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**SMS use intensity changes in the age of ubiquitous mobile Internet access:
A two-level investigation of residential mobile communications customers in Germany**

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Abstract

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SMS use intensity changes in the age of ubiquitous mobile Internet access: A two-level investigation of residential mobile communications customers in Germany

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Using data of 11526 residential postpaid subscribers of the German subsidiary of a multinational mobile network operator (MNO) extracted from the firm's customer and billing records, this investigation empirically examines the association between monthly mobile Internet (MI) data traffic volume generated by consumers and their monthly number of SMS sent at the within- and between-subjects levels over 25 months from October 2011 to October 2013. Multilevel analysis of the time-varying and -constant study variables suggests that, in spite of a sharp decrease in the average/median number of outgoing SMS between the first and the last study month, customer heterogeneity with regard to the relationship between MI and SMS use intensities is very large. The number of customers with a negative within-person regression slope for MI data volume is almost as high as the number of consumers, whose slope is positive. Subscribers, who are most likely to reduce their SMS volume in parallel to an increase of their MI data traffic, are persons, who (1) are heavy SMS users in the initial study period (October 2011), (2) are female, (3) have a longer MNO tenure, (4) are currently in an SMS flat price scheme, (5) are presently equipped with an Apple iPhone or a Samsung Galaxy smartphone and (6) put their current handset into operation more recently. Implications of these findings for service-marketing strategies of MNO and for future research on demand interdependencies between relatively newly introduced and well-established mobile communications services are discussed.

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1. Introduction

Message Service (SMS)

Since the first trials in late 1992 the Short Message Service (SMS) provided by mobile network operators (MNO) has changed the way people communicate everywhere in the world. Market researchers estimate that in 2014 the number of SMS delivered globally per day amounts to about 21 billion (Deloitte, 2014; Informa, 2013). The popularity of SMS has even led to concerns about an excessive integration of this service in people's daily lives, particularly among younger MNO customers (Lu, Watanabe, Liu, Uji, Shono, & Kitamura, 2011; Skierkowski & Wood, 2012). However, in the recent past the massive proliferation of so-called smartphones with browsers, which enable consumers to conveniently access the Internet and its services via data networks of MNO and with the capability to run software applications downloaded with the help of wireless or wired telecommunication networks has drastically changed the demand prospects for SMS. In particular, downloadable over-the-top (OTT) messaging applications, such as WhatsApp or Facebook-Messenger in Europe and the US, WeChat in China, KakaoTalk in South Korea or Line in Japan which smartphone owners can take to instantaneously send/receive text messages enriched with photos or other media elements to/ from contacts using the same application, are portrayed as better surrogates of the old-fashioned SMS (Leonhardt, 2012; Mäkinen, Luukkainen, & Karikoski, 2014; Nikou, Bouwman, & Reuver, 2012; Ogara, Koh, & Prybutok, 2014; Rio & Malik, 2013).

Indirect support for this view can be obtained from a secondary analysis of use statistics collected at the aggregate level of national mobile communication markets. According to OFCOM (2013, p. 302) the average monthly number of outgoing SMS per capita decreased in 2012 relative to the previous year by 5.8% in the US, 11.1% in Sweden, 25.1% in Spain and 29.3% in the Netherlands. In the same period mobile Internet (MI) data traffic and revenues soared in each of the four countries (OFCOM, 2013, p. 298). Specifically in Germany, the country which is addressed in the present empirical analysis, the number of SMS recorded in 2013 was 37% lower than in 2012 while MI use intensity (= volume of Internet Protocol (IP) traffic down- or uploaded over the infrastructures of MNO) increased by 71% compared to 2012 (Bundesnetzagentur, 2014, p. 77). Rio & Malik (2013, p. 7) estimate that the worldwide loss in revenues of MNO in 2014 due to the substitution of SMS by various MI services amounts to 21 billion USD (equal to about 16 billion EUR as of October 2014).

The market level trends may be taken to suggest that SMS and MI services in general and mobile instant messaging applications in particular are close substitutes for each other (Mäkinen et al., 2014). In line with this, quite a number of analysts conclude that the SMS era will irretrievably end in the short- to mid-term future (Fröhlich, 2011; Jayakar & Park, 2014; Kern, 2012; Rio & Malik, 2013). For MNO this view implies that hardly any further resources ought to be invested in the development of SMS pricing concepts and SMS sales strategies which offer the service on a stand-alone basis or package it with MI access offerings.

However, this conclusion could be too superficial because the aggregate country-level statistics may mask SMS and MI use change patterns, which are distinct in various customer groups. For instance, the aggregate level analysis leaves room for the possibility that observed overall decreases in SMS volume largely stem from a small number of customers who were very heavy SMS users in the past and who exchanged SMS for MI services. This means that the SMS volume of a considerable number of customers has remained fairly constant or even increased in spite of the diffusion of smartphone-based Internet access and that mostly MI services just expand the portfolio of MNO offerings used by consumers.

Unfortunately, empirical evidence to support or reject this alternative position is scarce. The few existing relevant studies suffer from several methodological problems. First, they rely on self-reports of past SMS and MI use in general or specifically MI instant messaging usage in particular or on self-assessments of use behavior changes (Bouwman & Reuver, 2014; Church & Oliveira, 2013; Ćosić, 2013; Hsiao & Chen, 2015; Lauricella & Kay, 2013; Mäkinen et al., 2014; Skierkowski & Wood, 2012). Available evidence strongly suggests that such subjective estimates share very limited variance with objective measures of MI or SMS usage behaviors (Abeele, Beullens, & Roe, 2013; Boase & Ling, 2013; Gerpott, 2011; Reuver, Bouwman, Heerschap, & Verkasalo, 2012). Hence, pure self-report studies are plagued by severe validity limitations. Second, earlier work which relied on objective use measures was either cross-sectional (Gerpott, 2010a; Gerpott, Thomas, & Weichert, 2014) or did not fully capture intraindividual use change patterns in longitudinal data sets (Karikoski & Luukkainen, 2011; Karikoski & Soikkeli, 2013; Verkasalo, 2007). Consequently, the second strand of research tends to look at interindividual use differences but fails to adequately model intraindividual use changes over

longer time periods.

Against this background, the first purpose of the present investigation is to empirically examine the extent to which changes in MI use intensity explain variance in SMS volume shifts over a longer time period at the level of the individual MNO subscriber. Second, it seeks to explore whether customer characteristics (e.g., gender, age, contract tenure with current MNO) moderate the relationship between MI and SMS use intensity changes. Put differently, we try to statistically profile MNO customers who are likely to show a positive or a negative association between MI and SMS use intensity variation.

The remainder of this article is divided into four sections. The next section reviews earlier conceptual and empirical work to develop our research questions. Section 3 introduces the empirical methods. It is followed by the empirical results. The article concludes in a fifth section with a discussion of the implications of the findings for practitioners in the field of mobile communications service marketing and scholars studying consumer use behaviors for established