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Communication behaviors and perceptions of mobile Internet adopters:

An empirical analysis based on actual usage data

Work in Progress # 99

February 2010

Abstract

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www.zftm.de

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To date, research on the first adoption and the subsequent use acceptance of Internet access via cellular networks and portable appliances (= mobile Internet) has typically followed a similar pattern: It has employed survey responses of mobile network operator [MNO] customers to explain consumers' stated future use (continuance) intentions or claimed use intensities related to mobile Internet [MI] access by various beliefs about MI (e.g., usefulness, ease of use). However, there is ample evidence indicating that MI use intentions and self-reported use intensities are only weakly correlated with actual MI use. Hence, the present work explores actual MI use intensity and relationships between this usage behavior and mobile voice call as well as SMS quantities at the individual customer level. Furthermore, it develops and empirically tests hypotheses pertaining to MI use intensity impacts of common evaluative perceptions of MI adopters, but also of largely ignored straightforward descriptors of verifiable MI use case features. The analysis is based on objective MI, voice telephony, and SMS use intensity data obtained for a sample of 443 MI customers of an MNO in Germany. "System-captured" use measures are integrated with adopter responses collected by means of a standardized telephone survey. Observed sample distributions of MI, voice telephony,

and SMS use intensities are highly skewed. A small group of users disproportionately contributes to the total MI traffic generated by the sample. Most customers use MI only to a very limited extent after the initial adoption. MI use intensity is not significantly correlated with mobile voice communication or SMS activity levels. Factual MI use case features (MI tariff type and appliance class, fixed broadband Internet home access) are significant predictors of MI use intensity, whereas MI-related evaluative perceptions (e.g., MI value assessment) are not. The findings suggest that variable relationships observed in earlier MI and information technology (IT) acceptance studies are likely to have been inflated by common method bias. Implications of the results for MNO seeking to forecast and to influence the MI use intensity of their customers and for future MI and IT acceptance research are discussed.



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Keywords:

Acceptance; Adoption; Common method bias; Customer behaviors; Customer perceptions; Factual use case features; Mobile Internet; Mobile telephony; SMS; Use intensity measurement

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1. Introduction

Mobile Internet (MI) or mobile Web entails packet-switched and Internet Protocol- (IP-)based access to a broad assortment of value-added data applications (e.g., web browsing, email, video streaming) via cellular mobile communication networks (Ahn et al., 2006; Kim, Chan, & Gupta, 2007; Lee et al., 2007; Bouwman et al., 2009; Shin et al., 2009). MI is enabled by the deployment of enhanced second-generation (2G) and third-generation (3G) cellular mobile network technologies such as EDGE, W-CDMA/UMTS, or CDMA-2000. These technologies allow data transfers at transmission speeds frequently far above a download bandwidth of 1 Mbit/s. They create the foundation for a wide range of mobile non-voice communication, information, entertainment, and commercial transaction services. MI tries to provide the same “look and feel” as wired Internet access alternatives at fixed locations (DSL, cable modem, telephone line dial-up) or as wireless platforms such as WLAN/WiFi or WMAN/WiMAX which provide a more strongly constrained geographical reach (cf., Kim & Jee, 2006; Gimpel, 2009).

MI distinguishes itself from other fixed or “portable” Internet access systems by including the option to use the web anywhere (“ubiquitous communication”) even while traveling at high speed (e.g., in trains). MI is a *subset of mobile data services (MDS)*, which do not only cover IP-based delivery of applications known from the conventional Internet. Rather, they additionally encompass the entirety of more or less established variants of text messaging services (SMS, MMS), location-based services, and WAP-based applications delivered by mobile network operators (MNO) (Bina, Karaiskos, & Giaglis, 2008; Hong et al., 2008; Lee, Shin, & Lee, 2008; Kuo, Wu, & Deng, 2009; Qi et al., 2009).

Worldwide MNO set strong hopes on MI as a market with enormous subscriber and revenue growth (BITKOM, 2009; IDATE, 2009). However, to date, various surveys suggest that only a small proportion of MNO customers who are already equipped with devices which possess the technical capability of accessing MI effectively apply this capacity (Koivumäki, Ristola, & Kesti, 2008; Accenture, 2009; Fittkau & Maaß Consulting, 2009; Malhotra & Malhotra, 2009). In addition, a considerable share of subscribers fails to use MI intensively or even completely ceases to apply MI after the initial adoption (Lee et al., 2007; Kim, Lee, & Kim, 2008; Lee, Shin, & Lee, 2008; Verkasalo, 2008b).

