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Exploring the WISP industry Swiss case study

Giovanni Camponovo
The University of Lausanne
Giovanni.Camponovo@hec.unil.ch

Mark Heitmann
The University of St. Gallen
Mark.Heitmann@unisg.ch,

Katarina Stanoevska-Slabeva
The University of St. Gallen
Katarina.Stanoevksa@unisg.ch

Yves Pigneur
The University of Lausanne
Yves.Pigneur@hec.unil.ch

ABSTRACT

Self-organized networks might be a disruptive technology in the mobile telecommunication industry, posing a credible threat to the current network operators' dominance of mobile applications and services. Indeed, with the emergence of wireless broadband networks based on clusters of Wireless Local Area Network (WLAN) hotspots, self-organized networks might become an important alternative to UMTS cellular networks deployed by network operators. The objective of this paper is to investigate the use of WLAN to offer wireless services from a business point of view, assessing the current supply of WLAN services in Switzerland by investigating different kinds of WLAN service providers, analyzing their business models through mini case studies and comparing them to theoretical expectations from literature.

INTRODUCTION

Wireless Local Area Networks (WLAN) are increasingly an object of debate regarding the wireless industry. Owing to the unexpected difficulties of deploying 3G networks and services, significant concerns are arising among mobile network operators and other important players about the so-called "Piranha" technologies like WLAN, which seem to have the potential to be disruptive and dislocate the profits of 3G operators by delivering wideband services earlier (Zweig 2001).

Whether WLAN is actually a threat to 3G is a disputed issue, especially concerning the extent to which these technologies are competing or complementary (Lehr and McKnight 2002). Since both provide broadband data communication services, a significant share of 3G revenues may be displaced from mobile operators towards WLAN providers (Laurent, Geraci et al. 2002). Conversely, mobile operators could employ them in a complementary way, providing enhanced service in particular locations through WLAN while offering ubiquitous coverage and permanent network connection through cellular networks (Laine 2002). In fact, Mobile Network Operators (MNOs) like BT Group (BT Group 2002) and Deutsche Telekom (T-Mobile 2002) are deploying both WLAN and 3G networks.

Contrary to 3G, WLAN providers do not require a license to operate and can deploy their network with much smaller investment. Consequently, a plethora of different Wireless Internet Service Providers (WISPs) is currently trying to take advantage of this opportunity to enter the wireless market. These players include incumbent firms from the telecommunications industry (i.e. mobile network operators, wireline network operators, Internet Service Providers) as well as new players such as start-ups, technology enablers, venues and communities. This diversity is likely to result in fundamentally different strategic approaches.

The main objective of this paper is to obtain an assessment of the current situation of the WISP industry in Switzerland, by categorizing the different kinds of WISPs and analyzing their strategic approaches. Since the market is still immature it is premature to predict what strategies will prove to be successful by empirical observation. Literature review is also inappropriate, because despite some literature about technical aspects of WLAN, few publications approach its business aspects. What can be done, however, is to conduct an exploratory study to identify the different types of WISPs, analyze their strategies and determine their key success factors (Herslow, Navarro et al. 2002). Based on this analysis, a well-grounded insight into the future of WLAN networks can be obtained.

The remainder of the paper is structured as follows. The next section describes our research methodology. Then section three provides an overview of the actual historical and technological context. After that, section four proposes a classification framework distinguishing different types of WISP, which are then illustrated in section five through case studies of selected Swiss organizations. Finally, section six exposes the principal results of the study and suggests further research directions.

RESEARCH METHODOLOGY

The research methodology used in this study follows a two steps process:

- first, secondary research material is gathered trough a literature review;
- then, a snapshot of the current market situation is taken in order to identify the entities that are deploying WLAN networks or plan to do so in the near future.

Based on the results of the first step, a classification framework of the various types of WISPs is proposed in order to identify relevant enterprises to analyze in more depth, and to provide an overview of the different strategic approaches used to offer WISP services. The major issues relevant to WLAN deployment are also identified and used as a base for structuring the interviews with these companies. These relate to business models as well as to technical, legal and social issues (Laine 2002; Verma, Beckman et al. 2002).

In the second step, interviews with representatives from these enterprises are performed and the main results are presented through mini case studies. A cross-case analysis provides the base for extraction of common and differing elements of applied business models and gives insights into possible future developments of WLANs.

