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Impact of 3G and beyond technology development and pricing on mobile data service provisioning, usage and diffusion

Jarmo Harno *

Helsinki University of Technology, Department of Communications and Networking, Nihtirinteenkuja 4 D, FI-02630 Espoo, Finland

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ABSTRACT

This study investigates the third generation mobile telecommunication systems (3G) diffusion challenges in the situation where large-scale mobile data service usage has not yet broken through. The paper first analyzes incumbent mobile operator business prospects in a large Western-European country. The results suggest that rollout of the most advanced available 3G technologies pay back through increased data service usage and revenues in the situation of declining voice revenues. In the main body of the study we discuss different pricing models and demonstrate that the flat rate pricing of data services, supplemented with certain conditions, supports the large-scale take-up of mobile data services. It boosts the usage of mobile data services and provides a competitive and sustainable business model for the operators and other market actors at the same time. Our modeling indicates furthermore, that flat rate model, combined with open access, gives better incentives to rollout high-speed mobile technologies to the rural areas, than the traffic-based charging.

1. Introduction

About 10 years mobile data services have been waited to soar and become a huge, life changing industry, but technology maturity, capacity, service availability and usability problems have moved the prospects further and further, time after another. This paper investigates the current technical and market parameters relating to wideband and broadband mobile data service diffusion in the European context.

According to the general theory of technological innovation, diffusion will follow an S-shaped adoption curve. The adoption starts slowly, and then rises quickly as more and more users adopt the innovation, and finally levels off (Rogers, 1995). Diffusion model of Bass is very commonly used (Bass, 1969). There different country specific characteristics, like GDP, educational level and e.g., competitive or regulatory conditions, introduce different values for the diffusion parameters (Dekimpe et al., 2000; Gruber and Verboven, 2001). Especially concerning communication related innovations, the network externalities have been considered important (Gurbaxani, 1990). General diffusion modeling has mostly concentrated on the user behavior, macro-economic and policy aspects, but business actors and modeling their decision-making in the micro-economical level has not been focused in the analyses (e.g., Frank, 2004). Some studies, however, combine various aspects, discussing different stakeholders that contribute to the diffusion process (Saugstrup and Henten, 2006).

In this study, we suggest that a crucial hindrance for the mobile data service usage lies in the technology or service bottle necks, and that it is possible to accelerate the service adoption through provisioning of better user experience through

* Tel.: +358 40 357 0445.
E-mail address: jarmo.harno@gmail.com

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enhanced technologies and applications. The other factor is price. These are seen to be the reasons for voice and plain SMS being still the only services adopted by majority of the mobile phone users. We have quantified these factors by end-user modeling, described in Section 2. Our methodology here is based on explicit technology and service parameters, not on before mentioned general diffusion models or externalities. The approach in end-user modeling is bottom-up type, looking at specific service aspects, rather than the traditional top-down approach, where generic trends are fitted for particular diffusion problem. It is clear that the task is challenging and more investigation and empirical corroboration is needed to confirm the accuracy of the approach. The mobile user base is already almost 100% in the investigated market, but the dilemma of mobile data service provisioning and usage is still acute, and the visions widely held in the beginning of the third millennium have not realized.

However, we continue to argue that the new high capacity mobile technologies not only affect the service diffusion through better user experience, but also make it economically possible and even optimal for the operators to migrate to certain type of flat rate pricing models. This is fuelling the usage and diffusion in its own right, generating the virtuous circle, where also growing network of service developers and providers are attracted into the market. Even the end-user is harnessed into developer and provider, leading to completely new business models.

To estimate the occurrence of the service diffusion break through, our primary focus is on the main business actors, because we see their decisions as critical for the diffusion process. But of course their success is dependent on their ability to serve the customers or end-users and benefit them. As the regulator is trying to optimize this play of operators, businesses and consumers, it also needs information about the market dynamics for the basis of its decisions.

The challenge for the business actors (especially the telecom operators) is in finding the right business models for pricing and service provisioning to build up a profitable business. Research results indicate that it is easier for the companies to discern the effects of technology development, or disruption, on the added value of products and services, but more challenging to see the changes needed in the strategic business model (Sainio, 2005). The ability to create a mobile data business case of virtuous circle with growing externalities is very much a result of the techno-economic combination of technical features and pricing model (Saarikoski, 2006). Co-operation and partnering are needed on and between several layers of the business ecosystem to create a flourishing service business.

What is meant with business modeling is not self-evident even in the economics literature. Some may even argue that there is no comprehensive definition for business modeling at all. Within the science, business modeling is still a young discipline (Osterwalder et al., 2005). Commonly technology-oriented and business-oriented people tend to use the term "Business Model" differently. Either the business aspects or model aspects dominate. In the literature we can find several approaches to business modeling.

In McKinsey and Company (1999), a business model defines how a company produces a product or a service and how it is delivered to the customer. It arises from the definitions of the activities of a company and their interrelationships. Timmers (1998) emphasizes the architectural description of the product, service and information flows, including the various business actors, their roles, potential benefits and sources of revenues. Slywotzky (1996) on the other hand has more functional definition, consisting of how a company selects its customers, defines and differentiates its offerings, defines the tasks it will take itself and those it will outsource; how it configures its resources, goes to market, creates utility for customers and earns a profit form that activity. For Afuah and Tucci (2000), a business model combines potential environmental factors and a firm's capabilities, providing a sustainable recipe to offer competitive products or services with relevant revenue logic.

A more recent definition by Weill and Vitale (2002) emphasizes the partnership dimension of the roles and relationships among a firm's consumers, customers, allies, and suppliers identifying the major flows of product, information, and money, and the major benefits to the participants. Finally Osterwalder et al. (2005) defines business model as a description of the value a company offers to one or several segments of customers and of the architecture of the firm and its network of partners for creating, marketing and delivering this value, to generate profitable and sustainable revenue streams.

All in all, the challenge is to identify the elements and relationships that describe the business of a company on a right focus and depth to make the estimation of the future development possible. A practical model needs to compile the selected technology, market and business structure inputs into the required economical outputs.

In our techno-economic modeling of the telecom operators, handling of business models, earning logics and cost modeling (of both operational and capital expenditures) of the business actors has to be combined with more fuzzy market and revenue forecasts of right granularity to gain balanced results. For recent mobile technology market forecasting, see Stordahl et al. (2004). Most of the technology/market research of telecommunication systems and services are not public but done by commercial analysts or inside companies. However, public funded research projects have produced some techno-economic analyses that combine economics, market forecasts and business strategy aspects with a comprehensive technology modeling (Olsen et al., 1996; Ims, 1998; Katsianis et al., 2001; Monath et al., 2003; Harno et al., 2007).

This study investigates the business prospects fuelled by emerging technology opportunities and tries to estimate the high data rate 3G services diffusion prospects in the Western-European context. In that market GSM technology has the strong foothold with its continuum in technological advancements by GPRS, EDGE, UMTS and HSDPA technologies (GSA, 2007; UMTS Forum, 2007).

The operators that control the networks and pricing are key actors, but they have to take into account both the end-users and their competitors in their strategic decision-making. In addition, equipment vendors, end-user service developers and providers, and the related value networks with mixed roles connect tightly to this diffusion dilemma. It is not only question of maximizing revenue, but also how to share this revenue optimally to guarantee the needed breakthrough in mobile data