Torsten J. Gerpott/Sandra Thomas/Michael Weichert

Usage of established and novel mobile communication services: Substitutional, independent or complementary?

An empirical study of residential mobile network operator customers in Germany

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Abstract

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Usage of established and novel mobile communication services: Substitutional, independent or complementary?

Past scholarly empirical work on consumption interrelationships between various categories of mobile network operator (MNO) services is mainly limited to established short message service (SMS) and voice calling. Research exploring the interplay between the consumption levels of these two MNO-provided services and the use intensity of the novel offering to access the Internet via cellular radio infrastructures (= mobile Internet [MI]) is scarce. This gap is addressed in the present article. Based on a review of theoretical perspectives on consumption relationships across mobile services a positive interdependence between the use intensities of the two traditional services and MI access is hypothesized. In addition, supplementary hypotheses and research questions on associations between personal background characteristics, device type and MI adoption time of cell customers on the one side and levels of SMS and voice service usage on the other are developed. "System-captured" measures on individual real service consumption behaviors and the remaining study variables are extracted from customer and billing data archives of the German subsidiary of a large international MNO. Regression analysis of data from 8,312 customers of this MNO indicates that MI use intensity (average monthly volume of mobile IP traffic generated by a subscriber in May and June 2011) is positively related to monthly number of SMS sent and outbound mobile voice minutes. The interrelationships are highly statistically significant but the absolute effect sizes are merely of "small" relevance. Age and male gender are strongly negatively related to SMS consumption. Subscription to an unmetered tariff scheme for SMS and voice has substantial influence both on SMS sent and outgoing voice minutes. SMS use intensity appears to be less price sensitive than outgoing voice minute quantities. The study variables explain only a negligibly small proportion of variance in incoming voice minutes. Practical implications for MNO and directions for future research are discussed.

Univ.-Prof. Dr.
Torsten J. Gerpott

Leiter des Lehrstuhls Unternehmens- und Technologieplanung, Mercator School of Management, Universität Duisburg-Essen, Lotharstr. 65, D-47057 Duisburg.

Dipl.-Kff. Sandra E. Thomas

Senior Business Consultant, BearingPoint GmbH, Gladbecker Str. 5, D-40472 Düsseldorf.

Dr. Michael Weichert

Leiter Business Management Marketing Internet, Vodafone D2 GmbH, Am Seestern 1, D-40547 Düsseldorf.

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Contents

1. Introduction

Worldwide, a rapidly increasing number of consumers opt for ubiquitous access to the Internet and Internet Protocol-(IP-)based services through high speed third- or fourth-generation (3G or 4G) nationwide cellular networks even while being on the move. This trend towards *mobile Internet* (*MI*) access and use is reflected in a strong sales jump of sophisticated mobile handheld devices, so-called "advanced" or "smart" phones. According to market researchers, the worldwide shipments of MI-enabled mobile phones grew at a compound annual growth rate of 42% from 119.7 million in 2007 to 481.3 million in 2011 (Strategy Analytics, 2011). Simultaneously, global MI traffic has started to explode: research of Cisco (2011) indicates that this traffic increased by a factor of 2.3 in 2011 compared to the previous year. It is expected that the demand for advanced MI-enabled handsets will continue to soar to a sales level of 926.9 million phones in 2016 (Strategy Analytics, 2011). This development is predicted to be among the key factors leading to an eleven-fold rise of the global mobile data traffic by 2015 over 2011 (Cisco, 2011).

At a first glance, the bright MI market demand projections appear to have solely positive business implications for mobile network operators (MNO), since they promise increasing revenues and profits from MI access and services. However, a closer look reveals that MI diffusion and usage increases may also have negative commercial ramifications for MNO. Novel MI applications could substitute the traditional MNO-provided short message service (SMS) and (circuit-switched) mobile voice calls sold at high prices by IP-based packet-switched (instant) messaging and voice call surrogates (e.g., *WhatsApp, Skype*) or other service types which generate lower prices per service unit and consequently reduce MNOs' profit contribution margins. Furthermore, usage of SMS or mobile voice service simply could decrease because customers have a limited time and monetary budget for telecommunication activities and spend more time and money on MI applications (such as emailing or entertainment services). On the other hand, high levels of MI usage could also lead to additional mobile voice calls or SMS because the value of content that consumers locate on the Internet or that they pass on over the Internet is frequently enhanced as consumers exchange their opinion about down-/uploaded material with other people. Hence, there are arguments to suggest either a negative or a positive interdependence between usage amounts of established mobile communication services (i.e., SMS and voice calls) and MI activity level.