UNDERLYING TECHNOLOGY AND ITS DEVELOPMENT

Historical background

WLANs are flexible communication systems transmitting data over electromagnetic waves, usually implemented as an extension to a wired LAN (Malladi and Agrawal 2002).
Their origins go back to 1990 to the efforts of the IEEE 802.11 Working Group aiming at establishing a standard for wireless connectivity within a local area. Yet, consumer demand was stagnating, as adoption was actually hindered for the major reasons of high equipment prices, range limitations, performance problems, security and lack of interoperability (Ruber 1999).
Subsequent research led to the creation of the 802.11 standard in 1997 (providing 2Mbps in the 2.4GHz band), which unified an otherwise fragmented marketplace that had previously relied on proprietary solutions. Growth in WLANs can actually be traced to the issue of the 802.11b standard in 1999 (providing 11Mbps in the 2.4GHz band), and to the interoperability certification service offered by the Wireless Ethernet Compatibility Alliance. With improved performance, interoperable products and rapidly decreasing prices, WLANs started to be adopted by enterprises and residential consumers as an interesting extension to or as a replacement of traditional LANs (Rao and Parikh 2002).
The widening diffusion of WLAN-enabled devices created an opportunity for WISPs to offer commercial WLAN access to nomad users in public locations. Recently, certain players expect to exploit this technology in order to create large-scale wireless broadband networks federating many WLAN hotspots in a common network. Two principal models are currently being used: a top-down approach, which requires a centralized entity who builds a network in a traditional way by planning, deploying and operating the network, and a bottom-up approach, which relies on a loose federation of enthusiasts willing to share their hotspots with each other (Rao and Parikh 2002). The former allows for guaranteed quality of service, support and scalability, but implies considerable initial investments. The latter benefits from organic growth and investment sharing among multiple participants, but is prone to scalability, quality of service, support and abusive use problems.

Technology Background - Competing technologies

So far, we restricted our discussion to 802.11. Yet there are many competing WLAN technologies (see table 1 below). An early competitor to 802.11 is HomeRF, which offered similar technical specifications, but has been overshadowed in the marketplace by 802.11b, probably because the latter came first in the market and because of more aggressive marketing (ISP Planet 2002). Nowadays, 802.11b is by far the most commonly adopted standard, accounting for 71 percent of all wireless nodes shipped in 2001 (Griffith 2002). In the future, 802.11b might be overtaken by a new breed of standards such as 802.11a, 802.11g and HiperLan/2. Owing to this diversity, multimode chips supporting different technologies might become necessary.

	802.11	HomeRF 1.0	802.11b	HomeRF 2.0	802.11g	802.11a	HiperLAN 2
Release date	1997	1999	1999	2001	Future	1999	Future
Frequency of operation	2.4 GHz	2.4 GHz	2.4 GHz	2.4 GHz	2.4 GHz	5 GHz	5 GHz
Theoretical max. data rates	2 Mbps	1.6 Mbps	11 Mbps	10 Mbps	22 Mbps	54 Mbps	54 Mbps
Medium Access Layer	CSMA/CA	Hybrid CSMA-TDMA	CSMA/CA	Hybrid CSMA-TDMA	CSMA/CA	CSMA/CA	TDMA
Physical Layer (modulation)	FHSS or DSSS or Infrared	FHSS	DSSS	FHSS	OFDM	OFDM	OFDM

Table 1: Comparison of different WLAN technologies

In addition to WLAN technologies, there are several other partially overlapping wireless technologies like Bluetooth, cellular networks (i.e. GSM, GPRS and UMTS) and different emerging technologies (see Varshney and Vetter 2000). While all these technologies seek to satisfy telecommunication needs of mobile users, they differ in the scope of coverage, bandwidth and quality of service (see table 2 below). Bluetooth basically seeks to simplify connectivity in the PANs (Personal Area Networks), whereas cellular networks are built to provide ubiquitous coverage over a wide area.

