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Economic factors and diffusion of IP telephony: Empirical evidence from an advanced market

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Abstract

Internet telephony (IP) telephony services have been available since the 1990s. Recently, this market has shown rapid development in terms of new services offered and an impressive increase in the number of users around the globe. Such developments put IP telephony in the spotlight. This article explores the diffusion of IP telephony by focusing on home users and the dynamics of the residential market. It combines insights from diffusion of innovation theory and network economics to investigate users and potential users' perceptions of the key economic factors and their impact on the diffusion process. The article uses Denmark as an example of a technologically advanced market with technologically mature consumers. Empirical data are collected through an online survey conducted in Denmark. The results highlight the economic factors that affect the diffusion processes and offer useful insights to other less technologically advanced countries on IP telephony market developments.

Keywords: IP telephony; Switching costs; Network effects; Diffusion process; Residential market

1. Introduction

The Internet telephony (or IP telephony) market exhibits high growth rates all over the world. The success of Skype has been thoroughly discussed within the research community (Rao, Angelov, & Nov, 2006) and by practitioners (Cook, 2003). By the end of 2006, Skype had over 21.3 million users and the network had exhibited exponential growth. In addition to the impressive increase in users (measured by number of software downloads), the network usage (measured by the number of concurrent users online) has also been high. The last 2 years' usage has doubled during the peak hours (Barton, 2006). Moreover, Skype has launched many new value-added services ranging from instant messaging and voicemail to video calls.

IP telephony is defined as transmission of voice and fax phone calls over a packet-based IP data network.[1] This article focuses on the IP telephony core service: the voice phone call. This service is a substitute for the fixed-line telephony service which has become a commodity (Keating, 2001). IP telephony may now become a serious threat for incumbent telecommunications operators' 'traditional' business activity of telephony

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services provision. Those services are offered by IP telephony vendors at lower prices than fixed-line telephony. For example, in the case of international calls, which remain a key revenue source for telecommunications operators, the price difference is up to 90% (e.g., Skype-Out rates per minute). However, at the current takeoff state of the IP telephony market both communications services (i.e., IP and fixed-lined telephony) are used by the majority of IP telephony home users.

IP telephony research as part of the telecommunications domain appeared in the mid-1990s, focusing on technological characteristics of the new service (Babbage, Moffat, O'Neill, & Sivaraj, 1997; Cawley, 1997; Foo & Cheung Hiu, 1998; Mason, 1998; McKnight & Leida, 1998; Ono & Aoki, 1998; Rowe & Richardson, 1998), highlighting the trade-off between quality of service (i.e., related to parameters such as average delay, packet loss rate) and price, the potential substitution effect driven by lower prices of IP telephony as well as the bottleneck of existing network infrastructure in terms of voice transmission. Moreover, in the realm of these research efforts, simulation results on cost parameters of IP telephony were also provided (McKnight & Leida, 1998).

The recent growth of the IP telephony market has led researchers to focus on end-user requirements. Varshney, Snow, McGivern, and Howard (2002) have identified a set of key attributes including service quality, reliability, price, security, cost of new equipment and the value-added prospect of new services (e.g., service integration of voice and data). These attributes have also been underlined by Zubey, Wagner, and Otto (2002), who claim that the most important requirement for end-users is integration of new services such as unified messaging, call waiting caller ID, followed by accessibility and price. Moreover, Tseng and Yu (2005) have explored the long-lasting challenge of IP telephony: provision of quality of service, based on data collected from Taiwan. However, research on the demand side of the IP telephony market for home users, focusing on the diffusion process, is not abundant. This article, motivated by the recent market growth, explores IP telephony diffusion in a technologically advanced context. The research approach, which has not been used before, combines diffusion of innovation (DoI) theory with network economics. The research is based on data collected from an online survey conducted in Denmark.

Since 2005, Denmark has maintained the top ranking of e-readiness, a measure developed by the Economist Intelligence Unit in an international study (2006). This measure includes, among others, connectivity, which measures the access of individuals and companies to fixed and mobile telephony, personal computers and the Internet, where Denmark has the highest score (EIU, 2006). This technologically advanced environment with technologically mature consumers has enabled the shaping of a dynamic IP telephony market. In 2006, there were 11 national providers coming from Internet service provision, fixed-line telephony, cable TV, mobile telephony markets or new entrants. During the first half of 2006, the highest market share belonged to an ISP (27%), followed by an IP telephony vendor (15%) (NITTA, 2006). The IP telephony service is offered as a substitute for fixed-line service. Some IP telephony vendors make offerings that include value-added services, such as voicemail, conference calls, account information, call diversion, call blocking, caller ID, video calls, information services, while recently some ISPs have also started offering bundles of IP telephony and broadband access services.[2] IP telephony subscriber numbers increased 120% from 2005 to the first half of 2006, reaching 155,401 in June 2006. Moreover, during the same period the outgoing traffic increased both in domestic (400%) and international (300%) calls (NITTA, 2006). According to the market data, Denmark is an example of a technologically advanced market that can offer useful insights to less advanced markets of the Western world.

In this article, it is argued that for technologically advanced markets, users' technical difficulties with new service use are minimal, while perceived technological limitations are reduced due to consumers' extended experience with comparable services such as those enabled by the Internet. Thus, the focus on ease of use or technical complexity that dominates the theory of DoI (e.g. Rogers, 1995, 2003) is not as useful in explaining the diffusion process on technologically advanced markets, since those factors may not be the decisive reasons for the adoption decision. This suggests that the focus should move from the service's technical characteristics to the economic factors that affect the consumer's choice. In the case of IP telephony, the key economic factors are network effects and switching costs. In particular, IP telephony is subject to network effects since it becomes more valuable (e.g., enabling potential interactions with other users) to a user as the number of users

[2]For example see www.cybercity.dk.