Surprisingly, most previous empirical scholarly work on consumers' usage behavior of various mobile communication service categories leaves out *MI use intensity* (= volume of up- and downloaded IP traffic of an MI adopter during a specified time period). Even a forthcoming article of Niculescu & Whang (2012) merely deals with adoption (in the sense of the initial subscription decision) interdependencies between mobile voice and MI services but neither considers the much more economically relevant interplay in the consumption levels of both services nor includes SMS. This research gap is unfortunate because these relationships are not only interesting from an academic consumer behavior point of view in order to better explain mobile communication service use patterns in a multi-category supply situation. Rather, a deeper understanding of cross-demand interdependencies between MI use and SMS/mobile voice call activity levels is also important for practitioners. First, this knowledge is helpful in making better informed MNO marketing strategy decisions concerning, among others, the integration of MI access, SMS, or mobile voice service in "bundled" offerings. Second, this understanding is beneficial for telecommunications sector regulatory authorities in improving their decisions on the delimitation of SMS, mobile voice, and MI access/services markets. It is exactly this demarcation analysis that constitutes a pivotal element in appropriately assessing the competitive intensity and the resulting need for regulatory remedies in various telecommunication submarkets.

Therefore, it is the primary purpose of the present study to empirically examine the extent to which MI usage intensity explains variance in SMS and mobile voice service demand at the level of the individual MNO customer. Besides addressing the described research lacuna this paper additionally expands prior work at least on two counts.

First, past research has overwhelmingly captured mobile communication behaviors by subjective retrospective assessments of mobile subscribers regarding their use duration or frequency of mobile services through written questionnaires at a single moment in time (e.g., Höflich & Rössler, 2001; Tung, 2004; Turel, Serenko, & Bontis, 2007; Butt & Phillips, 2008; Jiang, 2008; Wei, 2008; O'Doherty, Hill, Mackay, & McPherson, 2010; Armey, Vladàr, & Pereira, 2011; Peslak, Shannon, & Ceccucci, 2011; Kim, 2012). In contrast, the present investigation obtained objective "system-captured" (Sharma, Yetton, & Crawford, 2009: 479) measures of SMS, mobile voice and MI use quantities. This design shift is seminal because there is ample evidence that self-reports of com-

munication activities at best correlate weakly with non-perceptual measures of actually observed communication behaviors (Kim, Lee, & Kim, 2008; Rahmati, Shepard, Tossell, Dong, Wang, Zhong, & Kortum, 2011; Gerpott, 2011). Hence, our work responds to admonitions frequently voiced by scholars (e.g., Legris, Ingham, & Collerette, 2003; Turner, Kitchenham, Brereton, Charters, & Budgen, 2010; Choi, Kim, & Kim, 2011) to move beyond purely questionnaire- and convenience sample-based data collection procedures as a prerequisite to improve the quality of variable measurements and to decrease validity threats stemming from common method variance in research on the acceptance of telecommunications services.

Second, many earlier studies on interrelations between the use intensity of distinct mobile communication service categories (e.g., Höflich & Rössler, 2001; Grzybowski & Pereira, 2008; Wei, 2008; Andersson, Foros, & Steen, 2009) included only a very narrow set of variables or even no other factors which probably also affect the use intensity of SMS or mobile calling. In contrast, the present research incorporates a broader array of variables such as socio-demographic and MNO-related background characteristics or the phone type of the subscribers to explore the incremental contribution of MI usage intensity towards explaining SMS and mobile voice calling activity levels after controlling for potential other demand drivers of the two established focal mobile service categories. These "control variables" are taken up in a series of hypotheses and research questions, which supplement our primary research goal.

The rest of this article is structured as follows. To derive the two prime study hypotheses, the first part of the next section suggests distinguishing three theoretical perspectives on interdependencies between MI usage intensity and SMS quantities sent and mobile voice calling activity levels, respectively. In the second part of section 2 four additional hypotheses and two research questions regarding the impacts of the incorporated control variables on usage intensities of the two established mobile services are formulated. Section 3 covers the empirical methodology. We then report the empirical findings. Section 5 discusses practical implications of our work. Section 6 concludes with propositions for future research, which arise from the present study's limitations.