	Bluetooth	WLAN	GSM	UMTS
Coverage	Personal area	Local Area	Wide Area	Wide Area
Frequency band	Unlicensed ISM 2.4GHz band	Unlicensed ISM 2.4GHz	Licensed GSM 900/1800/1900	Licensed IMT2000 1900/2100
Typical Range	10 m	100 m	up to 35 km	up to 8 km
Theoretical Max data rates	1 Mbps	54 Mbps	14.4 kbps	2Mbps
Typical data rates	721 kbps	30 Mbps	9.6 kbps	384 kbps
Applications	Data / (Voice)	Data / (Voice)	Voice / (Data)	Voice / Data

Table 2: Comparison of different wireless technologies

Though it is generally agreed that WLAN will have an impact on these technologies, there are many different opinions as to their competing or complementary nature (Laine 2002; Laurent, Geraci et al. 2002; Lehr and McKnight 2002). Compared to 3G, WLAN provides higher data rates with a much cheaper equipment and does not require licenses to operate. However, disadvantages of WLANs lie primarily 1) in missing components to the standard, which lacks of proven security concepts, neglects quality of service, roaming and billing protocols; and 2) in the use of the unregulated 2.4GHz band, which makes WLAN networks susceptible to serious interferences (from ISM, Bluetooth and WLAN devices) and does not permit to avoid them trough centralized planning (i.e. by making neighboring base stations transmit on different channels or synchronizing emitters) (Dornan 2002; Redman 2002). Finally, WLANs are not suited to mobile use, owing to lack of handover between hotspots, small coverage and lack of truly portable devices (Thorngren 2002).

A WISP CLASSIFICATION FRAMEWORK

The WISP industry has already been addressed by a small number of authors trying to identify the different types of actors and their strategic approaches. Herslow, Navarro et al. (2002) suggest that WISPs can be distinguished by using pricing and coverage criteria, identifying Hot Spot WISPs, Facility Owners WISPs, Wide Area WISPs and Network Community WISPs. In addition they recognize other important players such as enablers (providers of technical solutions) and closed networks (private WLANs). Alvén and Farhang. (2002) focus on commercial WISPs, which are distinguished by their core business and the location covered. They identify single point WISPs, mobile carrier WISPs, ISP WISPs, plain WISPs, location specific WISPs, operator neutral WISPs, franchising WISPs and virtual WISPs. Sputnik (2002) claims that the future of 802.11 networks will take three directions: Private networks, free public access networks (communities) and paid subscriber networks. Verma, Beckman et al. (2002) examine what strategic approaches may be employed by WISPs, differentiating between primary business models (which extend traditional ISP models offering WISP services paid for by monthly subscription fees), emerging business models (offering the occasional usage of WISP services using micro payments) and neighborhood area networks (NAN). NAN are non profit networks of end users who share their WLAN hotspots, either organized to cover an extensive area or a single location (Pozar 2001).
We propose to distinguish between the different classes of WISPs using two criteria: whether the service is a commercial offer (i.e. the aim is to gain a profit) and whether the coverage is extensive (i.e. if coverage targets a wide area or is restricted to particular locations). The former has profound implications on the technical requirements of quality of service, customer support, authentication systems and billing systems. The latter involves important technical concerns such as handover between hotspots and network planning to avoid interference. Constructing a matrix of these two criteria, we obtain four groups of players (see table 3 below):

	Selected locations coverage	**Extensive coverage**
Non commercial offer	Private WLAN	Community WISP
Commercial offer	Hotspot WISP	Wide Area WISP

Table 3: WISP classification

Private WLANs are private corporate or residential networks owned and operated by companies, institutions and households to provide network connectivity to their own members. The main reason for deploying private WLANs in business and institutions is to combine wired LANs connectivity with user mobility within the company, thus benefiting from productivity, convenience and network flexibility advantages (Oake, Broxton et al. 1999; Herslow, Navarro et al. 2002). WLANs are especially expected to be successful in vertical sectors such as government, education, healthcare and hospitality (Lucero 2002). Residential wireless networks principally aim to share broadband Internet connections.
Community WISPs are free wide area networks built up by clustering private hotspots providing public access together. They are mostly composed and operated by technology enthusiasts who get together in loose federations motivated by an open source mentality aiming at offering Internet access to the whole community (Herslow, Navarro et al. 2002). Nevertheless, commercial attempts trying to foster the community building process are appearing (e.g. providing a basic free service while earning money on a secure corporate version (Sputnik 2002)). Community networks usually provide the most elementary service and do not treat issues beyond basic equipment and hotspots' location

communication, such as security, billing or metering (Verma, Beckman et al. 2002), and are therefore particularly exposed to abusive Internet usage.

