter, 2001; Li, 2002). According to Keen and

Macintosh (2001), the issue is that mobile commerce (m-commerce) is marking the start of another era of innovation in business and m-commerce will continue to extend the way organizations conduct business – and change the relationships between companies, customers, suppliers and partners. Mobility means *freedom* – say Keen and Macintosh – and freedom creates choice and value, something much more than convenience as it may revolutionize the way companies work, buy, sell and collaborate.

Although the mobile Internet appears to have much to offer as an instrument of commerce, little is known about the consumers' willingness to adopt wireless electronic media, and the factors that influence their adoption decisions and value perceptions relating to m-commerce (cf. Urbaczewski *et al,.* 2002; Pedersen *et al,* 2002). Just as we are gradually starting to gain an understanding of the unique characteristics of the fixed Internet, a new medium has emerged, the wireless Internet, which raises many of the same questions in a new context (Gurley, 2000; May, 2001). Building successful strategies for the mobile marketplace begins, no doubt, by recognizing the distinctive forces driving the emergence of m-commerce (Senn, 2000): On the Internet, firms can create value for customers in a manner that is different from that which has been achieved in conventional business (Han and Han, 2001). Correspondingly, m-commerce possesses unique characteristics – Keen and Macintosh (2001) call them "the mobilisation of knowledge" - when compared to traditional (i.e. fixed) e-commerce, and many statements on an impending m-revolution have, in fact, been triggered by the assumption that the potential of m-commerce will involve (i) lower barriers, and (ii) greater benefits in comparison to both fixed e-commerce and traditional commerce. In view of that, the key question for m-commerce is to find some way to assess the value of mobile applications to prospective users (Carlsson and Walden, 2002), and to gain an understanding of the factors that may delay the penetration of the mobile Internet on a larger scale (Lee *et al.,* 2002). Such insights are certainly needed to support investment decisions, to find viable business models and to develop mobile devices, networks, and services that address and take the concerns/wants of consumers into consideration.

2. Theoretical Foundations and Previous Research

2.1 Value Components and Adoption Decisions

Although mobile commerce still is an emerging phenomenon, a significant body of literature has, from the late 1990s onwards, pointed out the factors that are likely to drive the diffusion of mobile commerce in the business-to-consumer marketplace. In this area, most contributions - which are strongly dominated by intuition-based reasoning and conceptual analyses rather than empirical investigations - have primarily focused on establishing the value proposition of mobile commerce from the consumer's point of view, pointing out such general concepts as *flexibility, ubiquity, localization, personalization, and mobility* as key adoption motivators (see e.g. Müller-Versee, 1999; Booz, Allen & Hamilton, 2000; Vittet-Philippe and Navarro, 2000; Herman and Neff, 2002). While being pertinent and illuminating, such terms nevertheless appear to be too general and abstract to provide a comprehensive explanatory insight into the reasons for consumers' decisions to adopt mobile distribution channels. This is especially true if we look at the current situation, or in other words the factors that *today* drive adoption: Most

of the concepts listed above are understood in terms of the advanced features of the 3G rather than in the technology of the 2G or 2.5G networks, which is rather more modest[1].

Moreover, it should be noted that not only the *benefits* offered by new mobile channels, but also - and in particular - the *barriers* to using mobile services need to be identified to build an understanding of the factors that affect adoption decisions by consumers. In the marketing literature, many studies have proposed or verified that *perceived customer value*[2] is a salient determinant of consumers' purchase intentions and purchase decision making (see e.g. Zeithaml, 1988; McDougall and Levesque, 2000), and in understanding consumer behaviour (see Parasuraman, 1997). While value considerations typically have been associated with the overall pre-purchase assessment of the utility of a product, we argue that the core idea of the concept is equally relevant as we examine the relative advantages of technological innovations, commercial media, or even electronic distribution channels (cf. Anckar and D'Incau, 2002; Han and Han, 2001). In this context we argue, however, that the traditional view of the value equation as a trade-off between benefits and *costs* (or even a price-quality trade-off) is too simplistic in terms of building an understanding of the primary motivators and inhibitors to m-commerce adoption. Instead, the value concept should be interpreted as the trade-off between *benefits* and *barriers* - i.e. get and give components described not only in monetary terms, but seen from a much broader perspective, addressing non-monetary sacrifices as well (cf. Jensen, 2001; Sweeney and Soutar, 2001; Eggert and Ulaga, 2002).

