



Torsten J. Gerpott/Sebastian May

**The impact of mobile Internet on mobile voice use intensity:
A two-level analysis of private mobile communications customers in a GCC country**

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Abstract

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Within the telecommunications service industry a global trend is the rising pervasiveness of smartphones and, as a consequence, the overall increase in mobile Internet (MI) use. Little attention has been paid to MI use and its impacts on the demand for the established mobile voice (MV) calling service in countries outside Europe, North America, and South-East Asia. Therefore, this paper focuses on interdependencies between MI usage and MV calling patterns among residential customers in one member country of the Arabian Gulf Cooperation Council (GCC). GCC telecommunications markets are characterized by low fixed-line penetration and high mobile adoption rates. The analyzed data set contains usage data of 10,366 postpaid subscribers of a mobile network operator in a GCC country over 25 months from July 2013 to July 2015. The results provide evidence for a complementary MV–MI usage relationship. This relationship is more positive for users who (1) send fewer SMS, (2) are younger, (3) are foreign nationals, (4) use a smartphone, and (5) have a longer tariff tenure. The strength of MV–MI usage association in the GCC country sample is larger than relationships observed in earlier work which analyzed MNO subscribers in Europe. This is taken to suggest that the development

trajectory of a country's telecommunications service market moderates the relationship between MI and MV calling use intensity. The study contributes to the literature on telecommunications user behaviors in Arab states in general and the issue of substitutional, reinforcing, or neutral effects of MI usage on "traditional" mobile services in particular.



**Univ.-Prof. Dr.
Torsten J. Gerpott**

Chair of Corporate and Technology Planning, Mercator School of Management, University Duisburg-Essen, Lotharstr. 65, D-47057 Duisburg.



Dipl.-Ök. Sebastian May

Research assistant at the Chair of Corporate and Technology Planning, Mercator School of Management, University Duisburg-Essen, Lotharstr. 65, D-47057 Duisburg.

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1. Introduction

In the wake of the late 2000s, smart phone adoption quickly gained momentum with the massive roll-out of mobile broadband networks of the third generation. Along with changes in the types of mobile devices and the increasing capabilities of the mobile Internet (MI) in terms of ubiquitous availability and transmission speed, there are three major developments, which affect the mobile telecommunications industry worldwide. First, the joint effects of an increased use of mobile data, a stagnating use of mobile voice (MV) calls and a decreasing number of text messages (short message service = SMS) sent result in decelerated growth, stagnation, or even decrease in overall revenues for mobile network operators (MNO) (GSMA, 2016). Second, users tend to prefer flat rate over usage dependent tariffs (Peitz & Valetti, 2015; Uhrich, Schumann, & Wangenheim, 2012), even if this choice is economically disadvantageous (Krämer & Wiewiorra, 2014). Third, there is a steep increase in mobile broadband penetration from 11.5% in 2010 to a predicted share of 47.2% in 2015 worldwide (ITU, 2015a).

While the aforementioned trends can generally be observed all around the world, there are distinct local preconditions, which make a more differentiated analysis at the regional or country level valuable. For developing countries¹, the surge in MI usage is even steeper than in the rest of the world with per person penetration rates of 4.5% in 2010 and of 39.1% in 2015. At the same time, fixed broadband subscriptions in developing countries only grew from 4.2% per capita (23.5%,

developed; 7.6% worldwide) in 2010 to a projected 7.1% (29.0%, developed; 10.8% worldwide) in 2015 (ITU, 2015a). The infrastructure in densely populated and highly industrialized Asian countries, such as South Korea or Japan, as well as countries within the European Union and North America, allows users to complete many Internet-related tasks on both mobile and fixed-line networks (Hoernig, Bourreau, & Cambini, 2015; Nakamura, 2015; Vogelsang, 2010). In contrast, many developing nations and countries, which achieved their current advanced economic states in fast motion, do not feature a well-established fixed-line infrastructure due to geo-deterministic factors (i.e., environmental, historical, and/or population density related circumstances). Here, the establishment of mobile broadband networks poses a more feasible alternative to investments in comprehensive fixed-line networks (Abbas & Hamdy, 2015; ITU, 2015a; Garbacz & Thompson, 2007).