Hotspot WISPs are paid subscriber networks deployed inside specific public facilities such as airports, hotels, cafes, etc. to provide network access to their customers in their location. Venue owners might offer WLAN services themselves. However, the provision of public WLAN services is clearly not within their core competences, so they might feel more comfortable to collaborate with specialized WISPs or enablers (Thorngren 2002). WLAN services are usually seen as a complementary offering intending to achieve a competitive edge over rival companies. Hotspot WISPs are expected to offer limited quality of service and run weak Authentication, Authorization and Accounting (AAA) systems (Alvén and Farhang 2002). To enable occasional usage micro-payment models are predicted (Verma, Beckman et al. 2002).

Wide Area WISPs are paid subscriber networks providing network access to customers in a wide area, such as a city or a country, offering coverage both inside and outside buildings (Herslow, Navarro et al. 2002). They usually offer guaranteed quality of service, technical support, operate strong AAA systems and other value-added services that free public networks cannot provide. Wide Area WLANs can be provided by incumbent firms such as traditional ISPs and MNOs extending their services towards WLAN, as well as start-ups, who may follow less integrated strategies such as franchising, virtual operator, operator neutral, location specific and roaming broker models (Alvén and Farhang 2002; Verma, Beckman et al. 2002).

As can be seen in table 4, the proposed classification can easily be compared with those mentioned above.

<table>
<tr><th></th><th>Herslow, Navarro et al. 2002</th><th>Sputnik 2002</th><th>Alvén and Farhang 2002</th><th>Verma, Beckman et al. 2002</th></tr>
<tr><td>Private WLAN</td><td>Closed Networks (influencing actor)</td><td>Private networks</td><td></td><td></td></tr>
<tr><td>Community WISP</td><td>Network community WISP</td><td>Public access networks</td><td></td><td>NAN</td></tr>
<tr><td>Hotspot WISP</td><td>Hot Spot WISP
Facility owners WISP</td><td rowspan="2">Paid subscriber networks</td><td rowspan="2">Single point WISP
Mobile carrier WISP
ISP WISP
Plain WISP
Location specific WISP
Operator neutral WISP
Franchising WISP
Virtual WISP</td><td>Emerging Model</td></tr>
<tr><td>Wide Area WISP</td><td>Wide Area WISP</td><td>Primary Model</td></tr>
</table>

Table 4: Comparison of different WISP classifications

CASE STUDIES

In order to illustrate the business models of the different classes of actors in a consistent way, we base ourselves on an ontology for e-business models, which is composed of four main elements: 1) the product innovation, that consists in the value proposition the firm delivers to its customers; 2) the customer relationship, defining the target customers, the distribution channels and the relationship strategy; 3) the infrastructure, containing the resources, the activities and the partnership network that are required to offer the value proposition; 4) the financial aspects, which ultimately determine the profitability of the organization (Osterwalder and Pigneur 2002). In addition, we illustrate the current experiences that enterprises are having in delivering WLAN services.

Private WLAN

Case study: CHUV (University Hospital Centre of the state of Vaud)[1]

The CHUV is a university hospital employing 5'000 people, serving 40'000 patients with a yearly budget of 400 millions €. In May 2002, a project of installing a WLAN started: The service was tested during 2002 in one department and it is going to be deployed in the whole hospital during the next five years.

Value proposition. The WLAN offers access to a single application allowing them to consult and update all patient-related information stored in a central computerized patient file from anywhere in the hospital. The principal benefits sought are to increase the quality of medical treatment, better track patient's progress, and increase productivity.

Customer relationship. Doctors use the system to access up-to-date patient information when they prescribe medical acts and to check the compatibility of different drugs. Nurses can easily retrieve doctors' prescriptions and update patients' files with the actual treatments dispensed and monitor patients' progress. As a secondary effect, this data can then be analyzed by pharmacy and administrative staff for various purposes. The hospital does not currently plan offering patients Internet access.

Infrastructure management. The CHUV plans to extend its LAN (6000 nodes) with about 50 WLAN access points covering patient and staff rooms. Employees are given mobile internet devices to access the patient application. Except for the development of the application, made by a software developer firm, all infrastructure management is made in-house (i.e. network planning, deployment, operation and maintenance, user education and support).