To date, many studies, primarily from the IS discipline, on adoption decisions of information technology (IT) in fixed or mobile settings have built on the widely recognized and used technology acceptance model (TAM) by Davis (1989). (see e.g. Teo *et al.*, 1999; Lee *et al.*, 2001; Lee *et al.*, 2002; O'Cass and Fenech, 2003). Although a large body of research supports the TAM as an, in general, pertinent model to explain the acceptance of IT tools and information systems it is questionable whether the model is applicable to consumers' choice of commercial channels. Adoption decisions relating to m-commerce are, for a number of reasons, likely to be very different from technology adoption decisions: First of all, what the consumer chooses to adopt in m-commerce is not merely a technology *per se*, but rather a new instrument of commerce. Secondly, m-commerce encompasses, as it is generally defined, both transactional and non-transactional dimensions, which mean that consumers' intentions to transact in m-commerce should be seen as multidimensional behavioural intentions (see Pavlou, 2002). As a result, we need - in contrast to most technology adoption decisions - to distinguish between different *levels of m-commerce adoption* as we analyze consumer decisions relating to electronic channels - fixed or mobile. Thirdly, as pointed out by Eikebrokk and Sørebø (1998), TAM is usually applied as if every situation would be a single-target situation, building on the implicit assumption that only one specific technology is available for the potential users[3]. The authors argue that it may be difficult to obtain valid predictions and explanations of technology acceptance with TAM when consumers actually are exposed to a multiple-choice situation where they can choose among several alternative technologies - or in this case alternative channels. Fourthly, TAM is, as argued and demonstrated by Malhotra and Galletta (1999), incomplete in the sense that it does not account for social influence in the adoption and utilization of new information systems, a limitation that seems particularly disturbing when adoption decisions relating

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[1] The abbreviations 2G (GSM), 2.5G (GPRS), 3G (UMTS), etc. refer to generations of network technology.

[2] Broadly defined as the results or benefits customers receive in relation to total costs (McDougall and Levesque, 2000), i.e. a customer's overall assessment of the utility of a product (or service) based on perceptions of what is received and what is given (Zeithaml, 1988).

[3] In contrast, *value* is a relative concept which embodies an implicit assumption about a comparison between two or more alternatives.

to m-commerce are examined. <u>Fifthly</u>, TAM assumes that usage is volitional, that is, there are no barriers that would prevent an individual from using an IS if he or she chose to do so, a fact which has drawn criticism from e.g. Mathieson *et al*. (2001), and which has urged some authors (e.g. Lee *et al*., 2001) to extend the TAM with theoretical models that postulate perceived risks as an antecedent to the adoption of m-commerce. Pavlou (2002) highlights the fact that the advent of the Internet has introduced uncertainty and risk in system adoption, and validates the need for integration of variables that capture such notions in existing models of technology adoption by showing that *trust* and *perceived risk* are direct antecedents of intention to transact online (Pavlou, 2003). Considering that previous studies have shown that consumers' rejection decisions relating to (i) household adoption of personal computers, and (ii) non-transactional as well as transaction-based Internet commerce are based on perceived critical barriers to a much higher extent than on a lack of appreciation of the associated benefits (Venkatesh and Brown, 2001; Anckar, 2002a), there is little doubt that the impact of various non-monetary sacrifices need to be included in any model or study relating to channel adoption decisions.

2.2 Aims and Research Questions

As argued above, the translation of potentially significant underlying variables into overly general multidimensional constructs such as *perceived usefulness* and *perceived ease of use* is unlikely to address or provide decision support for practical managerial problems related to investment decisions or the development of appealing mobile services. Accordingly, this study sets out from a perceived value-based view on adoption decisions in order to accomplish our research objective, which is to identify the key benefits and barriers - the core get and give value components - that drive or inhibit consumer adoption of mobile commerce today and in the future. The investigation is guided by two interrogative research questions:

- Are adoption decisions/intents driven to a greater extent by benefits or barriers?

- Which benefits and barriers constitute important drivers/inhibitors to the adoption and use of mobile Internet and m-commerce in different consumer groups?

