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Empirical research on mobile Internet usage

A meta-analysis of the literature

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Abstract

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This paper reviews 175 scholarly empirical publications on mobile Internet (MI) usage intensity levels and potential determinants of respective usage behavior at the individual subscriber level. Based on an overview of MI measurement approaches and units evidence on the development of the average MI data volume generated per subscriber over the last years is summarized. Interindividual variance in MI usage was found to be very large. This raises the question which factors contribute to explaining MI usage differences. A qualitative review and a meta-analysis of correlations between 22 variables grouped into four categories (country, personal user characteristics, MI attribute perceptions/behavioral intentions and factual use conditions) on the one side and MI usage criteria on the other were carried out. Enjoyment, behavioral intention to use MI, educational level, subscription of a flat rate and ease of use turned out to be the five antecedents with the largest sample size- and measurement error-corrected average correlations \bar{r}_a with MI usage criteria. Moderator analysis indicated that the approach to measuring MI usage behaviors (subjective versus objective) and geographic origin of a sample (Asia versus Europe/USA) significantly altered relationships between a number of predictors and MI usage. Specifically, mono-method work which measures both explanatory factors and MI usage in one questionnaire was prone to overestimate relationships between independent study

variables and self-reports of MI usage. The review derives open research issues in three territories, namely measurement of MI usage, choice of MI usage determinants as well as study sampling and design.



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1. Introduction

Over the last decade, the adoption and utilization of the mobile Internet (MI), i.e. Internet access through cellular communication networks via various portable appliance categories, has surged significantly. The number of worldwide MI-enabled users passed the one billion mark in 2011. Some countries, such as South Korea and Singapore are already approaching MI market saturation with the number of MI-enabled SIM cards exceeding the number of people in the respective nations (Broadband Commission, 2012; ITU, 2012). Concomitantly, mobile data traffic volume has grown exponentially. According to Cisco (2012), global MI data traffic has again more than doubled in 2011 compared to 2010 and is expected to increase 18-fold between 2011 and 2016.

For mobile network operators (MNO), which face more intense price competition and saturation on voice calls resulting in decreased profit margins for this service type, data services are a new source of revenue growth. For instance in Germany, MNO generated more than 25% of their service revenue with mobile data services, excluding SMS and MMS in 2012 (Dialog Consult & VATM, 2012). However, increased MI traffic also poses severe challenges for MNO in struggling with network congestion (Taylor, 2012; Wortham, 2011). As a consequence, fair use policies, i.e., throttling of data transmission speed beyond certain thresholds are introduced to ensure a reasonable service quality for all users (Chetty, Banks, Bernheim Brush, Donner, & Grinter, 2012; Ha, Joe-Wong, Sen, & Chiang, 2012; Harno, 2010). Nevertheless, massive capacity investments in both 3G and 4G networks are required to meet the growing demand for mobile data. For targeting infrastructure expansion and understanding the impact of MI marketing measures it is

essential for MNO and business scholars alike to understand levels and drivers of MI usage intensity.

Accordingly, these developments in the mobile communications market triggered a substantial body of research on MI use behaviors of MNO customers. These studies cover a broad variety of determinants and measures of MI use facets for different types of MI services.

With regard to dependent criteria, research can be grouped into work that looked at behavioral intentions concerning the initial subscription to an MI offer (= adoption intentions) or the subsequent MI use continuation on the one hand and investigations focusing on use behaviors on the other. MI adoption and subsequent continuance intentions are defined as deliberate action plans of an individual to use MI in the future either for a first trial or permanently after this trial. Intention constructs are not directly observable and can be only captured by asking people about such plans. In contrast, "actual" or "overt" MI use behaviors can not just be measured by subjective introspection (i.e., self-observation) but also through network- or customer device-based objective technical installations.

Previous work on antecedents and consequences of MI use intentions was recently reviewed in a number of articles (AlHinai, Kurnia, & Smith, 2010; Feng, 2009; Platzer, 2009; Wu, Chen, Zhou, & Guo, 2010; Wu, Zhao, Zhu, Tan, & Zheng, 2011; Zhang, Zhu, & Liu, 2012). Therefore, for the present paper we chose not to add another synopsis of research on MI use intentions and its correlates. Nevertheless, we note that prior use intention studies suggest that the overlap between MI use intentions and behaviors is limited to such an extent that it is inappropriate to

take MI use intentions as a surrogate of MI use behaviors (Choi, Kim, & Kim, 2011; Gerpott, 2011b; Kim & Malhotra, 2005a; Turner, Kitchenham, Brereton, Charters, & Budgen, 2010; Wilhelm, Strahringer, & Smolnik, 2012; Wu & Du, 2012; Zhang, Zhu, & Liu, 2012; see also section 3.3.3 below). Rather, MI use intentions can be seen as one, albeit important, element of a larger set of factors influencing MI use behaviors.

MI use behaviors in turn encompass a person's first subscription to an MNO's MI offering (= adoption; dichotomously scaled variable) and the extent of ongoing MI use (= MI usage [intensity]; steadily scaled variable) following the initial adoption. Previous studies indicate that antecedents of continued usage differ from those of initial adoption behaviors (e.g., Kim & Malhotra, 2005b; Kim & Oh, 2011; Venkatesh, Morris, Davis, & Davis, 2003). Therefore, insights on determinants of MI adoption cannot necessarily be transferred to MI usage. However, for telecommunication network operators the viability of a service does not only depend on adoption but, to a larger extent, on continued usage (Kim, 2010). Ongoing usage behaviors as reflected in MI access frequency, duration or data volume are essential for the commercial success of MNOs' mobile data offerings.

Therefore, it should not come as a surprise that scholars have started to empirically explore post-adoption MI usage intensities and the individual-level determinants of such behaviors. To the best of our knowledge, this strand of research has not yet been synthesized.

Against this background, the main goals of our literature review are to

- integrate the state of scholarly empirical publications on MI usage, application situations which benefit most from such offerings.
- document findings on MI usage intensity levels, The remainder of this article is organized as follows: The next section outlines the review methodology including the study selection criteria, coding and analysis procedures. Section 3 summarizes univariate findings on MI usage levels and bi-/multivariate studies on determinants of MI usage. It also outlines research gaps. Limitations and final conclusions are presented in section 4.
- quantify the average size of associations between various potential determinants of MI usage and MI usage measures across studies,
- explore whether relationships between selected antecedent variables and MI usage are moderated by study characteristics (e.g., regional origin of sample),
- identify promising MI usage research areas.

The paper contributes to the literature because extant work is very fragmented and scattered across a wide variety of disciplines. Furthermore, research is varying in quality with regard to sampling procedures as well as reliability and validity of variable measurements. Consequently, it is challenging to obtain an overview of the current state of knowledge. We provide such an overview. It is expected to be valuable for telecommunication scholars because it helps to understand which specific variables and underlying conceptual frameworks explain interindividual variance in MI usage. Furthermore, it should sensitize researchers that specific study attributes have an important effect on the likelihood of detecting a strong or weak association between a potential explanatory factor and MI usage. Such an understanding is also valuable to MNO practitioners. It supports executives in planning mobile data network capacities and in updating customer segmentations, which were previously based on voice and SMS usage behavior. This in turn is a prerequisite for targeting new MI services or tariffs to customer groups and