Financial model. The WLAN project involves a substantial investment, principally in personnel training, application development, equipment and service operation. There are no revenues, nevertheless, some cost reductions are expected in terms of productivity gains and a decrease in unnecessary drug administration and treatments.

Current experiences. Education of personnel is an important issue, as it takes time for the new technology to be accepted and to manage change. Security and privacy is also an important matter: Communication is secured by using encryption technologies and an hardware authentication mechanism (security cards). Furthermore the devices do not store any information.

Hotspot WISP

Case study: Zurich Airport [2]

Zurich Airport is an international airport operating WLAN networks since 1999 for airport operations (e.g. baggage tracing) and set up a public WISP service mid 2002. Today, five access points have been set up mainly in lounges.

Value Proposition. Zurich Airport provides a public WLAN service through the 802.11b technology. Airport related information, e.g. timetables, is freely available, but internet access requires time based subscriptions. The main customer benefits are an increased satisfaction by shortening perceived waiting times and allowing productive use of otherwise idle time. Access to the customer base of mainly business customers who stay an average of 1,5 hours at the airport is offered to WLAN service providers.

Customer Relationship. Zurich Airport is not aiming at controlling the customer relationship itself but rather intends to offer customers a choice of WLAN service providers. Target customers are business travellers in the early adopter segment who possess and are familiar with WLAN equipment.

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1 Interview with Philippe Noth, person in charge for medical applications,www.chuv.ch

2 Interview with Mathias Berger, currently responsible for WLAN at Zurich Airport

Infrastructure Management. Zurich Airport communicates individual access points, controls service providers and manages wired infrastructure. Today, the service is provided by a single service Provider, Monzoon. In the future Zurich Airport intends to manage the whole access point infrastructure and to split traffic to multiple providers. Customer care, AAA or security services will be either left to service providers or a relation managing company.
Financial Aspects. Zurich Airport gains revenues from service providers who in turn charge for user subscriptions. Provider revenues are shared with the airport and in future providers will be additionally charged an initial fee to offer their services at the premises.
Current Experiences. Communication of individual access points and advertisements of the service are both crucial for attracting WLAN users. The split of responsibility between service providers and venues slows down service take up. Business customers using mostly email, use regular voice calls on mobile phones (existing billing relation) as a substitute to WLAN access. Few problems with interferences or restrictions of hot spot positions were noted even in the airport environment. Skilled partners for WLAN service customer support were hard to find.

Wide area WISP

Case study: Swisscom Mobile[3]

Swisscom Mobile is Switzerland's major MNO with a market share of 66%. It has been doing research in the field of WLAN since 1999 and launched its service commercially in 2002. Nowadays, its network consists of 107 hotspots. WLAN services are positioned to complement cellular based services. Swisscom Mobile ascribes WLAN a massive importance for their future data services and has therefore invested substantially.
Value Proposition. Swisscom Mobile aims at achieving a competitive edge by providing high quality, innovative WLAN services on 802.11b technology within a broad data and voice service spectrum. Venues are offered free set up and operation of WLAN at their premises and varying revenue sharing models. In addition, staff training as well as material and consulting for communication of hotspots are provided.
Customer Relationship. Existing cellular customers register for the service through their cellular phone number to receive a SMS with access information. Others need to buy prepaid scratch cards. Today, existing customers get access to WLAN more conveniently and benefit from by the minute pricing as well as a flat fee maximum price instead of uninterrupted 2/24 hour pricing for others. Existing infrastructure for customer support infrastructure (hotline, Internet, branches) is available for WLAN services. The service is targeted at business customers who use it for e-mail and access to corporate networks. In order to develop the market Swisscom engages in broad marketing activities by providing WLAN coverage for international events taking place in Switzerland (foe example the World Economic Forum in Davos).

Infrastructure Management. To achieve quality leadership, exclusive end-to-end solutions are provided, including AAA, security services, end-user education, customer care, service marketing, set up, operation, and communication of access points, as well as on site staff trainings. Network integration and provisioning of prepaid cards is carried out together with partner companies.
Financial Aspects. Revenues are achieved by prepaid and postpaid user subscriptions to make WLAN a profitable business on its own. Up front investments for set up of hotspots are to be covered to a specified extent before sharing revenues with hotspots. Venues also participate by selling prepaid cards. Generally, revenue models are varying depending on hotspot importance.