In order to accomplish our research objectives, our study needs to cover many different factors that potentially may have an impact on the consumers' willingness to take on and use m-commerce. In view of that, the basis for selecting the benefits and barriers to be included in the study was founded on an extensive review of work relating to m-commerce drivers and inhibitors. Based on the anecdotal and empirical evidence uncovered in the literature review (presented in the next section), we selected the most frequently mentioned potential drivers and inhibitors to m-commerce adoption – and extended the list with some other plausible factors – for inclusion in the empirical study.

2.3 mCommerce Adoption Drivers and Inhibitors: A Literature Review

From the late 1990s onwards, a significant body of literature - dominated by intuition-based reasoning or conceptual analyses - has aimed at identifying and predicting the emerging drivers and inhibitors to a mass-market adoption of m-commerce. As this literature review will show, different authors and studies have underlined very different factors as key drivers/inhibitors to m-commerce adoption.

Gillick and Vanderhoof (2000) propose five possible inhibitors, all very broad in nature, to the widespread proliferation of m-commerce: The *technology itself, industry*

standardization, the business case, consumer expectations, and security and reliability. Of these factors, the last-mentioned one is perhaps the most widely cited, with many authors having contended that lacking privacy and security could be a major stumbling block to the growth of m-commerce (see Li, 2002; Langendoerfer, 2002). Such contentions are partly supported by empirical evidence: In an empirical multi-market study conducted by e-Mori on behalf of Nokia Networks (Nokia 3G Market Research Centre, 2001), *the lack of perceived need* (cf. Signorini, 2001)*, conservatism*, and *perceptions relating to the reliability and security of the technology* were the main barriers to m-commerce adoption, while *convenience* and *control* were found to be the key determinants of demand.

Drawing e.g. on data collected through expert interviews, Buellingen and Woerter (2002) highlight four critical success factors for the use of mobile services; *transmission rate, personalization, data security,* and *user-friendliness.* Findings from a UK-based survey by Strong and Old (2000) suggest that *the convenience of having Internet access at any time and place* will be the most important incentive for consumers to use mobile Internet applications. The authors found that significant barriers to a quick take-up of the mobile Internet in the very near future are the *lack of awareness of content and application, high operating costs,* and *the unfavourable comparison of the mobile Internet with the fixed line Internet* due to smaller screen sizes, fiddly input, poor searching facilities, poor connections, etc. In contrast, many authors have argued that the overall volume of e-commerce may experience a significant growth with mobile technologies as many consumers who are not yet Internet adopters because of the *proficiency* with computers needed in PC-based e-commerce now will access the Internet due to the lower costs involved and their familiarity with mobile devices (see Müller-Versee, 1999; Vittet-Philippe and Navarro, 2000; Ropers, 2001).

Vittet-Philippe and Navarro (2000) and Green (2000), argue that *user-friendliness* will be the key for wide adoption of m-commerce. In line with this, the constraints such as small screen size, limited bandwidth, and the *simplistic functionality* of wireless handheld devices affect usability for designing effective user interfaces for m-commerce applications, and present exploratory findings in support of the usability issue being critical to the adoption of m-commerce. Similarly, the results from an expert survey conducted in Finland (Carlsson and Walden, 2002) indicate that the *slow speed of service* and the *limited screen size* of mobile devices constitute the major barriers for rapid m-commerce expansion. In contrast, Langendoerfer (2002) posits that technological issues such as the lack of infrastructure and mobile device will not be the major problem of m-commerce, but that psychological aspects - especially privacy concerns - will be the reason why m-commerce will not take off.

Shuster (2001) speculates that *pricing* certainly will have an impact on adoption. Reporting on an online survey, Vrechopoulos *et al.* (2002) present a broad list of critical success factors for accelerating mobile commerce diffusion in Europe; *improved mobile devices, user-friendly shopping interfaces, effective applications and services, reduced prices, secure transactions, high bandwidth and network coverage.*

Findings from a consumer survey conducted in Finland (Anckar, 2002b) indicated that m-commerce adoption mainly appears to be driven by a need for solutions that add *convenience and flexibility to daily routines* rather than excitement and entertainment. They also found that consumers perceive the ability to satisfy *spontaneous and time-critical needs* as the most important driver of m-commerce adoption.