Considering these adoption and use gaps it should not come as a surprise that over the past few years a large body of scholarly research has evolved on factors influencing customers’ initial MI or advanced MDS adoption decisions as well as their use continuation behaviors after the first adoption. The vast majority of this work is characterized by three features. First, it analyzes stated behavioral intentions to use MI in the future or claimed MI use frequencies in the past as criterion variables. Secondly, it provides little information on the distribution of MI use intentions or actual use intensities in the study samples but mostly briefly describes the sample average values of such variables. Finally, it limits the factors considered as potential determinants of various MI acceptance measures to constructs mainly derived from the Technology Acceptance Model (TAM) of Davis, Bagozzi, & Warshaw (1989).

These structural similarities of many investigations on MI or MDS acceptance do not guarantee that scholarly evidence is seminaly accumulated. Rather, it may severely hamper the scientific and practical

value of and progress in MI acceptance research (Straub & Burton-Jones, 2007). First, with regard to the dependent criteria of past work there is ample evidence revealing that consumers' self-stated behavioral MI use *intentions* are poor predictors of *actual* buying and use behaviors for telecommunication and information technology (IT) services (Szajna, 1996; Kim & Malhotra, 2005; Verkasalo, 2008a). Furthermore, the validity of studies which have drawn on self-reports of MI use frequency and duration is also uncertain at least because several investigations have found that retrospective measures share very limited variance with actual behavioral data (Kim & Malhotra, 2005; Kim, Lee, & Kim, 2008). Hence, the validity of the acceptance criteria measures of most earlier purely survey-based research is likely to be low (Legris, Ingham, & Collette, 2003, p. 202). In fact, a recent meta-analysis of 75 data sets on the relationship between perceived IT usefulness and IT acceptance measures detected that the magnitude of the association between the two constructs was a function of how acceptance had been measured in a study: The average usefulness-acceptance correlation fell from a significant value of 0.59 in investigations that obtained both independent variables and use intention reports through one questionnaire from the same rater to an insignificant value of 0.16 in work which had employed objective, system-captured records of actual IT use intensities as acceptance criteria (Sharma, Yetton, & Crawford, 2009). Thus, extant evidence on customer perceptions of specific MI attributes as determinants of consumer MI or MDS acceptance may to a large extent not reflect true covariance between the attributes and MI acceptance, but spurious associations caused by common method bias (Straub & Burton-Jones, 2007; Sharma, Yetton, & Crawford, 2009).

Secondly, the study of Verkasalo (2008a, 2008b, 2009) indicates that the distribution of use intensity among MI adopters was highly skewed: A small share of very heavy MI users generated a very large proportion of the MI traffic observed for his sample, whereas about 80% of the adopters were responsible for less than 35% of the total MI traffic of Verkasalo's sample. Unfortunately, since prior MI and MDS research applying actual MI use intensity data is very scarce I am not aware of any single MI or MDS acceptance study that has explored to what extent Verkasalo's observation on the skewness of the MI use intensity distribution among adopters also holds in other samples.

Finally, most investigations have relied on the TAM as a conceptual framework and therefore emphasized customer perceptions of MI "usefulness" and "ease of use" as most significant determinants of MI acceptance. This focus has been criticized as being tautological, trivial, too narrow, and of little help to management practitioners because it does not address the issue of which features shape customers' usefulness and ease of use impressions (Baron, Patterson, & Harris, 2006; Benbasat & Barki, 2007; Bouwman et al., 2009; Bouwman & Wijngaert, 2009; Gimpel, 2009).

The purpose of the present paper is to contribute to the literature on MI acceptance by overcoming the narrow perspective of extant work in three ways. First, the present research obtained actual MI use data from the billing system of an MNO in order to measure post-adoption MI acceptance. Secondly, it provides evidence on the value distribution of mobile communication behavior indicators in a sample of MI adopters. Finally, it not only included perceptual constructs repeatedly highlighted in past MI and MDS acceptance

work. Instead, it added several factual MI use circumstances largely discarded in previous research as predictors of MI use intensity. These complementary predictors describe objectively verifiable attributes of MI use cases (e.g., appliance category, tariff type, availability of fixed broadband Internet access at home) for which past publications imply that they may play a considerable role in improving the understanding of key drivers of MI acceptance (Kim & Jee, 2006; Bouwman et al., 2007; Malhotra & Malhotra, 2009; Qi et al., 2009; Shin et al., 2009).

These contributions are expected to be valuable both for scholars and practitioners in the fields of telecommunication/IT management. They help to assess whether earlier mono-method evidence relating to factors influencing customer acceptance of MI and MDS is replicable with actual MI use intensity data as dependent variables. The replication issue is important to avoid misleading conclusions from single-method studies. Furthermore, they urge researchers and practitioners to consider factual MI use case circumstances as factors which help to better understand and influence MI use intensity at the individual consumer level.

The rest of this paper is divided into four sections. The following section develops hypotheses on the distribution and interdependencies of mobile communication behaviors among MI adopters as well as on determinants of their MI use intensity. Section 3 describes the empirical methods employed to obtain measures of the study variables. The empirical results are then presented. Sections 5 and 6 discuss the statistical findings and their practical and research implications.