3 Interview with Thomas Kern, Head of Product Management "Business"

Current Experiences. Business customers perceive public WLAN as a natural extension of cellular services. Site acquisition has proven easier for WLAN hotspots than for UMTS with little problems regarding interferences. A large number of antennas are needed in certain buildings to ensure coverage. Services are mainly used to shorten waiting times by being able to work similarly as in an office environment.

Case study: SunriseTDC Switzerland[4]

TDC is Switzerland's third largest MNO marketing cellular services under the brand Sunrise. WLAN services are not yet operational but planned for 2003. TDC believes that WLAN will mainly influence competitive rivalry between MNOs penalizing those without a WLAN service. Therefore, WLAN is planned to extend the existing business and increase customer loyalty.

Value Proposition. The service based on 802.11b technology will be provided as a part of a cheap and simple wireless service bundle. It will be initially restricted to wireless Internet access without value added or security services aside from recommendations. TDC will offer venues their attractiveness to end users through their brand and single point of contact for wide area WLAN access.

Customer Relationship. TDC will control the customer interface in a way that customers always interact with the brand of Sunrise. In this context reliability of the service and its bandwidth as well as short reaction times will be a priority. The service will be targeted at existing business customers and communicated along existing direct channels (e.g. direct mailings, business centers). It will be billed together with cellular services. In cases of exclusive hotspot coverage, prepaid and roaming services will be offered. Existing customer support infrastructure will be available for WLAN.

Infrastructure Management. The customer interface and related activities billing and customer care will be performed internally other activities like hot spot set up and operation may be performed by partners depending on the type of hotspot. TDC intends to make use of their experience in wholesaling to offer relationship management also for multi provider models to venues. A flexible business model without the restriction to end-to-end solutions is planned. The coverage of their service is to be selective based on the communication needs of existing customers.

Financial Aspects. Revenues are to be primarily achieved by postpaid subscriptions of existing Sunrise customers and shared with venues. Besides revenues from non Sunrise customers, no further revenue streams are expected in the initial stage.

Case study: Monzoon[5]

Monzoon is a start-up company founded in the fall 2002, created with the idea of satisfying private needs to have access to Internet at any place. Monzoon is a neutral network operator, i.e. a "Greenfield" start-up offering broadband Internet access and services. At present Monzoon operates about 25 hotspots in Switzerland. In the future Monzoon plans to provide besides communication services, value-adding services as printing or location based services.

Value proposition. Monzoon's core offerings are the installation and operation of 802.11b-based WLANs at venues of corporate customers. Based on its innovative software solutions, Monzoon is able to offer AAA services, facilitating commercial deployment of public WLANs, and roaming with other WISPs. Monzoon also offers

4 Interview with Ezra Stein, Marketing of Broadband Services Sunrise Mobile

5 Interview with Mathias Koch, CEO Monzoon Networks AG

training for the venue's staff and support for marketing activities related to the service. In addition Monzoon offers a free encryption solution enabling secure data transmission.

Customer Relationship. The main target customers are business customers, who are interested to provide WLAN services to their end customers. Monzoon has given up the idea to target end customers as this market segment is already occupied mainly by MNOs. However, Monzoon has organised several broad marketing events with the aim to develop the market (e.g SeeSurf in summer 2002, where WLAN services were freely offered in the major cafes of Zurich).

Infrastructure Management. The network is composed of autonomous hotspots connected to ISPs. Installation and operation of hotspots is performed in co-operation with a broad network of business partners. Technical partners are CISCO, IBM, and TOGEWAnet. Customer support is outsourced to professional call centres. Of strategic importance for Monzoon are roaming partners operating different kind of networks or providing enterprise-grade remote access services. Currently Monzoon has roaming agreements with five WLAN operators and with iPass, one of the leading provider of worldwide enterprise-grade remote access services. Further strategic partners are mobility providers as airlines.

Financial aspects. Revenues are achieved by prepaid scratchcards, postpaid subscriptions and yearly flat-fee subscription. The offered prices vary with respect to partners (e.g. customers of the partner Swiss airline receive special discounts). Revenues are currently shared with venues and in future it is planned to share them with content providers as well.