As this review of previous research has shown, it is often suggested or assumed - implicitly or explicitly - that the main factors affecting m-commerce adoption decisions are associated with services and device features that go beyond the traditional use of a mobile phone, i.e. peer-to-peer communication. According to this line of reasoning,

consumers will be driven towards m-commerce by the fact that what was previously simply a phone will now turn into a personal trusted device, through which all kinds of commercial activities and transactions can be managed. An alternative, yet equally plausible scenario is that the opportunities and benefits associated with new application areas of mobile phones will not, after all, serve as significant adoption drivers in the b-to-c segment: Instead, consumers will (i) be persuaded by the value of sophisticated mobile devices and next generation networks as a result of the *enhanced features and new dimensions* such technologies offer in terms of traditional use of mobile phones, i.e. *person-to-person communication*, and/or (ii) driven towards new mobile technologies more or less inevitably, as older networks and devices gradually are replaced by new, m-commerce facilitating ones. Curiosity, playful experimentation, and customization to the devices while using them for conventional purposes will eventually result in a realization of the capabilities of new mobile technologies and the value of mobile services. As this line of argument suggests, our empirical investigation should not focus exclusively on possible adoption drivers for m-commerce services, but also on the benefits of advanced (3G) mobile devices and networks in person-to-person communication (acknowledging that this application area generally is excluded from definitions of m-commerce).

3.   The Survey

As noted by Luckett *et al.* (1999), marketing is not a battle of products, but rather a battle of perceptions: Consumers make decisions based on their perceptions, regardless of their accuracy or inaccuracy, and therefore it is around these perceptions that marketers must build their competitive strategies. With the research questions of this study pertaining to consumer perceptions and intentions, the consumer survey research technique was employed to collect the primary data needed to attain a thorough understanding of the expectations and concerns consumers have with m-commerce.

Since our research objective called for an investigation and comparison of different consumer groups in terms of m-commerce adoption, we decided to use non-interactive media in order to target different consumer groups in terms of their *level of experience* with m-commerce[4]. Choosing this approach, we were able to draw on two different dimensions of m-commerce adoption; (i) *mobile Internet adoption, and* (ii) *adoption of (transaction-based) m-commerce,* and thus to differentiate between important consumer groups when analyzing the data. The corresponding sub-samples were defined as follows:

- *Mobile Internet adopters*. Respondents who have experiences with the mobile Internet, but who have not necessarily purchased products or services over a mobile device.

- *Intended mobile Internet adopters*. Respondents who have never used the mobile Internet, but who reported an intention to use the mobile Internet in the future.

- *Mobile Internet averse*. Mobile Internet non-adopters who reported that they have no intention to use the mobile Internet now or in the future.

- *M-commerce adopters*. Respondents who have made purchases over a mobile device (and thus have embraced transaction-based m-commerce).

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[4] Investigating the reasons for consumer adoption or rejection of electronic channels, the non-adopters - whose statements on many important matters are conjectural and/or based on secondary opinions - constitute a very important consumer group, yet one often neglected in consumer studies relating to electronic media.

- *Intended m-commerce adopters*. Respondents who have not made purchases over a mobile device, but who reported an intention to do so in the future.

- *M-commerce averse*. M-commerce non-adopters who reported that they have no intention to make purchases over a mobile device now or in the future.

3.1   The Survey Instrument

Data was collected using a four-page self-administered questionnaire which was mailed out to a sample of 1000 Finnish consumers in March-April 2002, with two follow-up mailings to all non-respondents in June. The sample was drawn from the electronic sampling frame provided by the Finnish Population Register Centre based on a stratified sampling procedure where the sample was drawn using a simple random sampling method. The sampling frame used offered a complete representation of the target population, which was defined as the Finnish population in the age 16-64 years[5]

The survey instrument covered 20 questions relating to the consumers' perceptions and intentions relating to mobile commerce, as well as their current experience with the mobile Internet and m-commerce. In this paper we primarily report on a questionnaire section in which the respondents were instructed to indicate how strongly they agree or disagree with a number of statements relating to their perceived importance/magnitude of different benefits of and barriers to mobile commerce. For this, a five-point Likert scale was used (5 = strongly agree, 1 = strongly disagree). These data were used to identify the motivators and hindrances that constitute important/unimportant factors influencing consumer m-commerce adoption/non-adoption decisions.

