



The disruptive potential of PWLAN at the country-level: The cases of Germany, the UK, and the USA



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ABSTRACT

This paper analyzes the impact of WLAN technologies for incumbent MNOs based on an empirical cross-country study of the players in the public WLAN-hotspot market using the theory of disruptive innovation and theoretical extensions for the industry- and country-level. The main research question to be analyzed is whether and why PWLAN has shown a disruptive or sustaining impact trend for incumbent MNOs in the hotspot markets of Germany, the UK, and the USA in recent years. The results imply that incumbent MNOs and new entrants have taken advantage of the opportunity provided by PWLAN, but the market success of both types of players varies between the countries analyzed. Incumbent MNOs dominate in Germany but not in the UK and the USA. The reasons for these country-specific differences were further investigated, and the results suggest that the analysis of disruptive potential in telecommunications needs to include country- and firm-specific factors, which are, again, largely influenced by the local regulation.

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1. Introduction

Even though the hype created by the 802.11 standards and their ability to reshape the telecommunication landscape seems passé and the short attention span of the high tech community has already shifted away to the next *hot* and *disruptive* technologies such as 4G (fourth generation of cellular wireless standards), the dispute over whether mobile network operators (MNOs) should view *Wi-Fi* or *WLAN* (Wireless Local Area Network) as a complementary, a disruptive, a substitutive, or a competitive technology to cellular remains far from being settled (Gunasekaran & Harmantzis, 2008; Madjdi & Hüsigg, 2011; Shin & Weiss, 2010). As long as this discussion remains unsettled, the mobile communication industry may again be faced with a very similar question in future technology choices, particularly when it comes to the choice between various 4G standards such as Long Term Evolution (LTE) or WiMAX (Worldwide Interoperability for Microwave Access). If history is any guide, more needs to be learnt before history can be of any help in future decisions. One reason for this ongoing discussion might be rooted in the framing of the question itself, which frequently lacks an adequate theoretical framework and goes beyond the inherent nature of the technology being complementary or substitutive (Gunasekaran & Harmantzis, 2008; Lehr & McKnight, 2003; Plank, 2005). Furthermore, prior research in this area conducted by Christensen, Anthony, and Roth (2004), Hüsigg, Hipp, and Dowling (2005), and Camponovo and Pigneur (2006) with an adequate theoretical foundation suffers as a result of the insufficient amount of empirical data from the hotspot market or, as in the case of Hüsigg and Hipp (2009) and Shin and Weiss (2010), did not consider the country-specific differences. The studies above often reflect an implicit focus on a specific regional area (the USA and Germany), as

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is the case in Christensen et al. (2004) and Hüsigg et al. (2005), or an explicit focus on Switzerland, in Camponovo and Pigneur (2006), or on Germany, in Hüsigg and Hipp (2009), but without a conscious and systematic cross-country-comparison of country specific factors that play an important role in telecommunications. Therefore, better theoretical and empirical based contributions can help to develop a more holistic theoretical and empirically embedded perspective in the case of WLAN and the MNOs.

Based on the theoretical framework of Christensen and Raynor (2003), WLAN technologies could be viewed as being disruptive for incumbent MNOs' data services enabled by various technologies such as the third generation (3G) mobile telecommunications standards. This is because they enable wireless Internet service providers (WISPs) to offer short distance, high bandwidth data services in the unlicensed frequencies in the 2.4 GHz band in heavily trafficked public areas known as *hotspots* or PWLAN (public WLAN), which could partly bypass the MNOs' data services that are based on licensed band mobile communication standards (Christensen et al., 2004; Hayes & Lemstra, 2009; Hüsigg et al., 2005; Lehr & McKnight, 2003; Martikainen, 2006). WLAN was typically compared to 3G, which offers a vertically integrated, top-down, service-provider approach to delivering wireless Internet access and other services in contrast to WLAN, which offers a more decentralized and end-user-centric approach to service provisioning (Lehr & McKnight, 2003).