Current experiences. According to the experiences of Monzoon end customers use WLAN basically for e-mail and access to corporate VPN. The traffic volume varies at different hotspots. In average there are about 50 accesses per months, but most frequented hot spots achieve more than 100 accesses. Postpaid subscriptions are considered more convenient compared to scratchcards.

Case study: Netair[6]

NetAir is a very small start-up enterprise, currently in its creation stage, planning to offer WISP services on the Swiss Leman basin region. It tested its service during late 2002 in two hotspots and will make it commercially available in 2003.

Value proposition. NetAir provides a bare broadband wireless internet connection through the 802.11b technology. The basic service allows users to connect to a single hotspot and is positioned as a low-cost alternative to ADSL/cable connections. The premium version allows users to connect to the whole NetAir network. On the other hand there is limited support and quality of service guarantees except a 128 kbps minimal data rate and a maximum 24h interruption of service.

Customer relationship. NetAir targets the mainstream consumer market, with a particular attention towards early and late majority users, who are typically attracted by convenience and low prices (Moore 1999). In particular, the basic offering is directed to residential customers wanting a low cost Internet connection at home, while the premium service is directed to mobile users equipped with a WLAN enabled laptop.

Infrastructure management. The NetAir network is composed by autonomous hotspots, connected to the Internet by independent ADSL connections, sharing only the authentication and security software. The network covers different types of residential and public locations. Basically, the network is created using a hybrid approach: NetAir takes care of network planning, deployment, operation, maintenance, promotion and contract management, while involving users with an existing broadband connection in becoming part of the network, by sharing their existing broadband connections and hosting wireless equipment on their properties in exchange of revenue sharing possibilities. NetAir would also like to sign roaming agreements with other WISPs and

6 Interview with Patrick Winkler, founder of NetAir

roaming brokers in order to increase coverage and customer base. Other business partners are resellers (who promote the service for a commission), ISPs (who rent ADSL lines to connect the hotspots to the Internet) and equipment vendors (who sell the necessary network equipment).

Financial aspects. NetAir expects to gain revenue from monthly flat rate user subscriptions. Part of this revenue is shared with affiliate users depending on hotspot utilization. The remainder should cover ISP costs, network equipment expenses and provide capital for future network growth. NetAir expects a less than two years payback period.

Community WISP

Case study: Myotis

Myotis is a non profit association created in November 2002 aiming at creating an autonomous community wireless network covering Lausanne. The association already has a dozen members and operates a couple of hotspots, but hopes to reach fifty members and an adequate number of access points.

Value proposition. Myotis basically contributes to create a metropolitan community wireless network in Lausanne by federating people's access points, coordinating their deployment (e.g. for avoiding interference) and collaborating with similar networks. Moreover, the association offers knowledge sharing and formation courses on different WLAN topics and allows experimenting with new wireless technologies and applications.

Customer Relationship. Myotis adopts a tiered customer relationship model. Members have full and unrestricted access to the community network and its services, while non members are offered restricted services (i.e. low bandwidth Web access). Commercial sale of its bandwidth might be considered to raise additional funding.

Infrastructure management. Initially, the network will be composed by autonomous hotspots set up by the association's members, which are linked to the Internet through independent residential connections and share the same authentication system. Afterwards, a backbone (copper lines and point-to-point wireless links) might connect the different hotspots and share a high speed Internet connection. Hotspots will be set up and maintained by single members, who are assisted by Myotis to select, install and configure the necessary equipment. The association also manages the authentication service and promotes the network.

Financial model The members of the community are required to pay an initial and annual fees, which shall be used to extend the network and provide formation courses. They also contribute on a voluntary basis with equipment, knowledge and work. Connection fees are supported by single members providing access to their connections.

Current experiences. Currently, the major concerns are fostering member involvement and protecting against abusive usage of the community network.

CONCLUSION

In this section the basic findings of the cross-case study will be discussed from two perspectives: 1) From the different aspects of business models following the previous structure and 2) from the point of view of the WISP classification framework.