As an attempt to motivate the respondents to complete and return the questionnaire, the drawing of a top-of-the-line mobile phone among all respondents was announced. 8 questionnaires were returned undelivered due to incorrect addresses. 487 completed and utilizable questionnaires were returned by the deadline, giving an effective response rate of 48.7%.

4.   Findings

4.1   Sample Demographics

Figure 1 shows the sample demographics with respect to general variables such as gender and age, and portrays the sizes and partial overlap of the sub samples used in this study. The demographics are used as a background description as we do not have the space (in this paper) for a complete statistical analysis of the respondents by age and gender groups. This analysis will appear in a forthcoming paper.

In the following we will work through a summary of the results, which has been organized in the benefits (the "get" value components) and the barriers (the "give" value components) seen from the viewpoints of adopters, intended adopters and non-adopters of mobile internet services and mobile commerce.

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[5] Consumers in older age groups were excluded from the study since previous surveys recently conducted in Finland (Anckar and D'Incau, 2002) had indicated that consumers aged 65+ constitute an insignificant target group for most mobile services.
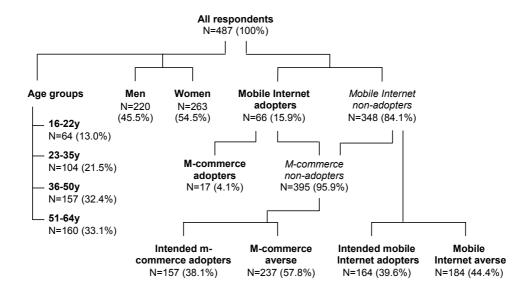
Figure 1: *Sample Demographics and Sub-sample Sizes*

4.2 Benefits: The 'Get' Value Components

As shown in Table 1, the descriptive data analysis showed that three benefits of using mobile devices and services stood out as especially important for consumers when not making any distinctions between different subpopulations: The *enhanced communications features*, the *flexibility with respect to the user's location and the time of the day*, and the *convenience and handiness of small, wireless mobile devices*.

Table 1: *Summary Statistics for Benefit Variables (N = 410- 418)*

BENEFIT	Mean	SD	Agree[1]	Disagree[2]
Enhanced communication features	3.74	1.28	68.9%	18.9%
Flexibility (anywhere, anytime)	3.73	1.18	64.9%	14.9%
Convenience and handiness	3.40	1.29	55.4%	25.7%
New dimensions of communication	3.07	1.28	43.1%	33.0%
Reminder and information services in real time	3.01	1.31	41.4%	36.4%
Uniqueness: exclusively mobile services	2.98	1.31	41.9%	36.1%
More effective use of time	2.78	1.35	37.8%	44.0%
Lower prices/special offers	2.72	1.22	29.7%	41.2%
Personalized information and services	2.24	1.30	22.7%	64.1%
Entertaining features	2.15	1.21	17.7%	65.5%
Being trendy/ahead of my time	2.04	1.18	15.4%	68.8%
Lack of proficiency with computers	1.89	1.33	16.5%	75.1%
Only connection to the Internet	1.84	1.31	13.7%	75.2%
Accentuation of social status	1.65	1.00	8.4%	81.3%

[1] *Percentage of consumers who responded* strongly agree *[5] and* agree *[4]*

[2] *Percentage of consumers who responded* strongly disagree *[1] and dis*agree *[2]*

As noted, it has been commonly hypothesized that handheld devices will expand access to the Internet, and increase the overall volume of e-commerce as consumers are much more familiar with mobile devices than with PCs. However, the results of this study certainly did not support this view, as the associated benefits (the *mobile device being the only Internet connection*, and *lack of proficiency with computers* were not seen as sources of attractiveness of m-commerce for the general public or for the sub-samples constituting the "untapped" market (see Table 2).