The emergence of public hotspots has been interpreted as a new submarket in mobile data communications since a new submarket is created when a new technology causes one group of customers within an existing market to behave similarly to one another and differently from other customers in that market (Chesbrough, 2003; Hüsigg & Hipp, 2009). This is in contrast with new technologies that completely displace an earlier technology because the new submarket can co-exist alongside the established market. The concept of a new submarket seems to be well reflected in the case of PWLAN since new entrants with new business models, such as Fon (Camponovo & Pigneur, 2006; Middleton & Potter, 2008), or new application fields such as municipal wireless networks (Hayes & Lemstra, 2009; Middleton & Potter, 2008; Shin & Weiss, 2010) entered the hotspot market and initially gained significant momentum. The new PWLAN-entrants seemingly questioned the success of the MNOs' mobile data services and the huge investments into new network infrastructure or licenses.

However, the MNOs also responded to this emerging trend by adopting the WLAN technology in their operations, acquiring WISPs, and developing their own PWLAN services (Camponovo & Pigneur, 2006; Hüsigg & Hipp, 2009; Lemstra & Hayes, 2009; Shin & Weiss, 2010). More recently, further efforts have been undertaken to integrate Wi-Fi into the cellular networks as the Wireless Broadband Alliance (WBA) has announced their Next Generation Hotspots (NGH) initiative, which enhances Wi-Fi hotspot access and turns the Wi-Fi technology into the operator hotspot services (Gabriel, 2012). By improving Wi-Fi roaming, mobile devices will allow a seamless connection with a Wi-Fi hotspot using the SIM (Subscriber Identity Module) card for authentication, which enables MNOs to uniquely and securely identify users, whether they are on a mobile or Wi-Fi network. This would allow MNOs to 'offload' many more users and their data traffic from their busy mobile broadband networks. In addition, the 'HotSpot 2.0' initiative pushed by the Wi-Fi Alliance tries to simplify hotspot usage and roaming between hotspots. Developments such as these show that the discussion surrounding PWLAN remains far from being solved once and for all.

In this paper, these gaps will be addressed by the proposal of a conceptual framework for the disruptive potential at the country level, which is then used to analyze real hotspot market data in detail in order to identify the underlying factors that influence the disruptive potential. Over the last few years, the public hotspot market, mobile telecommunications, WLAN, and other standards have developed further, and more empirical evidence has become available (Camponovo & Pigneur, 2006; Gunasekaran & Harmantzis, 2008; Hüsigg & Hipp, 2009; Lemstra & Hayes, 2009; Madjidi & Hüsigg, 2011; Martikainen, 2006; Sainio & Puumalainen, 2007). The aim of this paper is to capitalize on the further data available and shed light on the question of whether and why PWLAN developed disruptive potential or a sustaining impact for MNOs in different countries in recent years. Following the case study approach by Yin (1994) and using empirical data from the three largest public hotspot markets (according to Lemstra & Hayes (2009)) – Germany, the UK, and the USA – previous claims about PWLAN can be analyzed empirically. To do so, the disruptive innovation theory and recent enhancements are used to study in detail the impact of PWLAN on the firm and country level. This theoretical approach aims to explain how a disruptive innovation would typically lead to the dominance of entrants in a new sub-market created by an emerging technology of an established industry (Chesbrough, 2003; Christensen & Raynor, 2003). In contrast to a disruptive innovation, a sustaining innovation would lead to incumbent dominance in this new submarket. In order to clarify the question of whether and why PWLAN has developed disruptive potential or not for the MNOs in different countries, the following questions will be analyzed in this paper:

- How has the public hotspot market developed in Germany, the UK, and the USA? Who has dominated the PWLAN markets – entrants or incumbents?
- Are there country-specific differences in the development of the public hotspot market and the disruptive potential of PWLAN for the MNOs?
- Which factors influence these country-specific differences in the disruptive potential of PWLAN for the MNOs?

The paper is organized as follows: first of all, the preliminary conceptual framework for disruptive potential in telecommunications at the country level and the research propositions are developed. The framework and the propositions

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