One region with such a predominance of mobile broadband infrastructures is the group of the six states, which form the Cooperation Council for the Arab States of the Gulf (known as the Gulf Cooperation Council = GCC). Members of the GCC are Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates (UAE). On average, subscribers in the GCC region have a lower median age and exhibit higher average revenue per user (ARPU) as well as smartphone adoption rates than MNO customers in many developed countries (GSMA, 2015a, 2015b, 2016). A detailed description of the pe-

culiarities of mobile telecommunications markets in the GCC countries is provided in section 2.

Many studies predict a strong substitution of MV and SMS use through Internet protocol (IP)-based “over-the-top” (OTT)-services (e.g., Cisco, 2016; GSMA, 2016; Kumar, Kamal, Varyani, & Barward, 2015; Rio & Malik, 2013). Hence, along with the uplift in mobile data traffic (Ericsson, 2015, 2016; GSMA, 2015a, 2015b) it can be expected that this substitution effect might be particularly pronounced in GCC countries. In fact, Arthur D. Little (2016) highlights a substantial decrease in SMS sent between 2012 and 2014 in GCC countries and neighboring states, while at the same time data volumes and OTT use within the region significantly increased. However, the aforementioned market research firms base their predictions on country-level data, which reflects the average use levels of all customers in a market. But a small group of heavy users, who utilize the services significantly more than the vast majority, may drive up the average consumption and, thus, skew the overall mean usage and disguise changes in the use amounts of MV, SMS, and mobile OTT-services at the intra-individual level (Gerpott, 2015; Hox, 2010).

Hence, a number of studies have been conducted which explore demand interrelationships between established mobile communications services (especially MV and SMS) on the one hand and MI-access on the other not at the country-level, but at the level of individual consumers (Bouwman & Reuver, 2014; Cassidy,

1. The terms “developed” and “developing” countries are used according to the ITU’s country classifications (ITU, 2016), which are in turn based on the UN M49 assignment (United Nations Statistics Division, 2016).

Colmenares, Jones, Manolovitz, Shen, & Viera, 2014; Cecere & Corrocher, 2012; Church & de Oliveira, 2013; Gerpott 2010a, 2015; Gerpott & Meinert, 2016; Gerpott, Thomas, & Weichert, 2014; Hsiao & Chen, 2015; Karikoski & Luukkainen, 2011; Karikoski & Soikelli, 2013; Lauricella & Kay, 2013; Lu, Watanabe, Liu, Uji, Shono, & Kitamura, 2011; Mäkinen, Luukkainen, & Karikoski, 2014; Skierkowski & Wood, 2012; Verkasalo, 2007). Unfortunately, the validity of prior work is hampered by a number of problems. First, numerous studies build on self-reported usage frequencies of various categories of mobile communications services (e.g., Cecere & Corrocher, 2011, 2012; Mäkinen et al., 2014). However, there is ample evidence indicating that such subjective estimates share little variance with objectively measured past usage (Abeele, Antheunis, & Schouten, 2014; Boase & Ling, 2013; Ger-

pott, 2011; Gold, Rauscher, & Zhu, 2015; Reuver & Bouwman, 2015). Second, with few exceptions (Gerpott, 2015; Gerpott & Meinert, 2016), former studies do not account for intra-individual use changes and only look at cross-sectional usage data. Third, it is unlikely that work on telecommunications customer behaviors in countries with highly developed fixed-line networks (e.g., Hoernig et al., 2015; Nakamura, 2015) can be applied to GCC countries without limitations, because certain issues for MNO in highly developed countries, such as fixed-mobile substitution, are less relevant due to different historical preconditions.

In light of this state of research, the present paper sets out to remedy the highlighted shortcomings of many prior studies. This is done in a two-level empirical investigation, which explores the

impacts of the rise of the overall MI usage on MV calling over time and applies the statistical analysis techniques suggested by Gerpott (2015). However, in contrast to earlier studies, our geographic focus is on 10,366 residential postpaid MNO subscribers residing in a GCC country for which objective monthly usage data covering a time span of 25 months were obtained.

The remainder of this article is divided into five sections. Section 2 provides an overview of the state of the mobile telecommunications markets in GCC countries. The third section introduces the conceptual background of the subsequent analysis and develops respective research questions. Section 4 explains the empirical methods used to generate the results, which are presented in Section 5. Section 6 discusses the empirical findings.