Table 2: *Perceived Importance of Benefits by Sub-samples: Tests of Differences of Means*

BENEFIT	Mobile Internet adoption			*Sig.*	M-commerce adoption			*Sig.*
	adopters	intended	averse		adopters	intended	averse	
Enhanced communication features	4.05	4.01	3.39	.000 [c]	3.47	4.11	3.49	.000 [c]
Flexibility (anywhere, anytime)	4.05	3.98	3.45	.000 [c]	3.94	4.12	3.43	.000 [c]
New dimensions of communication	3.50	3.49	2.54	.000 [b,c]	2.76	3.65	2.71	.000 [a,c]
More effective use of time	3.36	3.09	2.26	.000 [b,c]	2.53	3.36	2.41	.000 [a,c]
Convenience and handiness	3.27	3.76	3.10	.000 [c]	3.29	3.85	3.10	.000 [c]
Reminder/information services in real time	3.14	3.32	2.65	.000 [c]	3.18	3.42	2.74	.000 [c]
Uniqueness: exclusively mobile services	3.09	3.43	2.47	.000 [c]	2.71	3.48	2.67	.000 [c]
Lower prices/special offers	2.73	3.02	2.41	.000 [c]	2.53	3.12	2.46	.000 [c]
Entertaining features	2.00	2.47	1.82	.000 [c]	1.76	2.47	1.97	.000 [c]
Personalized information and services	1.91	2.46	1.98	.001 [c]	2.29	2.50	2.06	.004 [c]
Being trendy/ahead of my time	1.82	2.29	1.70	.000[c]	1.47	2.34	1.87	.000 [a,c]
Only connection to the Internet	1.41	1.89	1.97	.189	1.71	1.87	1.87	.883
Accentuation of social status	1.41	1.74	1.48	.027 [c]	1.71	1.70	1.60	.614
Lack of proficiency with computers	1.00	1.81	2.14	.000 [a,b]	1.65	1.82	1.94	.516
Aggregate	2.62	2.91	2.39	.000 [c]	2.51	2.98	2.46	.000 [a,c]

[a] *significant differences (p < .05) between adopters and intended adopters (Sheffé)*

[b] *significant differences (p < .05) between adopters and averse (Sheffé)*

[c] *significant differences (p < .05) between intended adopters and averse (Sheffé)*

Mean values for all the benefits and barriers were calculated for all sub-samples, and an analysis of variance with subsequent post hoc tests was employed to identify the main drivers and inhibitors to the adoption of mobile electronic channels. Comparing the stated importance of the benefits by the different consumer groups (Table 2), we can conclude that the two main drivers to early and intended adoption of the mobile Internet and m-commerce are clearly the *enhanced communication features* and *flexibility (anywhere, anytime)*. These benefits are, in contrast to nearly all of the proposed benefits, acknowledged even by the consumers who are Internet and m-commerce averse.

Interestingly, the consumer groups by far most convinced of the benefits offered by the mobile Internet and m-commerce were the intended adopters. These consumers reported the highest mean scores on most of the proposed benefits as well as on the aggregate benefit value. Based on basic statistical tests of differences between adopters and intended adopters, we did not find any benefits that would explain why intended adopters of mobile Internet and/or m-commerce have not already become adopters. An equally interesting and unexpected finding was that most of the proposed benefits were perceived

as less important by the m-commerce adopters than by the mobile Internet adopters. This suggests that the key motivation for embracing transaction-based m-commerce does not lie in a greater appreciation of the benefits associated with commerce over wireless devices. Instead, the fact that some mobile Internet adopters have moved on to m-commerce is primarily explained by differences in perception of the barriers involved (see Table 4).

4.3   Barriers: The 'Give' Value Components

As far as the 'give' value components are concerned, nearly all of the proposed barriers were perceived as significant impediments to using mobile services today or in the future. Yet, the *cost-related* issues (*high operating costs, high initial costs*) stood out as the main barriers to using mobile services today or in the future. The limitations of the current technology (*limited capacity of devices, slow connection and/or data transfer*) were also seen as crucial, whereas the risks relating to *privacy and security* were not, interestingly, perceived to be equally critical as in the wired e-commerce environment (cf. Furnell and Karweni, 1999; Anckar, 2002a).

Table 3: *Summary Statistics for Barrier Variables (N = 395-413)*

BARRIER	Mean	SD	Agree[1]	Disagree[2]
High operating costs	3.95	1.13	73.7%	13.4%
High initial costs	3.81	1.22	69.5%	18.6%
Limited capacity of mobile devices	3.77	1.03	63.8%	10.0%
Slow connection and/or data transfer	3.68	1.06	54.2%	10.4%
Fear of privacy invasion	3.56	1.26	58.6%	20.6%
Security risks	3.55	1.24	57.9%	22.6%
Uselessness of services	3.50	1.11	52.9%	18.9%
Small screen size of mobile devices	3.50	1.25	59.7%	25.2%
Poor coverage of networks	3.37	1.10	48.4%	20.9%
Complexity involved in using mobile services	3.34	1.07	45.4%	21.5%
Complexity involved in operating mobile devices	3.01	1.21	37.1%	36.4%
Lack of new mobile devices on the markets	2.88	1.11	25.7%	31.5%