Value proposition. Today, WLAN technology is standardized and provides little opportunities for service differentiation based on bandwidth or quality of service. WLAN providers offer best effort with a maximum of 2 mbps. As a result differentiation opportunities have to be found in other spheres then technology. Based on the interviews we can identify three differentiation opportunities: 1) through leveraging strong existing customer relationships; 2) through fast establishment of partnerships and co-branding with companies having strong relationships to end customers; and 3) through the quality of added services (for example is metered payment possible or not). Players chose from the three opportunities based on their core competencies. MNOs try to leverage existing customer relationships and customer support infrastructure. They provide WLAN as part of their service bundle."Greenfield" start-ups seek to balance out their lack of direct relationships to end-customers by early occupying venues, with a high frequency of end-customers in the early adopter business segment, e.g. airports, fairs, hotels and by establishing early relationships to potential multiplicators of their services as for example airlines, and by early roaming agreements. Another differentiation opportunity for start-ups are development of competencies for offering added-value services as for example printing services in the future. On the other hand start-ups focusing on consumers seek to replace fixed Internet access and Community WISPs try to coordinate installation of Hotspots.

Customer relations. With their existing infrastructure MNOs are able to provide services such as support more effective and efficient than start-ups. The strength of an existing brand and customer base as well as advertisements for superior service bundles make the communication of WLAN services for MNOs easier. As venues are not primarily interested in handling the customer relation regarding WLAN, clearly MNOs are positioned best taking care of customer relations. But, this holds only for domestic customers. Incoming foreign potential customers can only be addressed through co-branding and partnerships with international players as well as customer and brand owners.

In general, all interviewed parties pointed to the underdeveloped market for WLAN. This is due to several reasons: 1) Currently most companies do not have a strategy how to handle end-devices and WLAN usage; 2) End-devices equipped with integrated WLAN cards are just starting to appear; and 3) The overwhelming number of negative articles concerning WLAN security provide a serious burden for developing trust in the new services. In order to develop the market MNOs and start-ups have to engage in broad marketing activities.

Infrastructure management. Of all analyzed players MNOs and private WLANs rely on the smallest partner network, e.g. Swisscom Mobile providing high quality end-to-end solutions to it's customers. Venues are ultimately interested at satisfying their customers but lack competencies in the area of WLAN. Therefore, they are interested in wide area WLAN services also at their premises and are not able to fundamentally influence the WLAN landscape itself.

Financial model. All players use currently the same subscription models with slightly different pricing, prepaid cards and postpaid subscription by credit card or an existing cellular billing relation. Metered payment has proven to be expensive to implement and only Swisscom Mobile aims at such a services. Volume based models are considered not feasible as users a not able to estimate transferred volumes of data. In the future attractive revenue-sharing models will be necessary for development of relationships to content providers and providers of value-adding-services.

Experiences. Interference with fixed infrastructure has not shown to be a problem for any of the players regarding installation or operation of access points. As expected abusive usage especially in the case of community WISPs as Myotis have been shown to cause problems. Today in Switzerland, services are mainly used by business customers for e-mail and corporate access. These are willing to pay for reliability and would not consider Community WISP services. Although all players offer prepaid cards, they are perceived to be highly inconvenient, due to the fact that users can not simply start using a service when they detect it. In general the currently prevailing usage of available hot spots is lower than expected.

Based on the findings described above the following conclusions can be drawn for the business models described in the classification framework: Regarding the WISP classification framework hotspot relations between the various business models can be refined. Hotspot WISPs do indeed collaborate with specialized WISPs. They do so either in a single provider or a multi provider model. Due to the technical complexity of traffic distribution the multi provider model is suitable only for venues with a large amount of

customers. For them the multi provider model increases the attractiveness for their customers and improves their bargaining position towards service providers.
On the other hand start-up Wide Area WISPs aim at collaborating with MNO and ISPs as opposed to Community WISPs. While MNOs targeting quality leadership try to operate their own end-to-end solutions, others try to build on flexible business models offering start-ups the potential to sell to MNOs and ISPs as their wholesale customers.
To provide a reliable service, support and communication activities especially for business customers, the centralized top-down approach seems to prevail. First experiences show that initial investments in the installation of access points are low compared to cost of providing AAA and support infrastructure.
In this context and from a business angle, WLAN seems to follow a complementary path to existing infrastructure based networks, as the centralized operation of wireless networks is a core competence of MNOs extending their existing wireless technology. This is even more so when the usage of GSM infrastructure for roaming starts to pick up.
In future, further research will be needed to verify the first results with a quantitative study and by comparing the results with surveys of other countries. As WLAN usage will pick up beyond the early adopter business segments, research on the application of diffusion models, disruptive technology or competitive strategy theories will lead to additional insights.

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