[1] *Percentage of consumers who responded* strongly agree *[5] and* agree *[4]*

[2] *Percentage of consumers who responded* strongly disagree *[1] and dis*agree *[2]*

When working out distinctions between different sub-samples in terms of mobile Internet and m-commerce adoption, we found that the consumers' decisions and intents to take on mobile technologies appeared rational when observing their perceptions of the barriers. Overall, the adopters perceive the barriers to using mobile services as less significant than non-adopters, with the adopters of m-commerce even less concerned about the impediments than the mobile Internet adopters (when evaluating these results, it should be noted that we had significant results in only 5 cases). However, some important exceptions from this pattern can be found: <u>Firstly</u>, three of the four barriers that were perceived as the most critical among the mobile Internet adopters *(slow connection/data transfer*, *limited capacity of mobile devices,* and *uselessness of services*) were not seen as equally important by the non-adopters, indicating that these particular barriers are real (in the sense related to actual use) rather than presumed. <u>Secondly</u>, the barrier *uselessness of mobile services*, which was rated as the most critical impediment by the m-commerce adopters, was not perceived to be equally crucial by the non-adopters.

Table 4: *Perceived Importance of Barriers by Sub-Samples: Tests of Differences of Means*

BARRIER	Mobile Internet adoption			Sig.	M-commerce adoption			Sig.
	adopters	intended	averse		adopters	intended	averse	
Slow connection and/or data transfer	4.23	3.74	3.42	.000 b,c	3.76	3.83	3.58	.080
Limited capacity of mobile devices	4.05	3.75	3.65	.217	3.75	3.81	3.74	.804
High operating costs	3.77	3.93	4.03	.484	3.18	3.97	3.99	.016 a,b
Uselessness of services	3.68	3.40	3.56	.292	3.76	3.34	3.59	.054
The fear of privacy invasion	3.41	3.49	3.64	.460	3.06	3.49	3.61	.182
High initial costs	3.36	3.88	3.89	.140	3.29	3.85	3.83	.199
Security risks	3.14	3.58	3.61	.237	3.06	3.47	3.64	.109
Complexity of using mobile services	3.09	3.26	3.47	.092	3.06	3.23	3.42	.141
Poor coverage of networks	3.05	3.39	3.47	.241	2.75	3.32	3.44	.039
Lack of new mobile devices on the market	2.95	2.93	2.87	.886	2.53	2.99	2.83	.160
Small screen size of mobile devices	2.82	3.39	3.60	.017 b	3.41	3.46	3.54	.804
Complexity of operating mobile devices	2.41	2.98	3.21	.007 b	2.29	2.87	3.14	.005 b
Aggregate	3.36	3.48	3.54	.458	3.14	3.47	3.53	.087

For meaning of symbols, see Table 2.

Other important survey findings relating to the barriers were that (i) *security risks* are not a major concern for Internet and m-commerce adopters, whereas non-adopters tend to be more sceptical in this respect; (ii) actual users of the mobile Internet and m-commerce are mainly troubled by the *limitations of networks and mobile devices*; and (iii) *high initial and operating costs* are the main inhibitors to m-commerce adoption.

5.   Conclusions

Arguing that TAM constructs such as perceived usefulness and perceived ease of use are multidimensional constructs that are too general to have significant explanatory power, we set out from a perceived value-based view on adoption decisions with the objective to identify the key benefits and barriers - the core get and give value components - that drive or inhibit consumer adoption of mobile commerce today and in the future.

As far as the first research question of this study is concerned, our study has shown that adoption/rejection decisions - and especially intents - relating to the mobile Internet and m-commerce appear to be determined to a greater extent by perceived benefits than by perceived barriers. More precisely, the main determinants of m-commerce adoption or rejection are not primarily related to a wide disagreement on the obstacles involved in using mobile services, but instead they originate from conflicting perceptions on a number of key benefits offered by mobility[6]. This finding contradicts with the results of previous studies, which have shown that consumers' rejection decisions relating to (i) PCs and (ii) e-commerce in a fixed environment are based on perceived critical barriers to

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[6] *Enhanced communication features, flexibility, new dimensions of communication, more effective use of time.*

a much higher extent than on a lack of appreciation of the associated benefits (Venkatesh and Brown, 2001; Anckar, 2002a).

It should, however, be noted that the recognition of the overall benefits was rather low in comparison to the perceived barriers in all consumer groups - even among the current users of the mobile Internet and m-commerce. The overall value of m-commerce is thus not seen as substantial, a fact which would suggest that the commercial prospects of m-commerce are not as bright as is often proclaimed. Likewise, the facts that (i) the intended users paint a rosier picture of the promise of m-commerce, expecting to derive greater value from mobile technologies than the actual users report that they currently attain, and (ii) almost 60% of the respondents reported that they have no intention to use mobile services in the future, certainly do not signal an imminent m-revolution. On the other hand, considering that m-commerce is a just emerging phenomenon, the portion of the sample indicating an intention to use mobile services should by no means be seen as insignificant: Companies attempting to predict consumer interest in brand new products or service concepts are often greeted with a disappointing show of interest from the end users (Yankee Group (2000)), as their appreciation of the associated benefits may be limited, and their assessment of the barriers involved may be exaggerated.

As far as the importance of the drivers/inhibitors (RQ 2) are concerned, we found a clear divide between different consumer segments: *Adopters* and *intended adopters* feel that the mobile Internet and m-commerce can offer a number of important benefits, especially with respect to *enhanced person-to-person communication* and *flexibility* (being able to use mobile services anywhere, anytime), whereas the *averse* consumers perceive nearly all of the proposed advantages as unimportant.

Mobile Internet adopters perceive greater barriers in terms of the *limitations of networks and mobile devices* than the non-adopters, indicating that these factors constitute significant barriers to mobile Internet usage today and thus likely also to an extensive use of mobile services in the future. For the current non-adopters, the *high initial and operating costs* were found to be the key factors that are influential in a non-adoption of mobile services.

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APPENDIX 1: The Survey Instrument: Question Phrasing

To you personally, major <u>benefits</u> of using mobile (wireless) services today or in the future are:

My only connection to the Internet is through my mobile device (I do not own a computer, nor do I use one at work)

I lack proficiency with computers, and therefore I prefer to use a mobile device over a computer

Flexibility with respect to my location ("anywhere") and the time of the day ("anytime")

The convenience and handiness of small, wireless mobile devices (in comparison to desktop computers)

The possibility to get reminder and information services (for instance hot news) in real time, as the mobile device is always connected to the network, and always with me

Entertaining features; mobile services are nice time killers/fillers.

Being trendy/ahead of my time

Accentuation of my social status

The possibility to get personalized information (e.g. personal horoscope) and personal service (e.g. health service reminders such as "remember to take your medicine").

Enhanced communication features: Using short messages (text/audio/pictures/video) I can reach persons even when I cannot talk on the phone, or when the person I try to reach does not answer the phone

The new dimensions of communication (picture/audio/video messages, streaming video; the possibility to have visual contact with the person you are talking to)

The more effective use of time (I can, for instance, send e-mails, order groceries, check my bank account or pay bills while sitting in the dentist's waiting room)

Uniqueness (the possibility to use services that are intended only for/ available only through mobile devices - for instance pinpointing/routing services, making small payments such as parking fees ,purchases at vending machines, etc.)

Lower prices (some special offers are available only through mobile devices)

To you personally, major <u>impediments</u> to using mobile (wireless) services today or in the future are:

High initial costs (costs of acquiring a mobile device)

High operating costs (costs of subscriber connection and mobile services)

Limited capacity / computing power of mobile devices in comparison to desktop computers

Slow connection and/or data transfer (connecting to the service provider and/or downloading files takes too long)

Complexity involved in operating mobile devices

Complexity involved in using mobile services (time consuming, lack of graphical support, etc.)

Small screen size of mobile devices
Lack of new mobile devices on the markets
Uselessness of services (purposeful and appealing mobile services are not available)
Poor coverage of networks (faulting connections, or connection missing entirely in some areas)
Security risks (concerns for the safety of personal information and/or the security of financial transactions)
The fear of privacy invasion (for instance as a result of numerous e-advertisements being sent to your mobile device)